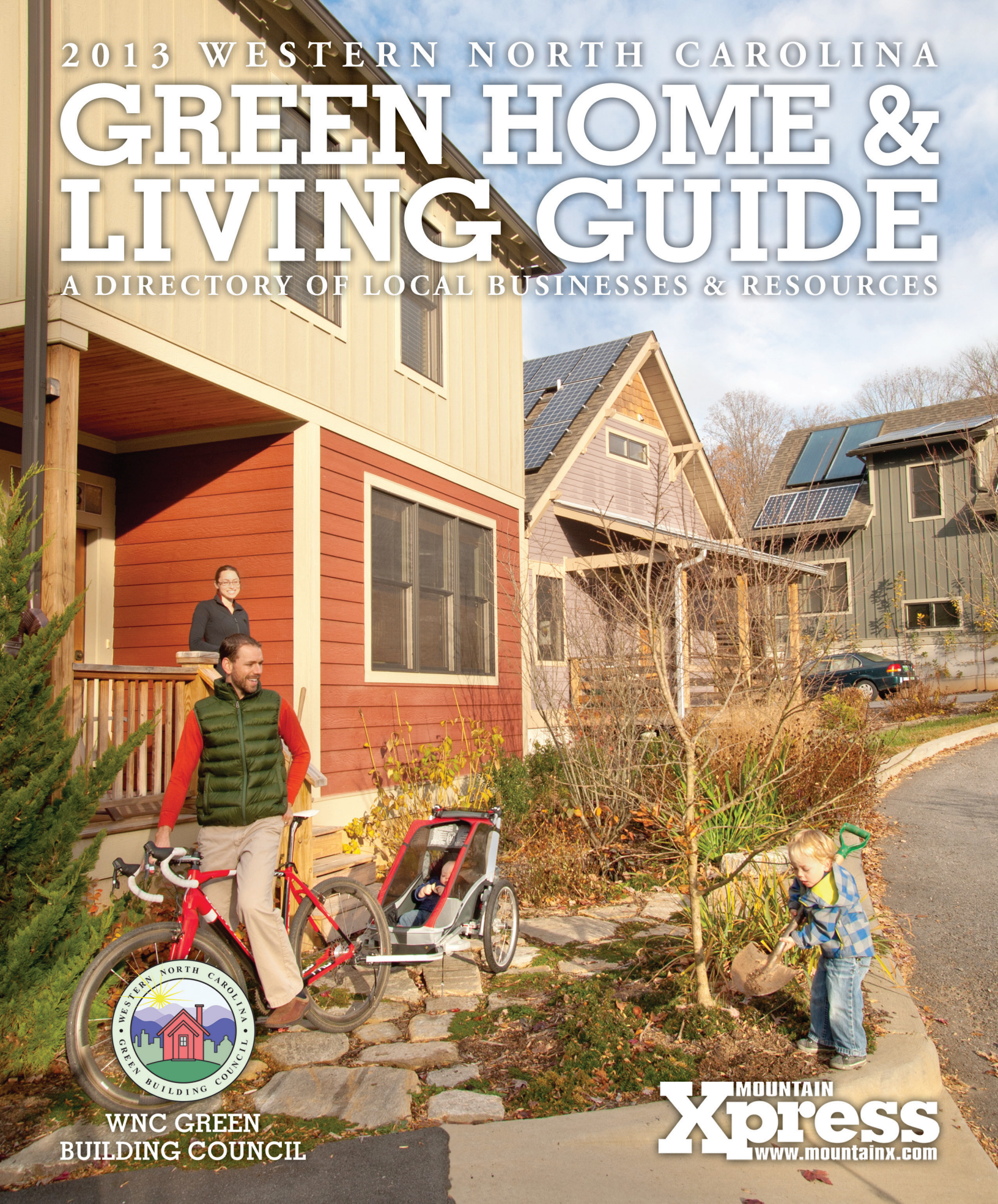
2013 WESTERN NORTH CAROLINA

GREEN HOME & LIVING GUIDE

A DIRECTORY OF LOCAL BUSINESSES & RESOURCES



WNC GREEN BUILDING COUNCIL

MOUNTAIN Xpress

www.mountainx.com

This isn't about keeping up with the Joneses

Environmentally aware building isn't the future.

It's now.

Palladium Builders

palladiumbuilders.com

828.713.0900

Sure Foot Builders
Design and Build Firm

Craftsmanship of Balance

Modern or Traditional / Custom, Spec or Remodel

Contact Info:

www.surefootbuilders.com
surefootbuilders@gmail.com
828-242-0925

High Country Timberframe & Gallery Woodworking

Licensed General Contractors
NC, SC, VA

timberinfo@highcountrytimberframe.com

highcountrytimberframe.com **828.264.8971**

The Affordable, High-Performance, Green-Building Solution

Proudly Manufactured in Boone North Carolina

- Meets Energy Star 3 and Other Major Energy Efficiency Standards
- Panelized 2x6 Weyerhauser I-Level Framing Wall Systems With Pre-Installed Doors & Windows Of Your Choice
- Choice of Spray Foam Insulation Services
- Reduce Conventional Framing Time by 60%
- Reduce Conventional Costs by 15%+
- Reduce Construction Waste
- Lengthen Your Building Season
- Increase Energy Efficiency
- Walls Can Typically Be Set In One Day
- Adaptable To Most Designs
- Custom Designed & Manufactured For Each Client In Our 26,000 SF Facility

SHOPBUILT™
Panelized Wall Systems

CERTIFIED GREEN PROFESSIONAL™ BPI SIPA Structural Insulated Panel Association MNC

Table of Contents

On the cover: The Larsen family at their Davenport Park home in West Asheville.

Builder and developer: JAG and Associates Construction Inc. / **Land Planning and Design:** Equinox Environmental Inc. / **Home Design:** Wilson Architects Inc. / **Solar Installation:** Sundance Power Systems Inc. / **Cover Design by:** Carrie Lare / **Photo by:** Max Cooper

MASTHEAD

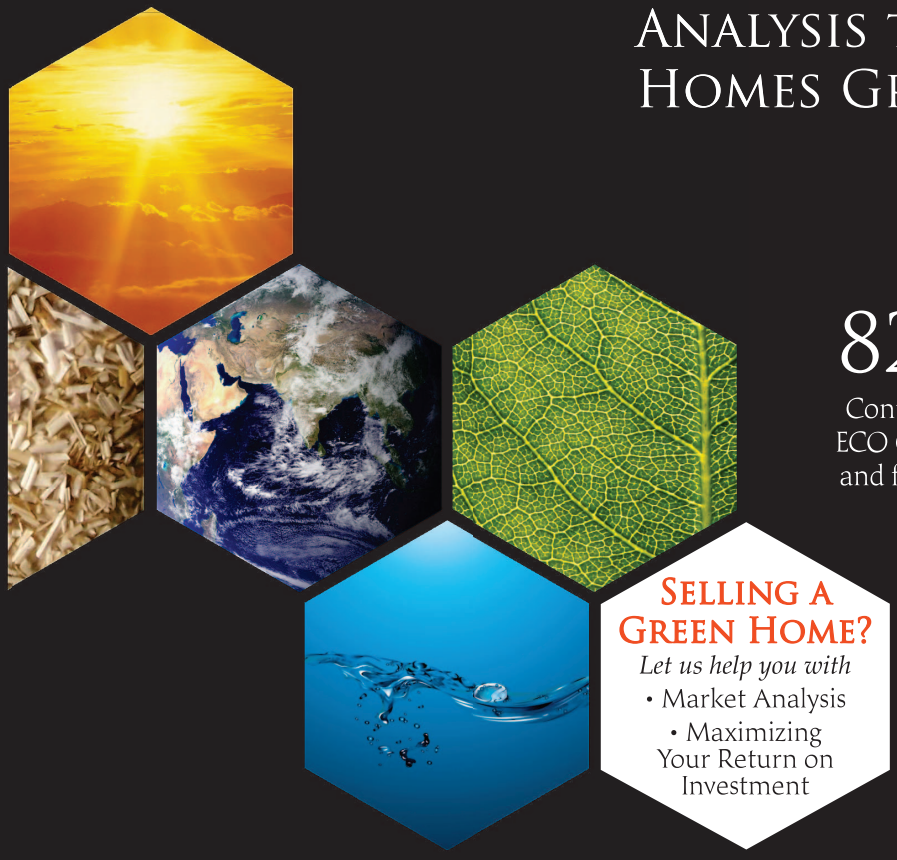
PUBLISHER Jeff Fobes
ADVERTISING MANAGER Susan Hutchinson
EDITOR Margaret Williams
ASSOCIATE EDITORS Jaye Bartell, Tracy Rose
COPY EDITOR Jon Elliston
ART & DESIGN MANAGER Carrie Lare
PHOTOGRAPHER Max Cooper
WEB DESIGNER Don Makoviney
DISTRIBUTION MANAGER Jeff Tallman
MARKETING ASSOCIATES
Bryant Cooper, Jordan Foltz, Arenda Manning, Tim Navaille, Samantha Pope, Aiyanna Sezak-Blatt, Emily Terry, John Varner
ART & DESIGN Emily Busey, John Zara
WNC GREEN BUILDING COUNCIL COORDINATORS Matt Siegel, Maggie Leslie
WRITERS Russell Barnes, Emily Boyd, Dena Chandler, Stan Cross, Darren Dahl, Stephanie Dahl, Hans Doellgast, Mari Fox, Boone Guyton, Jane Hatley, Nancy Hodges, Charlie Jackson, Jo-Jo Jackson, Jane Lawson, Maggie Leslie, Annie Martin, Sarah Beth Mulet, Amy Musser, John Myers, Allison Perrett, Alyx Perry, Laura Piraino, Nina Reinhart, Tracy Rose, Jake Sadler, Matt Siegel, Catherine Silver, David Tuch, Matt Vande, Joan Walker, Suzanne Wuelfing

MOSAIC
COMMUNITY LIFESTYLE
REALTY

Find Green Homes before they hit the market

discern between true Green Built Homes and "green-washed" homes

Use our Energy Retrofit Analysis to make Existing Homes Greener



Selling a Green Home?
Let us help you with
- Market Analysis
- Maximizing Your Return on Investment

828.337.8190

Contact Broker and Owner Mike Figura, ECO Certified, to discuss Mosaic's services and find a REALTOR® that is right for you

60 Biltmore Ave., Asheville, NC 28801 tel: 828.707.9556 fax: 800.553.1491

WWW.MYMOSAICREALTY.COM

Mosaic Community Lifestyle Realty is a triple bottom line company

How does your home measure up?

Putting your home on the market? *Let buyers know how green your home is in a simple and easy to read format by providing them with a Green Gauge Assessment*

Interested in remodeling and don't know where to start? *Have an assessment done by an experienced professional and take advantage of incentives to save energy!.*

Buying a home? *Ask for a Green Gauge Assessment and compare.*

GREEN GAUGE

Sample Assessment

Home Information

Home Owner Name: Mr. &Mrs. Green

Address: 11 Forrest Ave Greentown, NC 28809

Square Footage: 1900

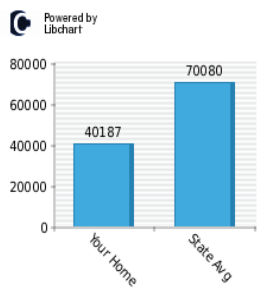
Year Built: 2008

Certification and Levels: NC HealthyBuilt: Silver

Energy Star: Yes

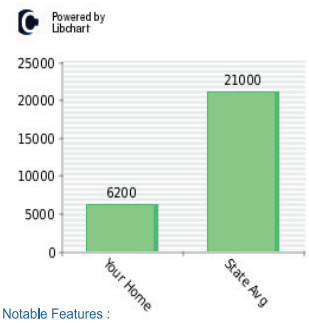
Water Use

Estimated Annual Indoor Water Use (gallons)



Energy Use

Estimated Annual Energy Use
Based on Energy Performance Score(kWhe)



Notable Features :

Solar electric and geothermal heat pump installed

Indoor Air

ASHRAE Compliant Ventilation System: ERV/HRV

Bath Fan Exhausts to Outside

Kitchen Rangehood Exhausts to the Outside

Radon System: Passive

High Efficiency Air Filter: Pleated

Sealed Crawlspace

Low Flow Water Fixtures

Showerhead: 1.50 GPM

Sink Faucet aerators: 1.00 GPM

Toilet : 1.19 GPF

Dishwasher : Energy Star ®

Clothes Washer : Energy Star ®

Site & Outdoors

Turf Grass: Less than 25% of Landscape

Native/Edible: Over 50% of Landscape

WalkScore: 90 Walker's Paradise

Rain Catchment: 500 Gallons +

Other Features:

- Rain Garden
- Fruit Trees
- Vegetable Garden
- Designed Permaculture
- Xeriscaping
- Drought resistance ground covers

Materials

Floors: Reclaimed Wood, Bamboo

Countertop: Recycled Glass

Siding: 50 Year Warranty,

Decking: Locust

Roofing: Metal

Kitchen Casework: Formaldehdye Free

A low- cost, simple program to help you gauge your:

- Energy use
- Landscaping
- Indoor water use
- Walkability
- Environmentally-preferable materials

WESTERN NORTH CAROLINA GREEN BUILDING COUNCIL

Green Gauge is a program of the WNC Green Building Council

Green building comes home

BY MAGGIE LESLIE AND MATT SIEGEL

Over the past 12 years the WNC Green Building Council has made considerable strides in expanding the knowledge about and implementation of green building in our region — through certification of more than 650 new homes, organizing monthly green open-house tours, creating new programs for existing homes and educating the public in many ways. As a membership-supported nonprofit organization, the WNCGBC has been able to serve the community, thanks to the support of member businesses and individuals. We hope that you find the *Green Home & Living Guide* a valuable resource, and support its continued publication through membership with the WNCGBC.

To further our efforts to build a more sustainable community, we've expanded the Green Building Directory. We recognize that green building is just one important aspect of a growing movement to live more sustainably. To that end, we've included aspects of sustainability and green living, such as transportation and home furnishings. The 2013 *Green Home & Living Guide* now provides valuable resources and information ranging from sustainable agriculture to transportation and, of course, green building.

The business directory at the end of the guide makes it that much easier for readers to take the next steps in greener living and utilize the local businesses we are so lucky to have in WNC.

How to use the Guide

This guide has something for everyone. It begins with case studies of regional projects, in both the residential and commercial settings. Feature articles follow, discussing a variety of themes in green living, as well as the technical aspects of emerging technologies for professionals. A series of How-To articles helps builders and homeowners alike with DIY projects like building a new deck or installing new floor materials.

As always, the guide includes a comprehensive directory of local green businesses. To keep high standards and provide a truly valuable resource, there are specific requirements for many of the business categories.

Of course, the guide — both current and archived articles from past issues — is always available online at wncgreenguide.com (just in case you accidentally lose the hard copy).

PHOTOS COURTESY OF ALEMBIC STUDIOS

Living in the Nauhaus

An efficiency success story

BY DARREN AND STEPHANIE DAHL

Our Nauhaus experience began in a grocery store. Back in April 2011, we were living with Maggie, our 45-pound mutt, in a dark, bunker-like apartment in the Brucemont Circle neighborhood of West Asheville. What the place lacked in light it made up for in cheapness of rent and proximity to Haywood Road's many amenities.

It was a chance meeting in a local supermarket with **Jeff** and **Jeannine Buscher**, the owners of the Nauhaus (Jeff was also the engineer during construction), that put the ball in motion for us to consider moving. We had not only watched the house rise from its foundation, we also had solid connections with many of the folks who had a hand, along with some blood, sweat and tears, in pulling it all together. We're friends with **Clarke Snell** and **Tim Callahan**, the founders of The Nauhaus Institute, along with folks like **Lisa Mandle** and **Jennifer Bennett**, who created the original layout and architectural drawings for the house, respectively. And so, after learning that Jeff and Jeannine were moving up to Weaverville to tend to their thriving kombucha business, Buchi, and were looking for responsible renters for the house, we enthusiastically raised our hands: Pick us, pick us!

Thankfully, they did, and we moved in about the middle of June 2011. That means, as we write this, we have lived in the Nauhaus for more than 15 months — a period of time where we've had the chance to experience each season at least once.

Full disclosure: We are not builders or engineers. (Darren is a freelance writer, and Stephanie is an urban planner.) That means our perspective on what it's like living in the Nauhaus is largely limited to what we see, feel and hear. Yes, we have been told all the wonders of hempcrete, R-values and the insulating properties of krypton-gas-infused windows (nothing to see here, Superman!). All great stuff, no doubt, but much of it flies over our heads. What we do understand is that the house's passive-solar design provides an amazingly light-filled atmosphere that is both airy or cozy, depending on what we want it to be.

Whether it's the cooling touch of the earthen blocks that make up the living room floor under our bare feet or the birdsong that wafts in through the dual sets of French doors that open up to the outside (which also

recently served as a great spot to snap a picture of a bear snacking on our bird feeders), the Nauhaus is full of pleasing sensory experiences.

If the weather isn't great outside, say too hot or cold for open windows, the combination of 16-inch walls and the fresh-air-circulation system does an efficient job of keeping the house comfortable. Jeff Buscher says of his time living in the house, "We turned the heat pump off in February and passive solar heat alone kept the house between 68 and 78. There was no overheating, and on a less-than-20-degree winter day without sun, the house only loses a degree or two in a day." There is also the hint of lime (the mineral not the fruit) in the plaster on the walls that freshens things up.

Because the sun shines directly inside the house during the winter, and deflects above the roof line during the summer, we can restrict our use of the four electric mini-split heat pumps that are spread throughout the house. When we do turn them on, those wall-mounted heating and cooling units are not only great at warming up a room in mere minutes, you can also engage them in dehumidifier mode to decrease lingering humidity you might run into during the middle of summer.

The home is prewired for solar electric panels, but those have not been installed yet, so we pay two utility bills each month: one for the electricity used in the house and the other to power the well that the builders installed when the water department told them the water line was too small to accommodate another house.

We consistently pay about $20 a month to power the well (the water from which is delicious after it's been processed through a non-chemical filter). When it comes to powering the house, our monthly electric bill averages $57, with a high of $93 last January. Again, we're no experts, but based on the reactions most folks give us when we share that statistic, we're guessing that's pretty good.

We're also able to shave a few kilowatts here and there by drying all of our clothes, washed in a high-efficiency washing machine, year-round, on the home's rear deck, which gets ample sun most of the day. Buscher also noted, "The experimental waste-water heat-recovery system that is hooked to the incoming 'cold' line of the shower supply has performed well. The cold-water supply line gets warm to the touch when someone is taking a shower."

One of our favorite aspects about the design of the Nauhaus is how it maximizes the use of outdoor space, where we get to enjoy covered areas on both sides of the house — including an enclosed outdoor dining room in the front. We've had many great mornings sipping coffee and doing our *New York Times* crossword puzzles, along with evenings spent entertaining our friends and family regardless of what Mother Nature was up to.

When lounging outdoors, we also have enjoyed the countless walkers and drivers-by who can't help but pause as they pass the house, because they're drawn in by the green roof that shields the front porch and gobbles up gallons of rainwater. Covered in flowering succulents, the "groof" shows off its range of colors from spring through fall.

Green, inside and out: A small home that incorporates passive-solar designs inside and out makes for an energy-efficient, comfortable abode. The Nauhaus features such green-building applications as 16-inch walls made with hempcrete.

The yard itself, which is a narrow one-quarter-acre plot that runs downhill from Talmadge Street down to Rhododendron Creek, is also a point of pride for us, as we personally have helped shape it along the sustainable lines drawn by the permaculture team, led by **Sara Brinker**. You'll find flowering edible treats like strawberries, blueberries and raspberries, to go along with apple trees, Brussels sprouts and sweet potato vines, all growing in a series of beds that adorn the home's perimeter. There's even a bridge that's part of a path connecting us to our neighbors living in the Gaia Community across the creek.

As far as nitpicks go, there's our sense of longing for an old-fashioned fireplace — something the German Passive House standard frowns upon, since it creates a hole in a home's envelope.

When you add everything up, though, we've truly come to love the place we live in — that is also why we puff up with pride when we play host to the growing number of people who come to visit the house from all over the world — everyone from former interns who helped build the house to a minister in the Canadian government who wants to tap into the demand for hemp-based building materials.

We don't entirely know what the future holds for us when it comes to our life in the Nauhaus. What's clear is that the time the team spent thinking differently about how to build a house paid off in ways beyond creating something that's green, carbon-neutral and energy-efficient. It's a great place to live, period.

The Nauhaus was featured in the 2010 Green Building Directory, *the year it was completed.*

Darren Dahl writes for publications such as Inc. *magazine and the* New York Times. *Stephanie Monson Dahl is an urban planner and the riverfront development coordinator for the city of Asheville.*

Designer: The Nauhaus Institute Asheville, thenauhaus.com

Construction: Red Shed Woodworks, Asheville. redshedwoodworks.com

Special thanks to: the many who contributed to the success of the Nauhaus

A green-living curve

Success and challenges for the Blue Ridge Parkway Visitor Center

BY TRACY ROSE

The first sign that the Blue Ridge Parkway Visitor Center boasts a green focus can be found on its roof or, more accurately, roofs.

Prickly pear cactuses, columbine, grasses, goldenrod and other native plants crown the sloped roof of the Visitor Center's exhibition hall and the flat roof that tops the rest of the building, at Parkway Milepost 384 near east Asheville.

The living roof is just one of a host of environmentally friendly features that helped the 13,000-square-foot building achieve gold LEED status when it opened to the public in spring 2008.

Built to resemble a barn with an attached shed, the building's green components also include passive-solar Trombe walls, radiant-floor heating, high-efficiency heating and cooling systems, motion-sensor-activated office lighting, on-demand hot water, a passive drainage system for the parking lot and a pair of cisterns that capture and recirculate rainwater.

Five years in, National Park Service officials now have a clear picture of just how well those green elements have performed, and they offer a frank assessment of what has worked — and what hasn't.

"It's been several years of trial and error and learning as we go, but overall, it's a good building," says **Brandon Hensley**, National Park Service maintenance mechanic who also serves as building operator.

All told, the Visitor Center cost $9.8 million, Hensley says, which includes engineering and architectural-design fees, site preparation and building construction.

Trombe walls: too efficient?

The building — made of concrete, steel, glass and wood — packs a visual punch, especially in its soaring exhibit hall, which features exposed laminate beams, a stuffed and mounted bear that appears caught in mid-trot, a motion-sensor-tripped mountain music display, blocks for children to try their hands at arch construction and more. There's even a small theater outfitted with high-definition surround sound.

From an environmental standpoint, one of the most impressive elements might be the 30-foot-tall bank of passive-solar Trombe walls on the building's south side. The structure works by allowing the sun's rays to pass through a glass window, which heats an air pocket between the window and a poured concrete wall. The superheated air heats the concrete, which then provides radiant heat to the building's interior.

Trial and error: After five years maintaining the LEED-certified Blue Ridge Parkway Visitor Center, staff have learned through trial and error which green features are working best and which need adjustment, says Brandon Hensley, National Park Service maintenance mechanic.

PHOTO BY MAX COOPER

"In the winter, they're making radiant heat for nothing," Hensley says of the walls. "In the winter, they're awesome."

The Trombe walls (eight in all) are a big reason why the Visitor Center's heating costs are 50 percent less than they would be for the same-size conventional building, he says.

Yet despite their wintertime efficiency, Hensley says, the Trombe walls became problematic in the summer by overheating the building, even with sun-blocking shade screens and mechanical cooling efforts. During the summer, air-conditioned air is pumped into the walls' air pockets to force the hot air through vents to the outdoors — which is supposed to eliminate the radiant-heat effect.

"But by no means was it doing that," Hensley reveals.

In fact, efforts to cool the Trombe walls in the summer ended up reducing the building's overall energy savings. Still, the combined heating-and-cooling costs come in at 30 percent less than a same-size conventional building, he says.

About a year ago, officials sought to address the problem by replacing the undersized air-conditioning chiller plant with a new split pump. They also bought higher-quality fans for the exhibit hall and lowered them to better circulate air. Though the new equipment does a better job, Hensley doesn't yet have the data to show exactly how well it's doing. He'd be satisfied, however, if combined heating and cooling costs were 45 percent lower than a conventional building.

Many paths to energy savings

On the plus side, other energy-saving features of the Blue Ridge Parkway Visitor Center have largely performed as expected, including the building's radiant-floor heating. Water heated by a propane gas-fired boiler is piped throughout the concrete floors, keeping them between 72 and 75 degrees during the heating season. Once the floors reach the proper temperature, the system turns itself off.

"It keeps that concrete from cooling down," Hensley explains. "You don't want it to fall down and have to heat it up."

Hensley seems particularly jazzed by the ERU (energy recovery unit) in the basement that brings in 100 percent outside air, boosting air quality in the build-

Not Your Average Thrift Shop

The Asheville Habitat ReStore is known for affordable building supplies; from doorknobs to complete kitchen cabinet sets, its worth the stop on your way to the big box stores.

If you have items you no longer need or want, Habitat will gladly take them off your hands. In addition to building supplies, the ReStore accepts and sells furniture, appliances, antiques, housewares, and much more.

Feel good about shopping and donating with us because the ReStore diverts 1,400 tons of usable material from the landfill each year and proceeds provide funding for Habitat's home building and home repair programs.

Open Monday-Saturday, 9am-6pm.
Free pick-up in Buncombe County!

Asheville Area Habitat for Humanity®
ReStore

31 Meadow Road, Asheville, NC | 828.254.6706 | ashevillehabitat.org

ing. It also boasts an energy-recovery wheel, which sends heated air back near the intake to preheat the outdoor air that will then run through the system. "Without this recovery wheel, this whole system would be very inefficient," Hensley notes.

Another area of efficiency is found in the air-handling unit's spanning capabilities. If the air needs to be heated about 1 to 5 degrees, the system is programmed to use the boiler. If more heat is needed, up to about 15 degrees, the split pump is deployed. Beyond that, the boiler kicks on.

"You don't typically see spanning in air-handling units," Hensley says.

Because the boiler is pulse-fired — meaning it's not putting out a steady stream of gas — it, too, is more efficient, he notes. And if the outside air temperature is greater than around 65 to 68 degrees, the boiler shuts itself down.

The hot-water system also is designed for efficiency. The upstairs restrooms and janitor's closet use a small hot-water heater. But the employee kitchen and downstairs restrooms use on-demand hot water, in which an electrical heating element heats the water when the faucet is turned on.

"That way, you're not keeping hot water," Hensley says.

The high-tech lighting system also yields significant energy savings, he adds. Motion sensors in the offices and restrooms turn on the lights when someone enters the room, with the lights gradually increasing in brightness.

"The sudden start of any output is what drains energy," Hensley says.

In the offices, the artificial lighting automatically dims as natural light increases. And in the downstairs conference room, a panel of switches allows for four levels of brightness, depending on the needs of the occupants.

Up on the roof

The living roofs atop the Visitor Center are doing precisely what they're intended to do — reduce the urban heat index — though they, too, have also presented their share of challenges.

"As far was what we're getting out of our roof, we're getting 100 percent of what we want," Hensley emphasizes. But keeping the plants alive on top of the building has been a "significant challenge," he admits, estimating that about 70 percent of the flora has died over the past five years.

Part of the difficulty lies in the National Park Service's requirement that only native plants can be used. And the native plants that thrive in the shady, damp conditions of the surrounding woods — such as trillium or bloodroot — won't survive summers on the hot, full-sun environment of a roof.

The roofs are irrigated by a pair of cisterns that capture and recirculate rainwater, but the water drains so quickly through the 4-inch-deep potting-soil mix, especially from the sloped roof, that it's still difficult to keep the plants hydrated.

"It's an extreme environment," Hensley notes.

Park Service officials have come to realize that a garden roof, one with beautiful blooms, isn't feasible using native plants.

But with the help of National Park Service plant ecologist **Chris Ulrey**, they're steadily trying out different types of native plants — such as the sun-loving prickly pear cactus — that will sustain themselves with minimal spot watering. Fire pinks are next on the list to try, though finding seeds, which have to be collected by hand, will present its own hurdle.

Growing in popularity

Apart from the environmental pat on the back from receiving gold LEED status, the Visitor Center has apparently won approval from the public. More and more people visit each year, with about 1,300 people per day trekking through the building during the latest peak leaf season, notes maintenance worker **Bob Rothweiler.**

And with the kinks largely worked out, Hensley's estimation of the building and its systems also has grown over the past five years.

"Overall, we're fully satisfied, absolutely," he says.

Tracy Rose is an Asheville-based freelance writer and editor.

OTHER GREEN FEATURES

- placing the building to have the least environmental impact
- low-emission interiors and formaldehyde-free wood harvested within 500 miles from the site
- a passive-drainage system for the parking lot, which traps silt in ditches instead of draining the sediment into the woods
- porous patio pavers
- a bike rack
- car-pooling spaces for the public
- recycling

Architect: Lord, Aeck & Sargent, Atlanta
lordaecksargent.com

Builder: Perry Bartsch Jr. Construction Co., Asheville, pbjrconstruction.com

Living roof company:
American Hydrotech, Chicago
hydrotechusa.com

Buchanan
Construction, LLC
Building with quality, integrity, and professionalism

Buchanan Construction, LLC

44 Buck Shoals Rd., Suite B7
Arden, NC 28704

Phone 828-650-6565

Fax 828-650-6501

If you are ready to build your new home, commercial, or industrial building, please **contact us for a free project consultation**. We are fully licensed, insured, and bonded.

Buchanan Construction is the area's leading builder of luxury homes at competitive prices. Our experienced staff of employees and subcontractors are committed to provide the highest quality of materials, the latest technology, and fine mountain craftsmanship that is simply unsurpassed. We are a full service General Contractor providing quality service to residential, industrial, and commercial clients in Western North Carolina.

Our Services Include:

Custom Homes • Design Build • Commercial
Industrial • Churches • Restaurants • Office Up-fits
Pre-Engineered Metal Buildings

Specializing in Unique Circular and Net-Zero Energy Homes

deltec HOMES
THE ORIGINAL GREEN BUILDER

deltechomes.com

For a free 20-page booklet and DVD call 800.642.2508

Cozy refurbishment: Much of Ashevillage's interior touches comes from reclaimed materials, from the curtain materials to the earthen paints and plasters. (Pictured: garden coordinator Sunil Patel, left, and Ashevillage founder Janell Kapoor)

PHOTOS BY MAX COOPER

Ashevillage A living laboratory

BY JO-JO JACKSON

Push the envelope beyond green living and green building: The Ashevillage Institute and Sanctuary aims to create "resilient" living, says founder **Janell Kapoor**. She describes Ashevillage as a "living laboratory," located on an acre in the downtown-Asheville area.

"The vision … was to create both a living demonstration of sustainable solutions in action in the urban environment [and] a sanctuary — a place of beauty, respite and inspiration," says Kapoor.

The Institute is the organization's nonprofit half, offering workshops, tours and programs. The more recently formed Sanctuary offers guests lodging and accommodations and provides site maintenance, she explains.

Ashevillage "was originally inspired to be a local model of what I was doing internationally," says Kapoor. She got her start after attending a 1997 natural-building workshop. Since then, Kapoor has taught natural-building workshops stateside and across the globe in Southeast Asia, South America and Europe. In 2004, she founded the nonprofit Kleiwerks International as an organizational umbrella for her worldwide work; in 2006, she started buying the three adjacent, downtown Asheville properties that would become a home for Ashevillage.

"It was the headquarters for Kleiwerks, but really, in time, it's [developed] its own identity, and it's less tied to the international work," she notes.

Although Kleiwerks still fiscally sponsors Ashevillage, Kapoor explains, she hopes to have it financially independent within the next year and gain a board of directors. She describes the process as an exciting time, saying, "It feels, in some ways, like we're at the beginning, because a lot of the first years have been developing the site, most of which has come to completion."

Renovating Sanctuary: Waste-stream redirection

The Sanctuary branch is comprised of two houses that were built in the 1920s, and both were renovated mainly with materials from the waste stream — that is, discarded materials. Kapoor and a revolving team of craftspeople used discarded materials to make their own earthen plasters and paints for interior walls and ceilings, as well as exterior surfaces.

Retrofitting "is something that is most important in the green-building world," she says. "The property

Shades of natural: Clay-based designs, plasters and paints appear inside and out at Ashevillage, as in the archway (top) or the dining room and kitchen walls. Renovation also relied on donated, gently used and thrown-away materials, from drapes to stoves.

was trashed, totally trashed [when purchased]. We have, I think, really done a lot to heal [it] and show what's possible in a backyard using, again, mostly salvaged materials along the way."

The earthen plasters and paints were made with such ingredients as recycled clay, sand, marble dust or mica, wheat paste, milk and water. The resulting natural plasters and paints were used over different surfaces, including the original plasters, wood lath and drywall that were in the house. The natural materials have endured six years of living, she notes.

"This is a practice that is applicable in conventional building," Kapoor says. "We also did the exterior over the brick with earthen plaster using a subsoil clay. … For a year, we had no gutters, and we've had all kinds of weather, and it's just held up beautifully." The exteriors were finished with a 1-to-5 mixture of Elmer's glue and water. "It was maybe $10 of Elmer's in the end," she recalls. "It's certainly a way to replace the really toxic paint[s]. These solutions work in any environment; they can be done in office buildings [and] any kind of new buildings."

Ashevillage also tapped the waste stream for the backyard stonescaping. The courtyard and amphitheater were constructed mainly with salvaged or donated stone. "About half of it was made with what's called 'urbanite,' which is a recycled concrete; it's old, ripped-up sidewalk," Kapoor says. "It's replacing mining up a new mountain for its stone by using and rerouting the waste stream into usable material."

For the Sanctuary, the renovation team also used salvaged and recycled furniture, windows, curtain fabrics and other such goods to furnish the sanctuary interior. "We don't participate much in buying new things unless we really need to," says Kapoor, describing this as a "hidden, but very ecological practice: [It's] less we're buying into the [new-product consumerism], and using what's already there." She points out some curtain material, noting that it came from a friend who had an old organic-diaper company. "She donated these fabrics," says Kapoor. "And the curtain rods are local bamboo that we harvested."

Permaculture, aquaponics and water bio-filtration

Part of Ashevillage's living laboratory is a near 18,000-gallon stormwater-catchment system that includes a bio-filtration canal and aquaponic system. Site engineer **Ash Aymond** and former Ashevillage colleague **Shawn Jadrnicek** designed and developed the canal system that taps into the overflow of water after storms.

When the stormwater is initially captured, it will be channeled through a 100-foot system that has a 10,000-gallon holding capacity, including a bioswale component that will consist of edible and medicinal plants and fungi. The water will then travel via small canals to another 6,000-gallon pond that acts as a central holding tank. The system includes a pump to keep the water moving and prevent stagnation or pests, Aymond explains.

The aquaponic system (which combines aquaculture fish farming and hydroponic plant gardening) includes the fish farm and greenhouse, an estuary and a pond. For the time being, the two water systems are separate, but Aymond plans to have them connected, with the canal system fully operationally

by summer 2013. "Everywhere that you walk on the property you'll hear water, you'll see water," he says, "The next phase would be to really populate it with fish — catfish, bass and tilapia. We'll have tilapia [only] in the greenhouse, because they're an invasive species."

The long-term goal is to eventually have an effective natural-filtering system in place that converts polluted stormwater into fresh drinking water.

As a permaculture model, this system doesn't exist for filtration only. It is a living mini-ecosystem with fish, mushrooms and plants that have culinary and/or medicinal use; the only input to the system will be nutrients, Aymond adds. "The only thing you have to feed in the system is the fish, and the fish feed the plants, and you can eat the fish and the plants," he says. The fish food will come from the Sanctuary by way of food scraps. There's a solider fly larva composter on site that "converts" food scraps into fish food (soldier flies eat and lay their eggs in the compost; the eggs hatch into solider fly larvae; and those larvae are fed directly to the fish). This closed, self-aerating system is "kind of the way to go with composting," he says.

In addition, the property is plumbed for a gray-water system, although it's not currently active because North Carolina code doesn't allow for it, Aymond says. "Eventually, I think it's going to happen, and so when it does … we can just turn the knob and start using [it]." Gray water is considered biodegradable, coming from the non- and low-toxic detergents and soaps used in hand washing, dishwashing, bathing or washing clothes; it's a liquid biological waste that can be used as lawn and garden fertilizer. Using gray water keeps it out of the local sewer system, which treats "black" water — solid human waste, heavy salts, toxic detergents or chemicals.

The system depends on a small yet mighty element: microbes. These beneficial bacteria are what make a permaculture model possible. "You put all your gray water into the ground, these microbes chomp it down," Aymond says, adding, "They actually make plant food. They convert it directly into plant food. The same thing with the aquaponics system: You have the fish and the plants, but what sits in between the fish and the plants are the microbes."

Rainbarrels and beyond: The Ashevillage storm-water system includes canals, ponds, pumps, bio-filtering and — eventually — fish that will feed on soldier fly larvae that will then feed on food scraps.

Intensives, immersions and initiative programs

The Institute focuses on a wide array of educational programs, offering tours to schools, community organizations and private visitors. "We've had Evergreen [Charter School] eighth graders come. There were 60 of them," Kapoor says. "We were their favorite field trip ever."

The Institute is also developing a new platform of one- or two-week-long Applied Ecology and Resilient Living programs that will include seven different workshops, such Bee City, Urban Food Security, Wise Water Management, Natural Building, Community Place-Making, Transitional Economy and Leadership and Deep Ecology, Permaculture and Wild Living. Groups of local specialists — or "practivists," as Kapoor calls them — will run each immersion program. "The goal is, people will be coming from out of town who intend to learn from what Asheville has to offer, and then take back what they learn and put it to action in their own communities."

Along with exporting Asheville's green innovations to other communities, the immersion prorams will help strengthen the local sustainable-living community by bringing together like-minded people who share information and create the workshops. "There's things happening here that aren't happening in other areas

in the South, for example. But we're on a spectrum," Kapoor says, referencing **Jason F. McLennan**, who started the International Living Future Institute and the Living Building Challenge. "I'd love to see [Asheville] become really a serious hub — a dedicated city of what [a living building city] would look like. … We have the right ingredients."

In addition, the Institute is exploring a potential partnership with the new Sustainability Studies graduate program at Lenoir-Rhyne University's Asheville campus.

"I think it was Einstein who said, 'The solution to the problem is much more complex than the problem itself,'" Aymond says."A problem that was created out of a certain complexity, to create the solution for it, you've got to really understand it at a higher level. … We want to bring in the people that are on the cutting edge and studying this stuff, and they know about the 50,000 pollutants that are in the water and what kind of plants you need to take those pollutants out."

Jo-Jo Jackson is a freelance writer.

System Designers:

Janell Kapoor, Shawn Jadrnicek, Sunil Patel, Steveo Brodmerkel, Ashley Aymond, www.ashevillage.org

Project Design-Builders:

Jarad Barkeim, Reida Sage, www.ashevillage.org

Aaron Maret, http://aaronmaret.com

Eva Edleson, www.firespeaking.com

Meka Bunch, www.artisanbuilderscollective.org

At home in Hickory Nut Forest

Creating a net-zero eco-community

BY JOHN MYERS AND JANE LAWSON

When we first walked the land that is now Hickory Nut Forest Eco-Community, we had to bushwhack our way through an overgrown forest that appeared to have had no human inhabitants for quite some time. We discovered a jewel, a wild mountain forest cut through by a tumbling, boulder-strewn creek. We discovered the stone foundation of an old gristmill that had washed away in the flood of 1916. Romantic notions arose of recreating the gristmill, as well as using the power of the stream to create electricity.

Our neighbor, **Hazel**, helped fill in some of the history about the place. She and her family were the last to live in the farmhouse, the ruins of which are adjacent to the gristmill site, and her uncle had worked in the mill grinding grain.

In addition to preserving the vast majority of the forest in its natural state, we wanted to create a small community where people could live in harmony with the land. We envisioned a net-zero community with green homes using renewable energy from the sun, wind and water. We bought an old apple orchard adjacent to the property and added a garden for growing our own food and herbs. Wanting to share this beautiful land with the greater community, we created five miles of hiking trails connected to 10 more miles on our neighbors' land. A few years later, we built a community center and retreat site, Laughing Waters, for educational and community events.

Grist mill reborn: Logs from an 1840s Piedmont cabin became Hickory Nut Forest's new mill, built next to the foundation of an old gristmill on the property.

PHOTOS COURTESY OF HICKORY NUT FOREST

Since then, our journey has evolved in many exciting ways. We began building Laughing Waters at a spot overlooking Hickory Nut Creek and planned to power it using the energy of the stream. We built it as an energy-efficient structure that received a Green Built N.C. Gold certification. We looked for a way to recreate a working gristmill, and with a crew of friends went to the Piedmont and took down an old log cabin built in the 1840s, marking all the pieces and transporting them back to Hickory Nut Forest. We reassembled it next to the stone foundation of the original gristmill and added a working water wheel. Eventurally, we hope to use it to press apple cider from our orchard downstream.

Over the next couple of years, residents of Hickory Nut Forest completed two more energy-efficient solar homes. These both have a passive-solar design, solar hot-water panels and solar photovoltaic (PV panels) to make electricity from the sun. They are now close to net-zero, generating nearly as much energy as they use. A third solar house is currently under construction.

Another homeowner has installed a whole-house rainwater collection and plumbing system. A wood stove provides most of the heat all winter, and the rainwater system can take care of the water needs.

Community: This passive- and active-solar home illustrates how each member of the community contributes to the zero-energy goal.

Water power: The community design includes preserving the property's many natural features, including Hickory Nut Creek. A mini-hydro-power installation draws on the creek as an energy source.

Our most recent accomplishment has been creating a micro-hydro generator to power Laughing Waters. We spent several years researching various system designs to find out which ones were most suitable for harnessing the power of Hickory Nut Creek, while honoring and preserving the ecosystem in its natural beauty. There were lots of things to consider: how much water to divert for energy generation, what size pipe to lay, which turbine to use, how much power could be created, how to design a pond and return the water to the creek, how to install everything within the ecosystem of Hickory Nut Gorge to cause minimal disturbance, and how to best store and use the power once it was generated.

We were excited about using hydropower, as it has many advantages. Besides being a renewable resource, it involves no burning of fossil fuels and leaves no toxic byproducts or waste of any kind (all the water returns to the creek). It tends to be cheaper than solar or wind power, and once the system is running, it can produce free energy for years.

Our goal was to generate enough power to fulfill the needs of Laughing Waters and then sell the excess directly back to the utility. We settled on a 6 kilowatt-hour turbine and 6-inch pipeline for the water feed. This was based on calculations we had made of stream flow and the amount of drop in the creek, the "head." The more vertical drop there is and the greater the volume of water, the more power can be created. To keep the trout happy, however, we could only take a portion of the flow, leaving the majority of the water in the creek.

In 2012, when we began to install the system, we faced many challenges. To get the most vertical drop, we needed to run more than 900 feet of pipeline from the stream intake down to the turbine site. Laying this pipe required fusing together 40-foot sections one at a time and then pulling the whole pipe through the woods using a 900-foot rope. Once the main pipeline was in place, the next task was to prepare the intake from the stream, including a larger intake pipe, leaf screens and a silt-collection box.

At the lower end of the pipeline, we built a shed for the turbine and dug a pond for the water to flow into before returning to the stream. Due to the rocky nature of the land, we hit large boulders almost everywhere while burying pipe and digging the pond. These giant rocks now ring our pond as a reminder of the work that went into creating it.

The final step was installing and hooking up the turbine and its related electronics. It became a huge challenge to get the various components to work together properly with the right balance of water flow, pressure, voltage and current output so it would run steadily at full power. This is still a work in progress, but we are now powering Laughing Waters from the stream, and are one step closer to achieving net-zero. With the excess energy, we also plan to heat hot water to warm the radiant floor in the retreat center, and someday we may even get an electric car and charge it from the stream!

The third leg of our net-zero plan is using the wind. Last year, we received permits to erect a wind turbine above the cliffs. We put up a monitoring pole to measure wind speeds and hope to get a grant to install a wind turbine in the future.

In our minds, being net-zero also means using permaculture throughout the community. This means taking into consideration the entire ecosystem — the plants, animals, water, soils and human structures — in our designs to work in harmony with nature rather than against it. In the community garden, we are growing organic vegetables, flowers and herbs along with fruit trees of various varieties. We recently set up a community chicken coop to share the eggs the hens lay. We hope to begin some aquaculture in the near future by stocking the pond.

The journey toward net-zero has been quite an adventure for us, and we are eager to share our hard-earned lessons with others. We welcome visitors to come out and see for themselves firsthand, and get inspired to take back ideas for their own homes and communities.

Jane Lawson and John Myers are founders of Hickory Nut Forest Eco-Community in Gerton, near Asheville, on 240 acres with waterfalls, wildflowers and mountain vistas. The community includes 23 home sites with green, solar homes surrounded by forever-wild land, an organic orchard and gardens, hiking trails and the Laughing Waters Retreat Center. HickoryNutForest.com.

Developer/Designer/Project Manager: John Myers

Builders/Installers Nathan Okorn, David Mount, Tommy Harris, Bill Maurer, Nate Ballinger, Bearwallow Construction

hickorynutforest.ecofriendlycommunities.com

Haywood Community College

A regional leader in sustainability

BY MARI FOX

More than four years ago, then-Haywood Community College President **Rose Johnson** signed the 2008 American College and Universities' Presidents' Climate Commitment. She joined the nearly 700 schools pledging to cut campus emissions that contribute to global warming, apply green-building practices and incorporate sustainability into the curriculum.

Campus initiatives have since included a biofuels project that collects waste grease and converts it to fuel, an electric-motor fleet with its own charging station, a best-in-North-Carolina recycling project, and two new buildings that meld the school's philosophy with its mission: the Professional Crafts Building and the Sustainable Research Demonstration House.

Slated to open in spring 2013, the Professional Crafts Building offers craftspeople-in-training a place to learn such skills as jewelry making while enjoying modern features like high-tech classrooms, solar-thermal radiant floor heating, natural lighting and a host of other green-building features. Further, it will likely be the first LEED-NC Platinum building in Western North Carolina.

The Research House, meanwhile, is a hands-on project from start to finish: In the past two years, it has been built by students in the college's Building Construction Technology/Green Building program.

Both projects demonstrate that HCC is a fertile breeding ground for earth-friendly, eco-minded people, practices, and places dedicated to preserving nature and the heritage of true Appalachian culture.

State of the art and crafts

Funded by a quarter-cent sales-tax referendum, the $8.5 million, 41,000-square-foot Professional Crafts Building will provide faculty, staff and students with a state-of-the-art sanctuary and living laboratory that fosters learning and exploring craft traditions such as woodworking, furniture design, pottery, jewelry and fiber arts.

With the nod to traditional crafts comes a touch-screen, sophisticated climate-control system for the interior spaces, along with a host of other green-building features that will a Platinum LEED designation — the highest possible.

"The collaboration and ideas of all parties — students, faculty, trustees — was considered in the functional design of this building," says **Bill Dechant**, director of campus development.

Plugged in: HCC's many green initiatives include a charging station for the community college's electric-vehicle fleet. Staffers Preston Jacobsen (left) and Bill Dechant keep things humming.

PHOTOS BY MAX COOPER

GREEN FEATURES AT HCC

- Natural light classrooms and studio spaces
- Strategically placed natural ventilation systems
- 112-kilowatt, photovoltaic solar system to generate electricity
- Solar-thermal, radiant floor heating
- Solar-thermal absorption chiller cooling systems
- Energy-efficient building envelope
- LED Lighting
- Low- and no-VOC paints, finishes and other materials
- Cistern for rainwater collection, toilet flushing and cooling tower
- Constructed wetland for collecting and treating stormwater runoff
- Native plants and low-maintenance landscaping
- Touch-screen energy-management system
- 100-acre arboretum on campus for studying and displaying many different trees and shrubs
- "No Idling" policy on campus
- Model for Green among Community Colleges Nationwide
- Recipient of second Nature Climate Leadership Award

Bio-fueled: A grant from BioFuels of North Carolina helped launch a program that trains technicians, builds awareness and supplies campus and Haywood County diesel vehicles.

To start with a clean slate instead of trying to renovate, he explains, the project launched with the demolition of the original 1960s building. Raleigh, N.C.-based architects Innovative Design took the school-led collection of ideas, combined it with the company's expertise in sustainable design, and built a structure that is on track to exceed North Carolina requirements for energy and water efficiency.

"This building will bring the college a lot of recognition," says Dechant. Officials from other schools and those in the green-building community have already expressed interest in touring the facility to see all the sustainable features, he continues. "We're proud of it. It's the best in the community-college system and the region."

Sustainable Research Demonstration House

Funded by the USDA Forest Products Laboratory, the Sustainable Research Demonstration House has been designed and built to teach students and the community about low-impact, sustainable design. And they're learning by building it themselves.

The house will provide data on the wood construction materials used in building the house and how those materials perform over time. Climate data and other external factors will also be collected and considered in evaluation. Meanwhile, the house will also host continuing-education courses on low-impact design methods, greening a home and energy management.

In the curriculum and the classroom, Haywood Community College is addressing the effects of the construction boom in our area, says **Preston Jacobsen**, sustainability analyst and director of the campus STARS program (Sustainability Tracking, Assessment and Rating System). "The goal is to educate and train in a vocation-based environment a whole new generation of green-collar workers in the construction field," he says. "Having an accessible research and demonstration house will definitely heighten interest in sustainability issues within a community that already has receptive nature."

In addition to being a display and research model, the Research Demonstration House will also be used for community classes, social functions, guest speaker and special visitor quarters and more. With the beautiful wooded area surrounding this unique home is also a memorable first lesson: Development can be functional, gorgeous, and low impact.

Architect (Professional Crafts Building): Innovative Design, Raleigh
innovativedesign.net

Contractor/builder: Miles-McClellan, Greensboro, mmbuildings.com

Special thanks to HCC Construction & Electrical Trade students, Haywood Heating & Cooling, Green Brothers Well Drilling, Tuscoloa masory students and many more

As the college grows and acquires funding, future plans include more green renovations, remodeling or rebuilding of many of the 23 structures on campus. LED lighting and many other easy green-energy solutions have been applied, and mechanical system monitoring controls put in place. "Now we can sub-meter buildings to see what is going on," says Dechant. "The initial cost of installing this real-time, green-monitoring system is high, but it will pay back in the long run by allowing us to use our self-sustaining energy sources [such as solar and thermal] most effectively and then selling surplus energy back for a profit."

And the students are seeing firsthand how the laws of supply and demand work: There's a rising demand for well-trained energy management and green-building workers.

Trends in the education of future building and construction workers are all pointing toward sustainability and energy management training. The advanced building-technology courses at HCC are evolving along with what's happening in the world at large. The graduates of the new green-building concentration program will be qualified to work in several different areas of the green construction industry: general contracting and construction, weatherization, energy auditing, home energy rating, affordable housing and land development, among other professions.

Green business owner and freelance writer Mari Fox lives in Weaverville. She can be reached at mari@shecology.com.

To learn more about Haywood Community College, its green-building curriculum, and the campus-wide sustainability initiatives, visit haywood.edu.

For direct information on campus tours for the Sustainable Research Demonstration House and Professional Crafts Building, contact Preston Jacobsen at 565-4033 or pjacobsen@haywood.edu to arrange a visit.

A cabin in the woods

Green renovation meets historical preservation

Old and new: This cabin once housed the office of a former summer camp; now, it's a private, green home.

PHOTO BY MAX COOPER

BY JO-JO JACKSON

In 2009, **Claus** and **Debbie Kroeger** "were just looking for a cabin in the woods" — preferably a historic one with a little character in its beams. What they found was a 1,100-square-foot cabin on a 165-acre, Reems Creek property that had been a boys' summer camp from 1920-78.

"Needless to say, [after] 30 years there was a lot of disrepair — a lot of stuff fallen down and, unfortunately, lost," says Claus. But there was a fair amount to work with, and as he explains, "We just sort of fell in love with [the property]. It had a lot of neat history, and it's a beautiful piece of land."

The couple recognized the property's potential to be the secluded, simple and quiet homestead they had dreamed of. They also recognized its historical significance to the many former campers who still hold yearly alumni reunions there.

But how to renovate smartly and apply green-building principles?

The couple enlisted Fairview-based contractor Larry Wilson of Wilson Construction and Asheville-based architect **Duncan McPherson** of Samsel Architects, who took stock of the condition of six of the 40-plus buildings that sat on the property. One of those buildings was the 1,100-square-foot cabin, which had been the camp's "Office and Administration" headquarters. Their cabin in the woods turned out to be cabins in the woods.

"We wanted to build places that we could use for ourselves," says Debbie. "And then trying to look at what's valuable, historically, and make sure those don't decay too badly. Some things, like [the] dining hall, are valuable historically."

It would have been cheaper and more efficient to tear down the old office cabin and build a new one, says McPherson. "It's not perfect," he says of the old cabin. "It's not as good as a new house. But [renovating it is] a real good attempt at taking something that's inherently flawed and making it as good as we could, and preserving [it]." He adds, "There's no reason to renovate this if we didn't preserve that historical character. We could've just built something new."

A green renovation

Recycling an old building and repurposing a majority of its original materials, as the Kroegers did, is potentially "greener" than building a new home. McPherson says, "If you think about the energy it takes to cut down new wood, and quarry out new stone, and do all these things, reusing everything you've got is the least impact possible for building and construction."

Still, transforming a drafty, rotting and unlivable cabin into an efficient, airtight and modern home was a major challenge. The office had originally been two separate cabins, attached by a dogtrot connecting hallway. These original cabin spaces were converted into the living room and bedroom. The dogtrot became a hallway. Storage structures at the back of the building weren't salvageable, McPherson explains. "There was English ivy growing in these

rooms, and corners of the foundation just completely collapsed." A kitchen, bathroom and closet space were built in their place, keeping the cabin's original footprint.

Other renovations included a new front porch, a little bigger than before but built with much of the original materials. The cabin also got a new roof, gutters, foundation repairs, skylights, energy-efficient windows and floors, a rebuilt fireplace and a new one. "The main goal was to make it as airtight as we could," McPherson says, noting the application of spray-foam insulation and other building-envelope improvements that close gaps where heat and cooling can escape or intrude. He adds, "Mouse-proofing [the cabin] helped us achieve that air sealing and energy efficiency."

One of the biggest projects was the roof, with the underlying structure in general disrepair, the shingles had been layered on top of one another over the years. The aesthetic and environmental solution was installing Enviroshake, a 95 percent recycled, content-simulated wood shake roof made of rubber, plastic and sawdust. A post-consumer recycled product, this roofing material doesn't rot and it's inedible. These factors make it extremely low maintenance and give it an exceptionally long life span, says McPherson. "A roof that you don't have to replace for 50 to 100 years is clearly more green than something that has to be replaced every 20 to 30 years," he notes.

Reduce, reuse, recycle

With historical preservation as a main driver, approximately 40 buildings to salvage or cannibalize, and an abundance of natural resources such as stone and wood, the Kroegers were able to source plenty of resources locally, from their new property.

Many of the camp buildings were made with American chestnut — a tree nearly wiped out over the last century by blight. It was a special find, and the couple took full advantage, repurposing the wood into kitchen cabinets, wall paneling and bedroom drawers.

Another prized discovery were the oak timbers used in many of the old cabins on the property. "Tax records show some of [the cabins] being from the late 1800s, so these [logs] are over 150 years old, and they're still useful. ... We really didn't do anything but re-chink them," Claus says.

In addition to reusing the chestnut and oak, the Kroegers reused old doors as well. "Only one door in the whole [cabin] was new," he says. "Every other one was either from this building, originally, or other buildings."

The Kroegers also used stone found on the property for stonescaping the back patio, and they milled dying hemlocks on the property into useable lumber for a garage. There's enough hemlock for a future renovation too.

Wood unsuitable for construction fueled the cabin's wood-burning stove, Claus says.

But some items, like the asphalt roof shingles, went to the dumpster.

Land conservancy and chestnut restoration

The Kroegers also recognized the environmental potential of the land. The couple allowed the American Chestnut Foundation to test-plant three "restoration" chestnut trees on the site. Since 1983, the Asheville-based foundation has been developing a blight-resistant American chestnut seed. Since 2009, the organization has planted restoration trees in woodlands across the Appalachians.

"We're participating in just a little project to see how they grow, and see if they'll be blight resistant," Claus says.

The couple also placed approximately 35 acres of their land in a conservation easement with the Southern Appalachian Highlands Conservancy. The Kroeger's land adjoins the 1,800-acre Woodfin watershed, which is also in an easement with SAHC. "It will keep the land in a natural condition in perpetuity," says Claus. "There are some minor exceptions allowing us to maintain existing trails, cut some firewood and such."

A conservation easement creates a voluntary land-preservation agreement that restricts land development. Once the easement is established, it passes on in the deed. "It's a good example of the right kind of mindset for people who do have the opportunity to own some large pieces of land," says McPherson. The Kroegers "don't have any intention of putting a subdivision in, and building a bunch of homes on it to make money; they really want to save it, in perpetuity."

Historical preservation

Overall, environmental awareness in the historical preservation of a private living space sums up the Kroegers' renovation decisions. From using 100 percent natural tung oil to finish the kitchen cabinets, to continuing to host annual camp-alumni reunions, the couple continues to restore the former camp in a compassionate way.

While the Kroegers have no plans on restoring the property into a functioning camp, they have a warm relationship with its alumni. "They raised money to replace the roof on the chapel," Claus says. "It's so generous to do, because it's so hard for us to get to everything."

McPherson adds, "Thinking about that kind of history, and power, and importance that [the] land and that place had for so many people gave us a sense [that] it was really important to take care of these buildings. [The] history helped us have some context of the significance of what we were doing."

Jo-Jo Jackson is a freelance writer.

Contracter: Larry Wilson, Wilson Construction Company, Fairview 628-9438

Architect: Duncan McPherson, Samsel Architects, Asheville
samselarchitects.com

Landscape partners: A handmade waterfall, cone flowers and moss please the eye at the North Carolina Arboretum.

PHOTOS BY ANNIE MARTIN

the magical world of mosses

Bryophytes offer beauty, environmental benefits

by Annie Martin

The allure of moss begins with an expansive parade of verdant shades — touching our spirits with a sense of serenity. But the benefits are more than sensory. Bryophytes (mosses, liverworts and hornworts) can reduce groundwater contamination, counteract erosion, curtail stormwater runoff and even reduce air pollution. Mosses may be small in size but they offer big options for greening our landscapes.

And mosses can offer year-round green beauty in your garden. As different moss species go through seasonal or reproductive transitions, the nuances of green in the landscape can range from dark, deep green to emerald tones, to neon-chartreuse and olive greens with golden overtones. To add even more delight, their *sporophytes* (spore prodicers) display intense hues of reds, golds and bronzes.

While many people appreciate mosses in our forests, the historical use of mosses as a horticultural choice in landscaping has been relegated to the grand temple gardens in Kyoto, Japan, tea gardens or the occasional introduction as groundcovers by native-plant enthusiasts. In contrast with moss lovers who encourage natural growth, most landscapers and homeowners go to extremes to eliminate these beneficial plants, considering them weeds. Misunderstandings based upon myths, coupled with a lack of knowledge of bryophytes and their growth habits, permeate the landscape industry, schools of horticulture and public perception.

When speaking of moss, it's more appropriate to use the plural form, mosses. Mosses are composed of thousands of individual moss plants that grow together in colonies, offering myriad textures and a variety of shapes. In the mountains of Western North Carolina, we have more than 450 types of bryophytes; there are more than 20,000 worldwide. Dating back 450 million years, these hardy plants are not only beautiful, but they provide options for stabilizing steep hillsides and minimizing the effects of rushing stormwater.

What makes bryophytes so special in the plant kingdom? Their unique botanical characteristics reveal implications for diverse landscape applications. Unlike other plants, mosses have no vascular tissues (xylem and phloem, which transport water and nutrients).

Mosses are different in other ways, too:

• They have no roots — only fibrous rhizoids that help them attach to surfaces. These rhizoids don't feed the plants. While most mosses can be dislodged by hand, rhizoids hold tight to substrates in high winds and don't blow away.

• Mosses have no flowers or seeds for plant reproduction. Instead, they reproduce through a two-stage cycle that includes spore dispersal via wind and water. In addition, bryophytes can grow asexually from plant fragments.

• Mosses feed through leaves instead of roots. They also have no cuticle, which is the waxy substance that covers leaves of vascular plants.

• They have internal compounds that enable them to be resistant to pests and diseases and to tolerate subfreezing temperatures. No fertilizers, pesticides or herbicides are required for successful growth — a major environmental benefit of earth-friendly mosses.

While advantages of mosses extend beyond beauty, it is their subtlety that captures our hearts and soothes the human spirit. The fact that the growing season continues throughout the entire year is yet another green bonus. Creative moss-features can add interest and dimension to all types of gardens.

Of course, mosses seem to be a natural choice when creating water features (rain gardens, bogs or waterfalls) but they are often overlooked in conceptual designs or haphazardly introduced without following "right moss, right place" guidelines. While a site assessment is beneficial to determine exact mosses, recommendations include: *Thuidium*, *Hypnum*, *Plagiomnium*, *Atrichum* and *Sphagnum*.

A living roof: Sun moss thrives on a garden shed at the N.C. Arboretum.

The moss lady: Annie Martin, owner of Mountain Moss Enterprises, encourages using bryophytes in almost any landscape.

Mosses add an air of antiquity and permanence even to new construction of hardscapes. Placing mosses between pavers or stones used for patios, paths or permeable driveways is both functional and attractive. Bryophyte types that thrive in either sun or shade include: *Ceratodon*, *Ditrichum*, *Atrichum*, *Bryum* and *Entodon*.

Moss lawns provide an option to the American obsession with grass lawns and provide huge benefits to our environment. As mentioned, no chemicals are needed that contaminate our groundwater. Since mosses don't need to be cut, air pollution from mowers and string trimmers is eliminated. Successful moss lawns often include: *Thuidium*, *Hypnum*, *Climacium*, *Mnium*, *Dicranum* and *Entodon*. When irrigation systems are incorporated or supplemental watering is provided for brief sessions (one to four minutes), mosses will spread faster.

Steep hillsides of clay, gravel or nutrient-poor soil can present challenges in terms of erosion control from the effects of periodic heavy rains. Mulch washes away, and it can be laborious to maintain control of vascular plants. Mosses thrive in fens — a kind of wetland. The botanical ability of moss leaves to absorb and filter water offers a solution. *Polytrichum* has rhizoids that grow downward that can hold soil in place with surprising strength. Also, *Climacium* and *Thuidium* are suggested choices.

As green roofs gain acceptance as a way of greening urban spaces, reducing stormwater runoff and lowering the heat index of buildings, mosses make desirable plant choices. Think about it. Mosses already grow on roofs in our mountain region. It makes sense that they could be intentionally featured on green roofs, particularly if rainwater harvesting is incorporated into the design. The moss green roof at the North Carolina Arboretum in Asheville exemplifies this concept. Installed in 98-degree temperatures in June 2012, this roof has already endured major thunderstorms, winds gusts of more than 60 mph, snow and hail. Featured mosses that live in the direct sun on this innovative green roof include: *Hedwigia*, *Entodon*, *Polytrichum*, *Climacium*, *Leucobryum* and *Ceratodon*, among others. The Arboretum's moss green roof has the distinction as the first sun-moss green roof in this country!

With all the aesthetic and environmental benefits of mosses, why don't you start (or continue) your own moss journey? Featuring magnificent mosses in your landscape will be good for your soul — and for our planet.

Annie Martin, aka Mossin' Annie, owns Mountain Moss Enterprises in Pisgah Forest (mountainmoss.com). An extensive selection of shade and sun mosses are cultivated at the "mossery," following environmentally responsible principles. Moss-landscaping services include site consultations, conceptual designs and turnkey installations. Reach Martin at 577-1321 or mossinannie@gmail.com.

MOSSES: FACT OR FICTION?

Mosses grow in the shade.
It is true that many mosses do grow in shade under the cooling canopy of trees or shadows of tall buildings. But certain moss types enjoy direct sun exposure and a high heat index.

Mosses grow in northern exposures.
This belief is partially true. Mosses grow on the north side because it retains more moisture. However, if rainfall is frequent, mosses will grow facing south, east and west as well.

Mosses like moist conditions.
Indeed, this accepted belief about mosses is true. Mosses thrive in niches that retain moisture and in regions with more rain. Some mosses dramatically change in appearance from wet to dry within minutes or seconds. Few terrestrial mosses want to stay soggy, with the exception of the *Sphagnum* species.

HomeSource
Homes For Life!

www.homesourcebuilders.com
828.252.1022 | info@homesourcebuilders.com

DRA Living

Precision Commercial & Residential Development

DRA Living is committed to providing ***quality, custom & sustainable precision-built*** *commercial & residential solutions to meet the needs of every customer and community.*

DRA LIVING, INC. | 900 HENDERSONVILLE ROAD, SUITE 309 | ASHEVILLE, NC 28803
828-274-4699 | **www.draliving.com**

Seeing the forest

Stewardship Council certifies woodlands — both large and small

BY ALYX PERRY

For several decades, forest communities and the general public have had growing concerns over the future condition of forests and the long-term sustainability of harvesting and other management activities. To address these concerns, the Forest Stewardship Council created a system of independent forest certification for forest products produced in an ecologically, economically and socially responsible manner.

FSC certification provides a tool to assure landowners that their forests are being well managed and continually improved to meet long-term ecological, economic and social goals. FSC certification also provides a product label that is increasingly recognized and demanded in wood-products markets. In the South, FSC certification is seen as a critical tool for setting wood products apart in the marketplace and for creating distinct market niches that provide benefits for small producers and local value-added processing.

Whether certification is an advantage for a particular landowner depends on many factors, including the size of the landholding, level of income-producing activities and current forest conditions and management. If financial considerations are an important factor, landowners should examine whether there are local markets providing advantages for certified timber or wood products.

Lay of the land: Property owners conduct a site visit in a FSC-certified forest in Stokes County.

PHOTO BY ALYX PERRY

If you're a landowner interested in becoming FSC certified, use the website us.fsc.org to find a group that serves your area. Forest-certification groups can provide you with useful guidance on the requirements for certification, and often provide template documents that can make the process easier.

Next you should discuss certification with your consulting forester. (If you don't have one yet, the North Carolina Forest Service can provide a list of registered foresters in your area.) You'll want to work closely with your forester to develop a forest management plan that meets FSC requirements. If your forest has fewer than 2,470 acres, it qualifies for "family forest certification," which streamlines certification requirements for smaller properties. To get a copy of the current FSC standards, look on the FSC-US website and download the "FSC US Forest Management Standard with Family Forest Indicators." It is helpful to first familiarize yourself with the requirements for forest-management plans, which are detailed under Principle 7.

If you already have a fairly detailed forest-management plan, don't panic: You'll likely already meet most of the FSC requirements. Most landowners find that they need to make a few additions, such as getting reports of any known endangered species or cultural sites on the property from the appropriate agencies.

When you have your plan in order, you can send it to your forest certification group for review and approval. Smaller forests that qualify as "family forests" do not require a site visit for certification, but if your forest is larger, a site visit will be conducted as part of the approval process. Once your forest is certified, your forest certification group will help you manage record-keeping requirements, sales documentation for certified products, and the use of FSC logos and trademarks for marketing.

Alyx Perry works on sustainability issues in Western North Carolina.

For more information, visit the Forest Stewardship Council-U.S. website: us.fsc.org.

The hypermile house

Saving energy is easier than you think

BY AMY MUSSER

You've probably read stories about "hypermilers" getting 80 miles per gallon in regular cars and thought, "Wow, can how you drive really matter that much?" It can, and it also turns out that how you live in your house can produce the same kind of savings.

My journey as a "house hypermiler" began when my husband and I moved into our new net-zero energy home in June 2011. As energy-efficiency professionals, we had a lot invested in the design and construction of our highly efficient home, and we also had a lot of personal credibility on the line if the home didn't live up to our expectations for efficiency. We also knew that every kilowatt-hour we saved meant one less pound of coal that had to be burned at the power plant.

We installed a circuit-by-circuit energy monitor and began watching our energy use carefully. The HVAC and hot-water systems were all working as designed. The rooftop photovoltaic system was producing the amount of electricity that we expected. That left two big question marks: lighting and appliances.

For most people lights and appliances account for 30-40 percent of their overall home energy use. Energy codes and heating/cooling equipment efficiencies are getting better. But at the same time, we have more "devices" that need to be plugged in. It's still important to weatherize your home, but after you've done that, there's still work to do on lights and appliances. This was especially crucial for us — we had made our home so efficient that lights and appliances accounted for 70 percent of our expected energy use.

Hypermiling your home works the same as it does for your car: Don't do unnecessary things, and do the necessary things as efficiently as possible. In your car, you avoid situations where the car needs to idle (like sitting at stoplights), and you'd empty out all the "junk in the trunk" that you're hauling around, causing you to waste gas.

The analogy in homes is "vampire" power that creates no useful benefit to you whatsoever. Chargers for cell phones use power even when nothing is plugged into them. If you feel the box on the cord, you'll notice that it's warm — that's energy that you're paying for, unless you unplug the charger when not in use. Even better, charge it using USB when you're driving (this doesn't reduce fuel efficiency) or using your computer. Computers, TVs, AV equipment and gaming systems in "sleep" mode can use a lot of power. It varies, so it's worth getting a handheld power meter (like the Kill-a-Watt meter, available at home improvement stores for about $20) and testing them. Or rent one from the WNCGBC. In general, you should turn these things off with a power strip when you're not using them. Walk around your house and fully appreciate the number of appliances with a digital display. Check each of them to see how much "vampire power" they're using.

In charge: Hypermilers get up to 80 mpg in regular cars, and you can apply the same energy-saving concepts to your home. This Kill-A-Watt meter is a good place to start.

Our home office was the biggest power vampire we found in our home. We found that we were able to save 1,400 kWh per year by turning all of our computers off at the end of the day instead of just letting them sleep. We experienced a 16-percent reduction in our annual energy use, just from doing that!

Homes also have a lot of what I call "almost vampire loads." These are things that provide really small benefits in proportion to how much power they use. Lighting waste falls into this category — lights left on, that are brighter than they need to be, or that use incandescent light bulbs. Don't get your energy or health advice from chain emails. CFL bulbs are perfectly safe and actually better for the environment — if you dispose of them properly. Fortunately, this is really easy to do in Asheville: Take them to most big-box home improvement stores for recycling. What about the outdoor light that you leave on all the time? Could that be on a motion or photo sensor? Or, can it be turned off entirely if you have street lights in your neighborhood?

The extra refrigerator in your garage is another big power user that provides little benefit to you most of the time. Call Progress Energy and they'll give you $50 to take it away. If you run your furnace fan on constant "on" instead of the "auto" setting, you're wasting a ton of energy and you're only getting a modest increase in air filtering. Most people would be better off changing to a clean filter and setting the fan back to "auto." Certain TVs and gaming systems use a substantial amount of power — sometimes more than a refrigerator. Do you need to run the TV 24/7 in the background? Could you buy an LED TV instead of a plasma TV next time you replace yours? Don't let the cable company give you an old cable box. If it heats up the cabinet it's in, it's wasting a lot of energy.

Pumps use a lot of energy, and are frequently used as examples of big savings in the marketing for home-energy monitors. If you have a well pump, that is a necessity you can't do much about. But a lot of people have landscaping pumps for water features. Yes, they look pretty … but they can cost hundreds of dollars per year to operate. Is it really worth it? Hot-water recirculation pumps can also waste both pump energy and hot-water heating energy if not designed and installed properly. It's always better to design a house so that fixtures are close to the water heater so that recirculation isn't needed. When this can't be achieved, using multiple tankless water heaters may be a better approach than a recirculating system.

Finally, there are big energy users that you can sometimes avoid through mild sacrifice or behavior alteration. Clothes dryers are one of the biggest energy users in your house. It took me a while to motivate myself, but a clothesline is really not very hard or time-consuming to use. Just try it sometime.

My grandmother wouldn't "light her oven" in the summer because it would heat up her house and she did not have the luxury of air conditioning. She had summertime recipes for no-bake cookies and salads. You don't have to make it an all-the-time rule and suck

See for yourself: New energy-monitoring software lets homeowners track usage and savings. Pictured: Powerhouse Dynamics eMonitor4-14 Intelligent Residential Power Usage Monitor.

all the joy out of life, but try to bake and boil more in the winter. In the summer, you use energy to cook, and more energy to cool the house back down. Instead, try to make quick meals and cold foods in the summer. It's nice to be in tune with the seasons.

A low-flow showerhead is a great way to save energy on hot water. It's probably one of the fastest payback changes you can make to your home. If your showerhead uses more than 1.75 gallons per minute (it should be printed in tiny lettering on the showerhead), change it. If I can rinse my 3-foot-long hair with a low-flow showerhead, anyone can.

Hypermiling your house is really just about having a little bit more awareness of what it means when you press that button, flip that switch or plug in that power cord. It's about understanding your house like you understand you car, and "driving" it with the intention of using power for things that matter to you, rather than wasting it on things that don't.

Amy Musser is a 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.

A certified edge

Reaping the benefits of a Green Built N.C. home

Certified: The Green Built N.C. certification program ensures that a home meets specific standards and that the state continues to be a leader in the field.

BY MAGGIE LESLIE

The WNC Green Building Council is now administering the Green Built North Carolina certification program for residential construction, which replaces the N.C. HealthyBuilt Homes certification program statewide as the N.C. Solar Center discontinues its administration of the building program.

From 2006-12, the WNCGBC oversaw the certification of 85 percent of the N.C. HealthyBuilt Homes in the state (more than 600 homes in Western North Carolina). As a result of that success, the WNC Green Building Council will continue certifying homes with the same basic checklist and program format with improvements, but under a new certification name — "Green Built North Carolina." The certification program will ensure that North Carolina continues to be a leader in green residential building.

"We are pleased that the WNCGBC has taken this big step to administer a fantastic housing program that provides value to home builders and buyers. Homes last for decades, and building them right reaps benefits not only for the first owner, but for the second, third, fourth and beyond," said Ward Lenz, director of the N.C. Energy Office. "It is far more difficult and expensive to try to make existing homes more efficient, so we celebrate the WNCGBC efforts to help builders achieve these high standards at the time of construction."

WNCGBC is thrilled about the opportunity to grow and improve the program. Green Built N.C. will become more streamlined — with faster certification, better responsiveness and improved marketing. Certified homes have benefits for builders, homeowners and the environment. Research shows that Green Built N.C.-certified homes sell faster, hold their value longer, save energy, lower utility bills and protect the environment. Certified homes are more comfortable, healthy and affordable.

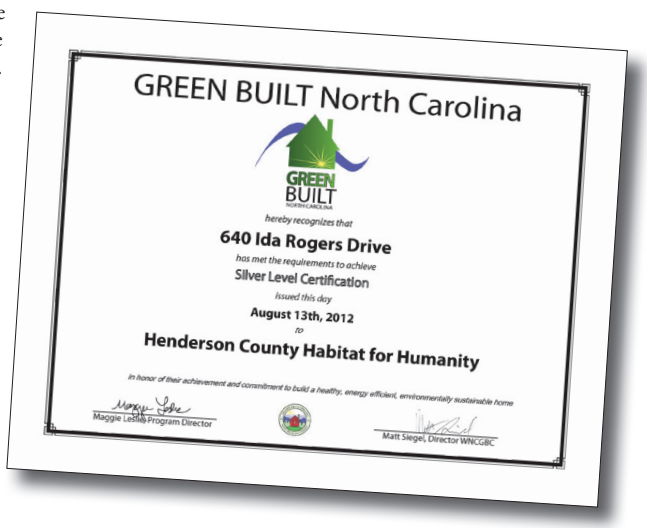
The program offers a certificate for homes that meet green-building guidelines inspected by a third party; it also provides technical and marketing assistance, design reviews, workshops and field-consulting services to enable builders to increase their green-building expertise and boost company profitability. Multiple levels of certification are available (Certified, Silver, Gold and Platinum), ensuring that the program is available to all budgets and experience levels. For custom homes, the checklist and energy-efficiency computer-modeling guide offers a process for homeowners to get involved and make more educated decisions about the payback of various features, as well as make choices based on their values and what attributes are important to them.

The Green Built N.C. program checklist will include a few improvements over HealthyBuilt, making an easy transition for participants. Instead of having to be ENERGY STAR certified, the new program will recognize homes that meet the N.C. High Efficiency Residential Option code or are a minimum of 15 percent more energy efficient than code.

All homes that were N.C. HealthyBuilt Homes certified will automatically be Green Built N.C. certified. This will help with continuity, as homebuyers looking for sustainability search for Green Built homes on the Multiple Listing Service.

In today's market, homebuyers can't afford to settle for anything less than a Green Built home. Contact the WNCGBC to get started today.

Maggie Leslie is the program director at the WNC Green Building Council. She can be reached at 254-1995 and maggie@wncgbc.org.



Checked and double-checked: Before certifying a Green Built N.C. home, third-party inspectors review a checklist and minimum features on site during construction.

WNC Green Building Council memberships support:

INNOVATIVE PROGRAMS

Neighbor Saves, Appalachian Offsets, Green Gauge

Ongoing success of Green Built NC and LEED for Homes

Free hotline serving over 500 people a year

Promoting green building businesses throughout the region

Increasing broad based implementation and recognition of green building

WESTERN NORTH CAROLINA GREEN BUILDING COUNCIL

CONNECT WITH US THROUGH

A little help from our government (and utility companies)

Tax incentives offer enticements to go green

BY MATT SIEGEL

Government can be somewhat unpredictable, and by the time you read this, the programs listed here may be outdated. Hopefully, there will be even more incentives than I list here. Fortunately, the federal and state renewable-energy tax credits will be in place at least until 2016.

One welcome new incentive is the very significant Progress Energy Residential New Construction program. It offers $1,000 to $4,000 in cash incentives for high-performance homes and an optional heating-and-cooling cost guarantee. This will be a significant local driver in green building for new homes.

For detailed information on financial incentives, visit dsireusa.org.

Matt Siegel is the director of the WNC Green Building Council. He can be reached at matt@wncgbc.org or 254-1995.

TAX INCENTIVES

FEDERAL

Individuals:

Renewable energy

• Through the end of 2016, a 30-percent tax credit for solar water heat, photovoltaics, wind, fuel cells, geothermal heat pumps and other solar-electric technologies with no caps.

Businesses:

Energy efficiency

• A tax deduction of $1.80 per square foot is available to owners of new or existing buildings who install interior lighting; a building envelope; or heating, cooling, ventilation or hot-water systems that reduce the building's total energy and power cost by 50 percent or more in comparison to a building meeting minimum requirements set by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1-2001. Deductions of 60 cents per square foot are available to owners of buildings in which individual lighting, building envelope or heating/cooling systems meet target levels that would reasonably contribute to an overall building savings of 50 percent if additional systems were installed. Available through the end of 2013.

• A flat $2,000 tax credit for builders who build energy-efficient homes was reinstated retroactively for 2012 and through Dec. 31, 2013. The credit is for builders who build homes projected to save at least 50 percent of the structure's heating and cooling energy compared to an identical home built to meet the standards of the 2006 International Energy Conservation Code.

Renewable energy

• A 30-percent tax credit is available for investing in solar water heat, solar space heat, solar-thermal electric, solar-thermal process heat, photovoltaics, wind, biomass, geothermal electric, fuel cells, geothermal heat pumps, combined heat and power (CHP)/cogeneration, solar hybrid lighting, and direct-use geothermal and microturbines. Available through the end of 2016.

• Accelerated depreciation (Modified Accelerated Cost Recovery System — MACRS) for eligible renewable-energy technologies.

NORTH CAROLINA

Individuals:

Renewable energy

• A 35-percent tax credit for passive-solar space heat, solar water heat, solar space heat, solar-thermal electric, photovoltaics, wind, biomass, hydroelectric, geothermal heat pumps, solar pool heating and day-lighting. Available through the end of 2015. Caps vary by technology.

Businesses:

Renewable energy

• A 35-percent tax credit for passive-solar space heat, solar water heat, solar space heat, solar-thermal electric, solar-thermal-process heat, photovoltaics, landfill gas, wind, biomass, hydroelectric, renewable transportation fuels, geothermal heat pumps, spent pulping liquor, direct-use geothermal, solar pool heating, day-lighting, anaerobic digestion, ethanol, methanol and biodiesel. Available through the end of 2015. $2.5 million cap for all technologies.

UTILITY INCENTIVES

In 2007, the North Carolina legislature passed a Renewable Energy Portfolio Standard, which requires utilities to increase their use of renewable energy and offer incentives for energy efficiency. Utility providers are now offering impressive incentive programs to meet those requirements.

• N.C. Green Power will pay a per-kilowatt-hour rate for electricity generated from a renewable resource that is fed onto the grid

PROGRESS ENERGY

Progress Energy

Residential

• The Home Energy Improvement Program will pay rebates of $190 to $500 for a variety of energy upgrades, including ductwork sealing, air sealing and attic insulation, HVAC audits, HVAC replacement, high-efficiency window AC units and hot-water-heater replacement.
Progress-energy.com/HEIP

• A 5-percent discount on electric bills for all ENERGY STAR-certified homes.

• New! The Residential New Construction program will pay $1,000 to $4,000 for new homes that comply with the new HERO code and receive low HERS scores. This program also has an optional heating-and-cooling cost guarantee. See "Benefits You Can Measure" elsewhere in this guide.

• The SunSense program will pay $1,000 per kilowatt AC plus a monthly credit of $4.50 per kilowatt for installed photovoltaics.
Progress-energy.com/Sunsense

Commercial

• The Energy Efficiency for Business Program offers rebates for everything from lighting replacement to energy modeling for LEED-NC in existing and new-construction commercial buildings. Rebates can pay for up to 75 percent of upfront project costs.

DUKE ENERGY

Duke Energy®

Residential

• The SmartSaver program offers $200 rebates for upgrades of HVAC equipment on existing homes, a $50 rebate for an advanced tune up on heat pumps and central AC systems, and $75 to $250 for attic air sealing and insulating, duct sealing and duct insulating. duke-energy.com/north-carolina/savings/smart-saver.asp

UTILITY INCENTIVES continued

• A 5-percent discount on electric bills for all ENERGY STAR-certified homes.

• Free in-home energy audit.

Commercial

• Commercial customers are eligible for rebates on upgrades of a wide variety of equipment, including but not limited to: lighting, HVAC, process equipment, pumps and motors.

PSNC

Residential

• Residential customers whose homes meet the EPA's ENERGY STAR for New Homes guidelines are eligible for PSNC's Residential Rate Schedule 102, which is a discount of 5 cents per therm.

• The company has implemented a $100 rebate for replacing older gas water heaters and furnaces with high-efficiency versions in residential buildings. psncenergy.com/rebate

• Residential customers with homes built before 1993 are eligible to receive a $25 in-home energy audit.

Commercial

• Commercial customers whose buildings meet LEED-NC certification are eligible for PSNC's Rate Schedule 127, which is a discount of 5 cents per therm.

• A $100 rebate for replacing older gas water heaters and furnaces with high-efficiency versions in commercial buildings. psncenergy.com/rebate

LOCAL GOVERNMENT INCENTIVES

CITY OF ASHEVILLE

• A $100 permit-fee rebate for N.C. HealthyBuilt Homes certification; $100 for ENERGY STAR certification.
• A $50 permit-fee rebate for each of the following: geothermal heat pump, solar-energy system, wind-energy system and stormwater/graywater collection device to be used for irrigation.
• 50-percent rebate for plan review fees for commercial projects seeking LEED certification.

TOWN OF BLACK MOUNTAIN

• A $500 permit-fee rebate for buildings certified under the Green Built N.C. or LEED programs.

CATAWBA COUNTY

• A 25-percent permit-fee rebate for buildings certified under the Green Built N.C., ENERGY STAR, NAHB Green or LEED programs.

Industry LEED-er

Charlotte Habitat for Humanity melds training, community projects

On the job: Habitat Charlotte and Bould LLC partnered to create a training program, Everbuild-PRO, that provides on-the-job experience as a way to help communities help themselves.

PHOTO BY SARAH BETH MULET

BY SARAH BETH MULET

Habitat for Humanity of Charlotte is committed to green building and environmental sustainability throughout the organization. From new construction practices and weatherization services to recycling and renewable energy, Habitat Charlotte is rapidly embracing the renewable technologies to better the lives of our homeowners and our environment.

Several years ago, Habitat Charlotte began building System Vision-certified homes, an energy and comfort guarantee program for affordable housing offered by Advanced Energy. The program has enjoyed success and improved homeowner comfort.

However, the affiliate desired to achieve a more widely recognized green-building standard, so in 2010 it tackled its first LEED for Homes project and received Silver certification without additional expense on the project. Habitat Charlotte used that as a pilot home and, as of January 2012, has committed to LEED for Homes on all new construction, which will include approximately 30 new homes per year.

Each of Habitat Charlotte's new construction homes has received Silver certification to date, and one LEED Registered home is pending Platinum certification, thanks to a gift of five solar photovoltaic panels from a generous donor.

With its commitment to education, Habitat Charlotte now partners with Bould LLC to offer a LEED project experience program called EverbuildPRO. In 2009, the Green Building Certification Institute began requiring that green-building professionals have project experience on a LEED Certified building to become LEED Accredited Professionals. Recognizing that it is often difficult for aspiring professionals to gain the experience, EverbuildPRO developed in order to minimize this barrier while simultaneously serving the affordable-housing community.

The 50-hour course, over a four-month building project, provides students with on-site construction experience, LEED-documentation assignments and classroom instruction. Students have an opportunity to engage in and understand the LEED for Homes process from the preliminary rating through the final on-site inspection. Students are eligible to sit for any of the LEED AP specialty exams upon completion of the course.

Habitat Charlotte is currently teaching its second full class of EverbuildPRO, and hopes to offer project experience at least once per quarter. Currently, the cost is $600 for full-time students and $800 for professionals; the revenue is split between Habitat Charlotte and Bould LLC, making it a fundraiser to support the LEED initiatives of Habitat Charlotte while simultaneously offering a great opportunity for aspiring professionals.

Sarah Beth Mulet serves as Habitat Charlotte's sustainability coordinator, managing the LEED for Homes and EverbuildPRO programs. She holds bachelor's degrees in biology and Spanish from Queens University of Charlotte, and a juris doctorate from the University of South Carolina.

OTHER GREEN INITIATIVES

Homeowner education: Habitat Charlotte teaches a homeowner class about conserving energy and the benefits of the efficient homes it builds.

Existing homes: Through its rehab, weatherization and critical home repair programs, Habitat Charlotte is also committed to improving existing and owner occupied homes. Each home that goes through the program is weatherized according to BPI guidelines with an entry and exit audit including blower door testing.

Recycling: Habitat Charlotte recycles more than 100 tons of scrap metal, wire and appliances each month and removes up to 75 pounds of refrigerants from air conditioning units and refrigerators. The proceeds of all metal recycling efforts in 2011 was $268,000, enough to build four new LEED Habitat Charlotte homes.

Future initiatives: A solar PV farm at the Wendover Road ReStore, solar PV on new construction homes, biofuel use in its ReStore and Construction fleets, and other technologies as they become available to the affiliate.

For more information, visit everbuildpro.com or habitatcharlotte.org.

Count up to improvement

New trends, products for your green upgrade

BY BOONE GUYTON

One of the more interesting aspects of green building is the continual influx of new ideas and products. A product can be made with a lower impact than what it replaces, contribute to greater energy efficiency or produce energy from a renewable source. The following are some products that are either new or have recently become more readily available.

The building enclosure

In a house that's properly air sealed, more insulation can be the lowest-cost way to increase efficiency — up to a point. The gain in popularity of the Passive House Standard and "net-zero-energy" homes has furthered this notion. The possibility of reducing heating and cooling loads by as much as 90 percent has been accomplished, so the question becomes which one provides optimum value: increasing insulation or producing energy via renewable energy such as solar. The price of solar has come down enough to alter the old equation.

A product that helps to add R-value, or thermal resistance, to walls is **Zip System R Sheathing**, which comes with either half-inch or 1-inch sizes of foam laminated to Huber zip board sheathing to give an R-3.6, or 6.6 exterior continuous insulation. Adding the 1 inch, R-6.6 sheathing to a 2-by-6 R-19 wall creates an R-25 wall with much less thermal bridging through the wood framing. That is short of the Passive House standard for our area (around R-40), but it's a significant bump up from what's legally acceptable by code and even from what's acceptable by green-building standards.

Spray-foam insulation, which eliminates ozone-depleting and greenhouse-gas-producing chemicals, and can contain recycled content, is also available from a number of manufacturers. Many spray-foam -insulation installers work in our area. (For more information, visit avl.mx/p4.)

Air sealing, which is required for a well-insulated home, can be accomplished in many ways. The old-fashioned ones were the fastidious use of caulk guns and taped house wraps or taped sheathing. Now there are also a few spray-on air barriers, which can be permeable or impermeable, depending on the situation. DupontTyvek is one manufacturer; Stoguard, Henry, Enviro-Dri and W.R. Grace Co. are some others. Spray-ons are more expensive than other methods of creating air barriers (they run about 60 cents per square foot), but they're easy to use and provide strong results.

Figure 1: Lunos e2 ductless HRV (detail at right)

Mechanical systems

Once you have a well-sealed and highly insulated home, heating and cooling are the next big considerations. The geothermal heat pump and the ductless **minisplits** are the most recent advancements. Both run on electricity, but with new efficiency standards. The best of the geothermal systems can produce up to 5 units of energy for every 1 unit of electric energy — an efficiency rating of 530 percent. They're much more expensive than traditional heating systems, but are eligible for tax credits.

If you worked on the building enclosure, and you're building a small home, a geothermal system might not be the best value for you. You might look into the minisplit heat pump system. These have been around for a while and now include a partially ducted version for some applications. There's also a minisplit that heats water as it cools your house. (Water-heating capabilities have been available with geothermal systems but have only recently been included in air-to-air heat pump systems.) See hotspotenergy.com/air-conditioner-water-heaters.

Many new programmable and smart thermostats are now available to control the operation of your mechanical system more efficiently. The **NEST** has caused the most stir. The "learning thermostat" follows user habits. It turns itself down and can be accessed through a Wi-Fi network. These thermostats are somewhat pricey (around $250) compared to other programmables, which can cost $75 or less.

Fresh air ventilation

So now that you have a really tight, well-insulated house, you'll want to make sure you can breathe clean air in it. Heat- and energy-recovery ventilators have been around for years; manufacturers keep coming up with new versions and improvements.

One new version is a ductless HRV for small homes, the **Lunos e2** (see figure 1), which I only found available from Four Seven Five in Brooklyn. A pair that works together costs $1,195. They're claimed to work at 90 percent efficiency at 10, 18 and 22 cubic feet per minute. A pair would work for a 700-square-foot, two-bedroom home, and would meet the Green Built North Carolina ASHRAE Standard 62.2 ventilation prerequisite. Two pairs ($2,195) would work for up to 1,400 square feet.

Water heating

Heat pump water heaters deserve some mention, although they've been on the market for a few years. Several brands are available at home- and plumbing-supply stores. The one from GE — "GeoSpring" — is supposed to be the quietest. Rheem, A.O. Smith, and StiebelEltron also make them. They do take the heat from the air, which means your heating system will have to work a little harder in the winter, but in the summer, they help with air-conditioning and dehumidification. In our region's mixed climate, they're an efficient choice; they sell for around $1,500.

Landscaping

Landscaping is often the neglected aspect of green building. A lot of attention has been given to catching rainwater for landscape and garden needs, as well as for flushing toilets. In our area, RiverLink has started the WaterRICH program, which assists and encourages homeowners to install rain gardens and use rainwater on site. The goals are both to reduce the demand for potable water and to increase the infiltration of storm water within the ground, thereby reducing pollution to creeks and the French Broad River.

Living walls and **vertical gardens** (see figure 2) — which can be grown both indoors and out — are also gaining popularity, and more companies are making the process easier. These gardens can help keep a house cooler and can contribute to cleaner indoor air. They do take regular watering but can also produce herbs and some food crops.

The **No-Mow Lawn Seed** mix from Prairie Nursery needs very little watering if any and can be mowed once a month for a manicured look — or not be cut at all. This can have a big impact on water use and the impact of lawn moving on air quality.

Renewable energy

The big new thing in renewable-energy generation is the cost. We recently priced a 4-kWh solar system similar to one that we installed three years ago, and its price has come down significantly, to $15,000, since then. With the tax credits, the cost after five years is down to less than $3,000 (and the system generates income, selling power through the N.C. Green Power program). The renewable-energy industry has

Figure 2: Living walls keep homes cooler and contribute to cleaner air.

Figure 3: DOW Solar Shingles (Image courtesy of DOW)

a constant stream of new products, from **DOW Powerhouse Solar Shingles** (see figure 3), that blend in with a roof to the small **Honeywell Wind Turbine**, which is gearless and starts generating at 2 mph wind speeds. Solar is making a significant difference is in the developing world, where grid connection isn't possible and diesel is the only alternative. In many cases, the solar option is not only cleaner and quieter but also cheaper.

Appliances

Many improvements have been made in appliances; the ENERGY STAR rating is still a good indication of which products are best.

Induction cook tops have become more available. These heat pots and pans directly, as long as they're made of the correct metal. They cook faster than gas stoves, are more efficient than normal electric cooktops, and can be powered by solar. In a zero-energy house, they're a good fit, but they're more expensive: They start at around $1,300 for a 30-inch cooktop.

Other Products

The new countertop materials, paints and finishes are too numerous to mention. In Asheville, we're lucky to have local green-building supply stores, which carry these supplies and know which ones are new and better. There's a continual supply of new products and prototypes of products — and some fade. I post about the ones that make sense to me on Twitter @wncgbc, Facebook and the WNC Green Building Council website. Good luck with your early adapting and innovative efficiency improvements. If you have a great discovery, please share it.

Boone Guyton is a partner with Claudia Cady in Cady and Guyton Construction. He is a longtime member and co-founder of the WNC Green Building Council.

There is no place like a Certified Green Home.

- Third Party Verification and Consultation
- Reduced Energy and Operating Costs
- Improved Comfort and Durability
- Environmental Protection
- Green Building Education

Photo Credit: Living Stone Construction

LEED™ FOR HOMES

GREEN BUILT NORTH CAROLINA

WESTERN NORTH CAROLINA GREEN BUILDING COUNCIL

It is the best investment you will ever make.

Contact the WNC Green Building Council Hotline

www.wncgbc.org or 828-254-1995

Go with the flow

Avoid problems caused by clogged gutters

BY RUSSELL BARNES

When is the last time you had your gutter system inspected? If you don't keep gutters free of clogs and working properly, many problems can occur. Sometimes they can be severe enough to lower your property value and result in expensive repairs.

When gutters are clogged, this creates a perfect environment for many types of pests such as cockroaches and ants. They will have food, moisture and a protected area to live and breed, plus easy access to your attic through the eaves. Standing water in gutters will also breed mosquitoes, flies, gnats and other pesky flying insects.

Besides attracting pests, clogged gutters can damage your home. They can cause eaves and fascia boards to rot when the water builds up and sits stagnant against them. These areas are commonly attacked by carpenter ants, which can create even more damage. Replacing rotten fascia boards can be expensive. Clogged gutters also allow water to pool around the foundation of the home, which weakens it. This can cause cracks in the foundation to occur, or form penetration points that allow water to seep into the crawlspace or basement.

In the winter, ice in the gutters can block the flow of water from the roof. This excess water can weaken the shingles and wood and lead to leaks. Also, when clogged gutters don't divert water away from the home, pools of water accumulate. These pools of water can freeze in the winter and pose a major safety hazard to you and anyone else walking around these areas.

If you notice water spilling over the front or back of your rain gutters, then something is wrong. It can be caused by debris in the gutter, such as leaves, sticks, pine needles, roofing materials etc. The problem also can be due to faulty gutter-hanging brackets.

Maintenance check: Clogged gutters can result in expensive and far-reaching problems.
PHOTO BY MARCUS RENNER

The brackets may sag over time, or completely fall off, requiring them to be adjusted or replaced.

As you can see, cleaning gutters is vitally important to the long-term health of your home. Experts recommend that you clean and inspect your gutters in the spring and late fall, or even more often, depending on the number of nearby trees. Doing this is laborious and time-consuming. It can also be dangerous because it usually requires climbing up and down a ladder or getting on the roof.

Since cleaning gutters is a hard and dangerous job, eliminate this maintenance by having gutter protection installed. A properly installed gutter-protection system will keep out leaves and debris and allow water to flow freely through the gutters. Having clog-free, functional gutters will help keep insects away and protect your home.

Russell Barnes is the regional manager of Mountain Region Terminix Service, Inc.

All passive-heat storage is not created equal

The case for phase-change materials

BY NINA REINHART

Anyone who has sat on a sun-warmed rock on a cold night has experienced the effects of passive-heat storage. The effect occurs regularly in nature with anything that collects solar heat during the day and releases it at night. In this case, rock is a type of thermal mass — material that absorbs and retains heat for release later. With indoor spaces, many different types of thermal mass can be utilized.

Good passive-solar building design means that the walls, floors and windows can collect, store and give off heat during cold temperatures and repel heat during warm periods. Examples of commonly used thermal mass are brick, rock, concrete, tile and, more recently, various types of phase-change materials.

In poorly insulated structures such as greenhouses, thermal mass is used to trap solar heat during the day for night release, preventing damage and promoting growth in plants and veggies. It also is used to decrease overheating by providing a place for the sun's energy to accumulate, creating a more stable thermal environment. A typical thermal mass found in greenhouses is a Trombe wall of dirt, concrete, brick and/or barrels of water.

Normally, the larger the thermal mass in a space, the greater its ability to store heat and stabilize temperatures, resulting in less energy consumption, and savings on heating and cooling costs. Any thermal mass is good for heat storage, but some work better than others.

Phase-change materials as thermal mass

Phase-change denotes materials that change from a solid to a liquid and liquid to a solid while absorbing and releasing thermal energy. Some commonly utilized PCMs are water, paraffins, fatty acids and salt hydrates. PCMs are an ideal solution for passive temperature control, especially when there are large variations between outside day and night temperatures. PCMs made from salt hydrates serve as practical and efficient thermal mass in buildings, homes and greenhouses because they are nontoxic and nonflammable, require less space than other types of thermal mass, and are simple to employ.

A good example of how a 72-degree-Fahrenheit salt-hydrate PCM works can be observed at Sycamore greenhouse at A-B Tech's main campus in Asheville. The installation process was simple. The PCM was poured into 5-foot-long, 1.24-inch PVC pipes. Wooden supports were drilled into the existing cinder-block wall inside the greenhouse, and the pipes were horizontally bound. The rows of pipe were framed with wood and covered in a half-inch insulation board. An attic fan was attached beneath the row of pipes for thorough air circulation. The fans pull the air from above, through the PCM pipes, releasing the heated or cooled air below. This ultimately stabilizes the temperatures inside the greenhouse.

Hot and cold: Andy Reinhart installs PCM pipes at A-B Tech's Sycamore greenhouse. The thermal-mass system helps heat the greenhouse in winter and cool it in the summer.

PHOTOS COURTESY OF RGEES

A total of 274 pipes were installed, with each pipe containing 5 pounds of PCM, for a total of 1,370 pounds. This system provides 30 kilowatt-hours of heat-storage capacity. During the day (the heat-gain cycle), the PCM pipes absorb 30 kwh of heat, reducing its cooling load by 30 kwh. At night, during the heat-loss cycle, the system will release the PCM's absorbed heat and reduce the heating load by 30 kwh. This provides 60 kwh of free energy within a 24-hour day.

All the materials above, excluding the PCM, can be bought locally. This 72-degree, salt-hydrate PCM can fill any container made from HDPE, PP plastic or stainless steel. Placement inside a space can be against, on or inside a wall; above the ceiling; in between floors; or independently standing. The PCM is melted by warm daytime temperatures and begins to release the absorbed heat as the temperature falls below 70 degrees. The PCM then solidifies. During solidification, a constant temperature of 72 degrees is maintained. Once it's completely solid, it acts as a heat sink as temperatures rise above 74 degrees and continue the cycle of absorbing heat.

Without the PCM installation, the greenhouse would have been intolerably warm during the summer months. The temperatures inside the greenhouse are consistently 15-20 degrees lower with the PCM than without it. The phase-change material in the greenhouse eliminates temperature extremes that would normally occur with our changing seasons, not to mention that it retains optimal conditions for plant growth.

Due to the simple nature of phase-change materials, there are numerous methods of storing heat in both passive and active solar applications. All types of buildings and enclosed spaces can benefit from incorporating PCMs. Computer and communications facilities already utilize PCMs to absorb heat and maintain the recommended temperatures to protect their electronics. Thermal heat storage can, at the same time, shift the load on heating and cooling equipment and serve as backup during power failures. The possibilities of heat storage for enhancing active solar applications are currently being explored and implemented by professionals in various industries worldwide. Thermal heat-storage solutions will become an important objective of future energy-conservation efforts with the goal of preserving natural resources and lowering energy consumption and costs.

Nina Reinhart is a partner at RGEES. To find out more about phase-change materials, visit rgees.com.

Benefits you can measure

New energy programs offer paths to efficiency

BY AMY MUSSER, MATTHEW VANDE AND EMILY BOYD

In March 2012, North Carolina introduced a new residential energy code. It includes the usual tougher standards, but also has new requirements for testing and an expanded role for third-party inspection and testing. Additionally, a new High Efficiency Residential Option path provides an option to improve your household systems' efficiency by as much as 15 percent. The new standards form the basis for some exciting new utility rebates from Progress Energy as well. With the new code in effect since last year, we know what's working well, what could be working better and how to get the best results with the least frustration.

Duct-leakage testing

Duct testing is one of the highlights in the new code. Any duct system outside conditioned space (in attics, crawlspaces and unconditioned basements) must be tested for leakage of less than 6 CFM25 per 100 square feet of floor area served, or 6 percent total leakage. (CFM25 stands for the cubic feet per minute of airflow required to create a 25-Pascal unit pressure change in the duct system.) This measure applies to new homes and new duct systems for existing homes. Leaky ducts are a major cause of energy waste and problems with thermal comfort and indoor air quality in homes. Based on our company's experience, most new duct systems would have failed this test prior to the new code — unless the home was already pursuing ENERGY STAR or Green Built N.C. certification (both of which have required testing for a long time). It's great that all new systems will now meet this level of quality.

Whole-house air sealing

Unfortunately, the new code hasn't been as successful in the area of whole-house air tightness. The new code allows builders to fill out an air-sealing checklist or perform a blower-door test to demonstrate whole-house air tightness. Most builders choose the checklist option, and it's not clear that more air sealing is taking place as a result. Unless you test with a blower door, there's simply no way to know that a home is airtight.

As a third-party testing service, most of the code-compliance blower-door tests we've been asked to perform for the new code are for modular homes. Since it's difficult to easily or honestly track all of the air-sealing tasks back through the plant, builders of modular homes are among the few who are opting to test their homes. Scores vary based on the modular plant of origin, but we do see failures that can be traced back to fairly obvious leakage paths. Without a requirement that every home be tested with a blower door, the checklist option is unlikely to result in tighter homes. This is one area where ENERGY STAR and Green Built N.C. homes have a significant advantage, since all homes in those programs are blower-door-tested.

Air-tight? Testing ductwork for tightness can ensure proper performance and increased efficiency.

PHOTOS COURTESY OF MINNEAPOLOIS BLOWER DOOR

Increased insulation and window requirements

The new code has also upgraded requirements for walls and windows. In Western North Carolina, walls now need to have insulation with an R value of 15 (up from R-13 in the previous code), which can be easily achieved in 2-by-4-foot walls with a high-density batt. Windows now need to have a lower U-value and a much lower solar heat gain coefficient (SHGC) than before. In both cases, the code is definitely driving large numbers of builders to install components that were better than before, and that's great news.

However, builders do need to be aware that the window SHGC is difficult to trade off if you happen to buy the wrong window. And, if you have a passive-solar house (where you want a lot of solar-heat gain), you'll need to have your design analyzed by a licensed design professional who can perform energy analysis and develop a "simulated performance alternative" method of meeting code. For a new home, this isn't difficult to do. But for a renovation, you'll likely be hamstrung by the existing building components.

Unless it's a gut-rehab, you're better off sticking to the prescriptive requirements for windows.

Air barriers for air-permeable insulation

New requirements for air barriers are yielding mixed results, but we're hopeful that the situation will improve over time. It's been well-known for years that air-permeable insulation (fiberglass, cellulose etc.) needs to be in contact with a hard, air-impermeable surface (sheathing, drywall, rigid insulation etc.) on all six sides to work properly. This requires builders to add a rigid surface on the attic side of kneewalls, behind tub enclosures, under stair platforms, in duct chases and a number of other locations where the insulation might not be fully encased. We call it the "no naked fiberglass" rule, and it's been part of the ENERGY STAR New Homes program since 2006.

Code inspectors are now looking for these details, but enforcement varies by jurisdiction, as does interpretation of what constitutes an acceptable "air barrier." With time, education and experience, this will hopefully become more uniform.

Slab-edge insulation

The new code also clarifies vertical-edge insulation for slabs on grade. Heat loss through floor slabs tends to take the shortest path, which is out through the vertical edge. The easiest place to put insulation is horizontally under the slab, which unfortunately misses this entire vertical edge. There are two big challenges with installing vertical-slab edge insulation properly. First, the code shows only one insulation detail, with the insulation placed on the outside of the foundation wall. Second, because termites can tunnel through some types of rigid insulation, there is a 2-inch required "view strip" that must be left uninsulated at the top of this vertically applied insulation. This leaves about half the slab edge uninsulated, preventing it from achieving its full energy-savings potential. In reality, there are several ways to detail this that are both termite-durable and allow the slab edge to be insulated, but some code officials are interpreting the single detail in the code to mean that only one method is acceptable. We're afraid that this detail will continue to frustrate efficiency-seekers for the next few years.

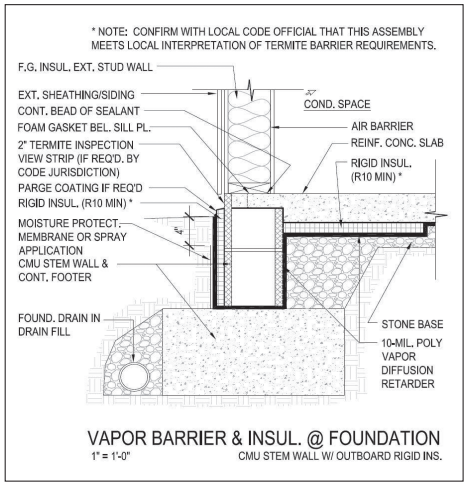


Figure 1: In the top image, blow-door tests measure how airtight a home is — an essential element of energy efficiency. In the lower schematic, proper slab-edge insulation prevents thermal bridging.

New financial incentives for energy efficiency

Finally, the above-code HERO pathway provides an optional compliance path to achieve even more savings. The N.C. Utility Commission has just approved a new $1,000-$4,000 Progress Energy builder rebate that is based on this HERO compliance path, so we expect to see more people pursuing it in the near future.

In addition to HERO requirements like R-19 walls and above-code windows for Asheville's climate zone, this program also requires that the home be tested by a third-party HERS rater, passing both the duct-blaster and blower-door tests. Progress Energy feels so confident that this will result in a highly efficient house that they will even offer a bill guarantee to the homeowner in addition to the rebate. We expect the HERO code to become a lot more popular locally because of the significant utility incentives.

There is no doubt that the new residential-energy code raises the bar for builders. While there will be a significant learning curve, it's all feasible to incorporate into standard building practices. It will also significantly improve the performance of new homes in the area. In addition, new utility rebates will reward builders for going even further with these energy efficiency measures, reducing the out-of-pocket investment for high-performing homes. New homes will be substantially more efficient than older homes, providing savings and value that homeowners will enjoy for their entire time living in the home. It's the very definition of a win-win!

Amy Musser, Matthew Vande and Emily Boyd bring diverse points of view to Vandemusser Design PLLC, an Asheville-based home-energy-efficiency company. Musser is a mechanical engineer; Vande is an architect; and Boyd is a general contractor and former home inspector. Together, they provide design assistance, certification and audits to support high-performance homes.

The economics of urban timber

Why wouldn't you use trees from your site?

BY HANS DOELLGAST

When I first started building new green homes in Asheville, the idea of milling trees from the site was extremely appealing. I decided to send all of the sawn logs from trees I was forced to take down to a lot that I owned. When I had a healthy pile of timber, I called up a friend who had a bandsaw mill, and had him saw all of my trees into lumber that I envisioned using on future projects.

Over the next five years, I moved those same piles of wood five times. Every time we moved the piles of wood, we would find that more of my precious lumber had rotted, warped or cracked. Finally, the lumber made it to the kiln to be dried around the same time that I started building my own home. By this point, it was pretty clear that I had taken the least efficient approach to processing my trees. I had mismatched species, non-uniform thicknesses and widths, and warped boards — plus, I had paid to move this same lumber over and over and over again.

When I showed up at the dry kiln, I had the workers unload the worst-looking wood in the whole lot, and it showed on their faces. In the end, I was able to use every last piece in my own home, but I paid dearly for the warm, fuzzy feeling of reusing my trees.

In my line of work, taking down trees is a necessary evil that comes with clearing home sites. I have yet to meet a client who doesn't like the idea of reusing all of the lumber off their property. Clients especially love the idea if it saves them money. After years of trial and error, I have streamlined the processing of my clients' trees to the point where I can typically get all their trees back into their house.

Here's how I make it happen: When we take down trees that show good potential for reuse in a home, we are careful to not let our grader simply knock them over. My sawmill guys have told me that pushing over trees encourages them to split. Instead, we take them down with chainsaws. We usually cut the tree trunks to long, straight lengths. Curves and crotches can be really cool and interesting, but you need to make sure that your local sawmill is willing to maneuver a log around to accommodate a tree's character.

Next, we call a knuckle-boom driver to come and pick up the logs. A typical fee for a knuckle boom is $200 to $350, depending on how far they have to drive. I used to use a dump truck to move my logs, but it is a lot more convenient to have a driver show up who can load and unload your logs without additional machinery. A single full truckload typically measures out at 3,000 board feet, give or take.

Cutting edge: Urban forestry allows builders to save money, support local mills and reuse a valuable resource.

PHOTO COURTESY OF SUNRISE SAWMILL

THE COST OF PROCESSING A 12-INCH CHERRY BOARD

ACTION	COST	EXPLANATION
Cutting tree	N/A	The tree has to be cut down anyway
Hauling logs	16 cents	10 cents per foot to haul times 65% yield
Milling logs	54 cents	35 cents per foot to mill times 65% yield
Drying lumber	38 cents	25 cents per foot to dry times % yield
Shaping board	25 cents	2 cents per lineal foot to plane and shape
TOTAL COST	$1.33 per square foot for 1-by-12-inch cherry board	
RETAIL COST	$5.50 per square foot for a 1-by-12-inch cherry board	

FIGURE 1

After the logs are delivered to the mill, I call and request a board-footage count by species. I then relay this count to my clients, and we plan how to use their lumber in their home. Common options are stair treads, flooring, trim, built-ins, siding, ceilings, wainscoting and cabinet faces. If the lumber is going to be dried, planed and processed, I assume that I will get a 65-percent yield out of my rough-cut material. If I am using the material rough, as we do with siding, I assume that I will get more like 80 to 90 percent. The cost of milling my trees usually comes in around $350 per 1,000 board feet.

The finish: Even the more rustic, rough-hewn materials can be transformed into attractive, long-lasting features of the home.

PHOTO BY BOONE GUYTON

After my lumber is milled, I send it to the kiln to be first air-dried and then kiln-dried. The process usually runs about $250 per 1,000 board feet, and it can happen relatively quickly for soft hardwoods and pine trees. Soft hardwoods include maple, cherry, walnut, poplar and several others. In the summer, I can have my poplar put into the kiln after only a couple weeks of air-drying.

After my lumber had been kiln-dried (assuming I'm not using it rough-sawn), I send it to the shaper. I rely on them to turn my wood into flooring, trim, siding etc. They are usually willing to store it for a short time while I compile my order. The way that they bill is based on lineal footage, as opposed to square footage. Sending a 6-inch trim board through their shaper takes them the same amount of time as a 12-inch trim board, so they don't differentiate. On a recent project, I was charged 20 cents per lineal foot for processing hemlock siding. Processing trim, where we also have one side sanded, costs 25 cents per lineal foot **(See Figure 1)**.

The realized savings are obvious for a cherry log. Through a little bit of forethought, and about four phone calls, I can save a client $4.17 per foot on cherry trim. The great thing about the cost of $1.33 per square foot is that it is the same regardless of what wood species you are processing. The savings for a $7-per-square-foot black walnut board are huge. The savings for a $2-per-square-foot poplar board are small, but still there. The satisfaction you get from using your trees is free.

There are some instances in which milling your trees makes sense ethically, but not financially. Partially rotten and split logs are usually more trouble than they are worth. In the city, and around old homesteads, some logs are full of metal from nails, barbed wire and spikes. It is amazing the things you can find 6 inches deep in a tree! If your sawyer hits metal, he will charge you for any damage to his blades.

When our clients hire us, they rely on our ability to balance ecological responsibility with their budget. It is rewarding when the two exist in harmony. By practicing urban forestry, we save money, support local sawmills and reuse a valuable resource.

Hans Doellgast owns Jade Mountain Builders. He and his team of 30 craftsmen have built and remodeled more than 40 green homes in the Asheville area. Doellgast received his degree in environmental education from Warren Wilson College.

Growth field: A decade ago, local food was mainly fresh produce. Today not only can we choose from a rich array of fresh fruits and vegetables but also locally raised meats, artisan cheeses, eggs, honey, mushrooms, herbs and much more. Razor Mountain runs a diverse farm operation in Barnardsville. (Pictured here: farmer Mary Tavolacci.)

PHOTOS COURTESY OF ASAP

Growing a sustainable food system

Local farms feed families and the economy

BY ALLISON PERRETT AND CHARLIE JACKSON

Food is the most basic of human necessities, but it's easy in our current food system to make decisions about what we eat without much knowledge of the human or natural resources used to produce the food. Writer and lifelong farmer Wendell Berry has observed that the boundaries of the global economy are so large that its participants can neither see nor take responsibility for the impacts of their decisions. On a global scale, we participate in an economy of which we have no knowledge; we know nothing of how goods are produced — with whose hands, using what resources, extracted by what means.

In this context, most "eaters" have little or no understanding of food production; it is not part of the normal realm of social experience. Food simply comes from a supermarket shelf without any history, and we don't think to think about how and where our food is being produced. But, as Berry put it, "eating is an agricultural act."

The tobacco transition

Agriculture in Western North Carolina is nearing the end of a fundamental transition. Two decades ago, and for most of the last century, tobacco was the area cash crop. In the mid-1990s, anticipating the end of the federal tobacco program that had supported the tobacco economy, a group of farmers, agriculture-support personnel and concerned community members got together and asked themselves: What can we do to make sure that farming survives, that farms continue to be a part of our landscapes and communities?

The answer the group eventually came to was "local food." Localizing food production made sense for farmers and consumers. It could provide a market for the region's smaller mountain farms, which were unlikely to successfully compete in global markets. Profitable farms would keep land productive and free of commercial development. Consumers would have an alternative to the mass-produced food of the

Tailgate vibe: In the past 10 years, the number of farmers markets in the region has grown from just a handful to more than 90. Here, a customer meets a farmer from Earthlife Farm at Asheville City Market.

industrialized food system and even have a say in how their food was being produced. In 2000, Appalachian Sustainable Agriculture Project launched a campaign to raise awareness about the region's agriculture and the benefits of buying food grown by the region's farms.

Today, with tobacco mostly gone, the region maintains a strong farming economy. Local food and farms have become a conspicuous part of WNC culture, and the market for locally grown food is thriving. In the past 10 years, the number of farmers markets in the region has grown from just a handful to more than 90; the number of farms with community-supported agriculture programs, a kind of subscription service where customers prepay for a farm's seasonal yields, has increased from just 10 to more than 100.

Farmers have responded to increased demand by growing a greater diversity of products. A decade ago, local food was mainly fresh produce. Today, not only can we choose from a rich array of fresh fruits and vegetables, but also locally raised meats, artisan cheeses, eggs, honey, mushrooms, herbs and much more. Shoppers aren't restricted to the tailgate markets; they can purchase fresh local goods in a number of grocery stores or order them prepared in a restaurant. Students and teachers are eating local in their school cafeterias. Hospitals are serving regional foods to staff and patients.

All in a logo: The Appalachian Grown symbol is displayed with farm products grown or raised in Western North Carolina and the Southern Appalachian Mountains. When you see the Appalachian Grown logo, know you're buying fresher foods that support family farms, strengthen the local economy, preserve rural culture and protect the region's natural beauty.

Changing the global food system from Asheville

A dozen years ago, ASAP's Local Food Campaign was one of a handful in the country. Today, the degree to which local food has entered the public's mindset is evident in a national movement — in a proliferation of local-food campaigns across the country, in the growth in the number of alternative food markets like farmers markets and CSAs, and in the number of big food retailers with local-food-marketing programs. Amid of all this excitement, there is also increasing scrutiny of the local-food movement and speculation about the economic, social and environmental benefits that movement advocates claim.

Local-food advocates like ASAP argue that localizing food production is the means to address the social, environmental and economic externalities of the global food system. The question is, how and why? Last year, ASAP launched the Local Food Research Center to study what happens when we localize food production and to test the idea that food production integrated in local communities leads to positive changes.

For ASAP, integration is key to the transition of our food system; it is the basis of ASAP's theory of change. Local-food systems emerge from the ground up. Food

production is grounded in the natural and human resources of a particular place. It responds to ecological limitations and possibilities. It emerges from the skills, ideas and knowledge of local people — from you.

The boundaries of a local-food system are relatively small, and this creates the opportunity for the development of feedback loops, the ability for community members to observe and monitor the impacts (good and bad) of agriculture. Short food-supply chains create transparency. Because food production happens where we live, we have knowledge of how it is being produced, by whom and using what means.

Anchored in communities, the processes involved in localizing production and consumption develop human and conceptual connections. Relationships develop around food production and provision; conceptually, we re-learn about the connections between growing food, land use, labor and consumption. These connections change the way we think about food and eating. Our food decisions are conditioned by them.

Food in this context is not without history. It is connected to a person, to a landscape, to a growing sense of community. We make value-laden choices based on an appreciation of this interconnectivity. Collectively these choices — your choices and the choices of your neighbors — directly shape the characteristics of the food that we eat and the way our food system works.

The maturity of the Local Food Campaign here in WNC provides a unique opportunity to study the transition to local food systems. How do we transition from a largely anonymous economy to one where decisions are embedded in the relationships and conditions of place? How can localizing food systems bring about positive economic, environmental and social change? What actions do we need to take to bring these changes about? In the coming months and years, ASAP's Local Food Research Center will focus on these questions and others, often seeking your input.

With a little long-term research into the assumptions that are the foundation of the local-food movement, the critical study of this region's evolving food system — from producer to diner — will be relevant to its continued development, and to the development of local-food systems in other regions.

Charlie Jackson is ASAP's executive director and has been with the nonprofit since its inceptions. Allison Perrett is a researcher with ASAP and has been with the organization for five years. ASAP's mission is to help local farms thrive, link farmers to markets and supporters and build healthy communities through connections to local food.

To learn more about ASAP's work and Local Food Research Center, visit asapconnections.org, or call 236-1282.

MAJOR GROWTH

Since 2002, WNC has seen:

- 855 percent increase in farms selling locally
- 733 percent increase in CSA farms
- Nearly 200 percent increase in farmers markets
- 558 percent increase in farm-to-table restaurants
- In 2012, the number of Appalachian Grown-certified farms and partners grew to 558 farms and 352 businesses
- Estimated purchases of Appalachian Grown certified products increased fourfold since 2007 to more than $62 million.
- WNC is home to 16,206 farm operators who work on 11,533 farms
- Direct sales totaled $4.9 million
- The average age of farmers in WNC: 57.3

Go forward

Greening Asheville's transportation options

BY LAURA PIRAINO

Asheville is familiar with accolades. It's been recognized as the best (or in the top 10) for its happiness quotient, beer, Southern charm, access to outdoor adventure, beauty and more. But did you know that we are moving toward becoming a more walkable, bikeable and transit-friendly city as well? One of Asheville City Council's strategic goals is to fully use our urban services and infrastructure to create more transportation options and reduce vehicle miles traveled. The latest initiatives to green transportation may have benefits that extend well past the initial ride.

Last May, the American League of Bicyclists designated the city of Asheville as a Bicycle Friendly Community, in the bronze-level category, in recognition of the city's accomplishments in increasing bicycle accessibility and awareness. These efforts included expanded bike lanes, bicycle parking, bike racks on city buses, bike lockers and a bike-repair station. A growing network of greenways extends beyond bike lanes, increasing route options for cyclists and pedestrians.

Designing and constructing an interconnected infrastructure benefits not only residents, but employs folks here at home. Improvements can stimulate economic growth for rental, tour, equipment and outdoor-gear related businesses, but are not limited to the recreation industry. Businesses like New Belgium Brewing were attracted to Asheville in part for the amenities that sustainable transportation planning had to offer.

Asheville is already a mecca for mountain bikers, and becoming a more bicycle-friendly city offers the city an opportunity to increase tourism. The North Carolina Outer Banks' $6.7 million investment in bicycle infrastructure led to an annual 9-to-1 return, generating more than $60 million in economic activity a year by drawing affluent visiting cyclists.

The greener mile: Asheville's hybrid-biodiesel buses and a new and improved ART system route are part of a strategy to fully use urban services and infrastructure to create more transportation options and reduce vehicle miles traveled.

PHOTO BY MAX COOPER

To increase awareness, the city and community partners like Asheville on Bikes and the Blue Ridge Bicycle Club organize events for both beginner and advanced cyclists, including the Ring of Fire bicycle races at the Carrier Park velodrome, low-cost bicycle-safety classes, the annual Strive Not to Drive campaign and regular group bike rides in the summer. To emphasize the health and transportation benefits of greenways, a community bike ride to celebrate the Reed Creek Greenway ribbon-cutting was led by Olympic silver medalist **Lauren Tamayo**.

For those who prefer to travel without pedaling, public transportation offers the option to ride, relax and connect. The city of Asheville approved its first

Transit Master Plan in 2010, with the first phase of the implementation of Asheville Redefines Transit (ridetheart.com) launched last May. The reconfiguration of the transit system included increased bus service along major corridors, improved schedules and streamlined routes to improve on-time performance. Riders are now able to use the transit feature on Google Maps to identify route options, transfers and schedules completely online.

ART has been able to modernize the transit-vehicle fleet with seven hybrid-diesel vehicles and seven cleaner 2012 diesel vehicles, resulting in fuel savings and reduced carbon emissions. By 2014, riders will be able to receive real-time information about route arrivals at any given stop, via online maps, downloadable apps or by using a text-message feature.

Since many local car trips are less than one mile, traveling out of the car can really save money. Owning, operating and parking a vehicle on average is more expensive than the alternatives, so integrating multimodal into our lifestyles can help decrease our transportation expenses, which is essential for those on limited or fixed incomes.

To advance a more comprehensive approach, Asheville adopted a Complete Streets policy last June, which mandates that new and renovated roads include safety measures for pedestrians, bicyclists, transit vehicles and riders, children, the elderly and people with disabilities. Part of a larger strategy to reduce vehicle miles traveled, the city is leveraging existing funds to pursue opportunities to improve an interconnected network of sidewalks, bike paths, greenways, transit options and access to rivers.

As our population continues to grow, reducing time behind the wheel will help protect the character of our neighborhoods by increasing safety, reducing traffic and the need for new parking spaces. At the same time, we "cut the carbs," or carbon emissions, and reduce air pollution that leads to many respiratory illnesses. This also reduces our dependence on imported petroleum, and allows us to reinvest the savings into our local economy.

Fixed gear: A bicycle commuter makes use of one of Asheville's public repair stations, installed and maintained by the city.

XPRESS FILE PHOTO

Reducing dependence on the automobile through complete streets helps folks of all ages and different physical abilities, as it provides safe routes to school for children, increases mobility for the disabled and can allow seniors to stay independent for a longer period of time.

Increasing safe and active transportation choices allows residents to burn off those regular carbs through frequent out-of-car travel experiences, as we spend more time outdoors and increase physical activity. Along the way, we also have more opportunities to interact with others. As residents look for more transportation and recreation choices, access to a green infrastructure increases the options.

Want to support and improve multimodal transportation here in Asheville? Serve on one of Asheville's many community boards and commissions, like the Transit or Greenway Commission or the Asheville Bicycle and Pedestrian Task Force. But most important: Get out from the behind the wheel and explore Asheville's multimodal options.

Laura Piraino is the sustainability-outreach specialist for the city of Asheville's Office of Sustainability. Piraino has a background in sustainability program development, education, fundraising and marketing. Prior experience includes work with the Blue Ridge Sustainability Institute, the Sierra Club and her own consulting firm, Post Carbon Services of Asheville.

A load of energy savings

"Cool is Clean" promotes cold-water washes

BY LAURA PIRAINO

Did you know that most of the energy used to wash a load of laundry goes into heating the water? Ninety percent, in fact.

The city of Asheville is participating in one of the first multicity research and program-development projects of its kind, adopting new strategies to improve sustainability outreach with the Cool is Clean pilot campaign. Participating cities are using community-based social-marketing techniques, which bring together environmental education, behavioral psychology and marketing research to improve the design, content, messaging and methods of outreach engagement. A grant from the Urban Sustainability Directors Network provided funding for the pilot campaign, securing the support of Action Research, a community-based social-marketing consulting firm.

cool is clean

Washing laundry in cold water can significantly reduce energy consumption across the nation. The real or perceived barriers for choosing to wash in cold are relatively low: We all have to clean our clothes, most machines have a cold-water setting, and selecting cold does not require a new financial investment.

To better understand remaining barriers, benefits and opportunities for this laundry behavior, research was conducted through surveys and focus groups. Many conservation measures, such as washing in cold water, save money, so measuring and reinforcing those additional benefits in the educational content are important incentives. Neighborhood norms and testimonials also offered additional motivation, while marketing prompts — in this case, magnets — helped pilot participants remember that Cool is Clean.

Preliminary results show that those who received the Cool is Clean campaign materials in Asheville were significantly more likely than the control group to report using either mostly cold or all cold-water washes and had washed more loads of laundry in cold water in the last month (85.7 percent versus 66.1 percent). The treatment and control groups did not differ on any other energy-saving behaviors.

Laura Piraino is the sustainability outreach specialist for the city of Asheville's Office of Sustainability. Piraino has a background in sustainability program development, education, fundraising and marketing. Prior experience includes work with the Blue Ridge Sustainability Institute, the Sierra Club and her own consulting firm, Post Carbon Services of Asheville.

To learn more about the Cool is Clean and other outreach campaigns from Asheville's Office of Sustainability, visit ashevillenc.gov/green.

Builtwright CONSTRUCTION Co

828.545.0052 BUILTWRIGHT-CONSTRUCTION.COM

GLAZER ARCHITECTURE

U.S. GREEN BUILDING COUNCIL MEMBER

LEED™ AP Professionals

WESTERN NORTH CAROLINA GREEN BUILDING COUNCIL

Asheville, NC
tel: 828.254.5853

www.glazerarchitecture.com

sustainable commercial and residential design

Connect the plots

A countywide greenway system is not far away

BY DAVID TUCH AND DENA CHANDLER

There has been a lot of talk about greenways and bike lanes in the Western North Carolina region, and for good reason: They are key elements in supporting and developing a mobile community. The benefits of greenway development reach the cardinal points of the community, in material and immaterial ways, which is why so many sectors of the community champion such systems.

Environmental groups encourage greenway development — and bike lanes especially — because they provide an alternative to driving a car to a park or a grocery store, helping redress climate-change issues and air-quality concerns on the ground level. Since greenways are often associated with significant natural lands, ridgelines and rivers, conservation easements are typically placed along the entire trail corridor, which leads to permanent protection of the surrounding habitat.

Health and wellness organizations find much to support in greenways and bike lanes too: They invite physical exercise, provide access to recreational facilities and encourage community interaction with the natural environment. As linear parks, greenways provide far-reaching recreational opportunities for neighborhood and community members that otherwise may not exist. Even tourists visiting this region have opportunities to walk, bike, rollerblade, skateboard or jog to destinations, allowing for a richer travel experience.

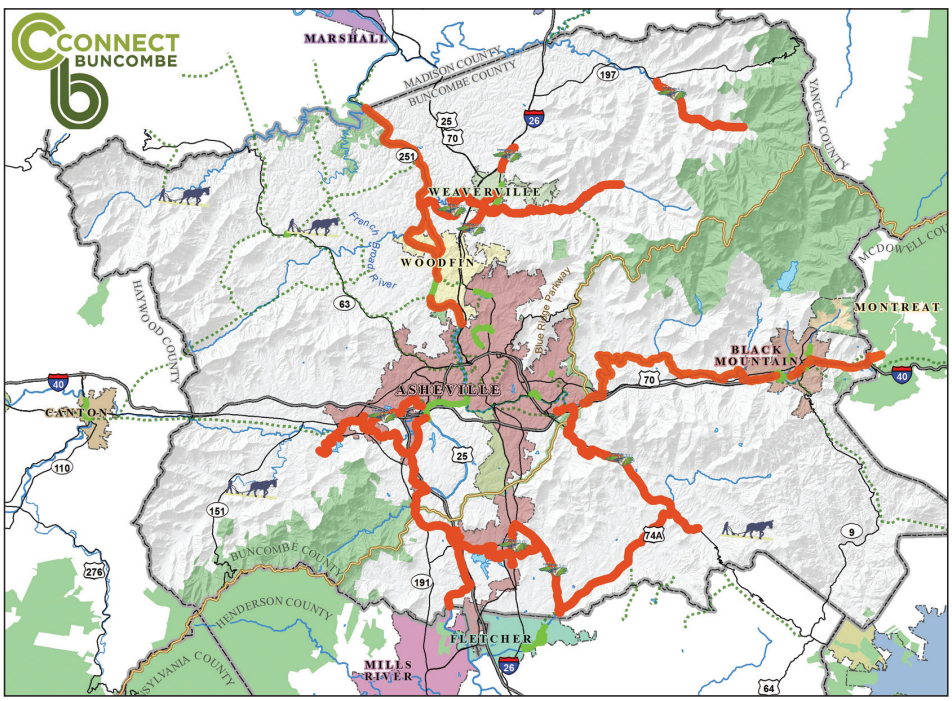
Greenways increase transportation options and can increase travel efficiency. Much of the planning that has occurred locally includes abundant bike lanes, sidewalks or complete streets that incorporate all users' needs to provide a street system that is better and safer for drivers, transit users, pedestrians and bicyclists.

But there are significant challenges in creating a connected network of greenways and trails in our mountain region due to steep valleys, ridges and the existing built environment. A combination of on-road connections such as bicycle lanes and sidewalks are often required to make a connected greenway system work in such developed and challenging areas.

Economic groups also embrace greenways because of the real tangible benefits of greenways in business retention and business relocation. Quality of life factors, such as access to open space and greenways that promote the walkability and bikeability of a community, play a significant role in an organization's decision to relocate or start a business in a particular area. Who can argue against greenway development when it helps attract business and jobs to a community?

Multipurpose: Greenways offer venues for school field trips as well as alternative routes for travel to and from school.

PHOTOS, IMAGES COURTESY OF EQUINOX ENVRONMENTAL



The 102-mile plan: Buncombe County leaders recently completed a Greenway Master Plan that, if implemented, will link many communities and projects.

The 102-mile plan

Buncombe County recently revealed its comprehensive Greenway and Trails Master Plan for the development of a system connecting major destinations such as business corridors, schools, farmers markets, community centers, parks and and neighborhoods.

Learning path: Greenways offer opportunities for environmental education as well as recreation.

The process began in 2008, when the county established the Greenways and Trails Commission, with Lucy Brown as Park and Greenways Planner. In a June 19 *Mountain Xpress* article, reporter Jake Frankel describes how the plan highlights seven priority areas and about 100 miles of proposed corridors, and how the process evolved: "Crown and other officials have spent countless hours poring over data and maps, and meeting with residents and other stakeholders, to determine the optimum routes." He continues, "Many link existing parks, greenways, residential areas and schools; several follow waterways such as the Swannanoa and French Broad rivers."

The Master Plan includes eight key greenway corridors throughout the county, including Asheville, Black Mountain, Weaverville and Woodfin. Currently, the city of Asheville has a little more than four miles of developed greenways. The completed segments include such areas as the French Broad River, Glenn's Creek, Reed Creek and the Swannanoa River. The ultimate goal is for a 15-mile system throughout the city. (For more details on the system's location points and phases of development, visit avl.mx/o1).

When Colorado-based New Belgium Brewing decided to build its East Coast production facility in Western North Carolina, company executives identified "Asheville's growing multimodal infrastructure [as] a key factor in their decision to build a $175 million production facility along Craven Street in the River Arts District," *Xpress* reported. As part of the company's agreement with the city, New Belgium's 17.5-acre riverside complex will include a greenway along the French Broad River, toward which the city has pledged up to $500,000.

In addition to the economic gains, jobs and infrastructure the brewery will generate, the land itself — a former stockyard — is a designated "brownfield," an area contaminated by past industrial use, which New Belgium will rehabilitate.

The New Belgium site provides a sound example of the diverse benefits of greenway development. Greenways can have a positive impact on communities and individuals by providing opportunities for recreation, alternative modes of transportation and even protection of the natural environment, all while influencing economic development.

David Tuch and Dena Chandler of Equinox Environmental, an environmental planning and design firm located in Asheville N.C., have been working on greenway projects throughout the region, several of which have been listed above. Tuch has extensive greenway experience including work on greenway and trail projects in the Pacific Northwest and the Southeast. Chandler has been involved in numerous greenway-planning projects in Western North Carolina, including the Buncombe County Comprehensive Greenway & Trails Master Plan approved by the county Board of Commissioners in 2012.

Seed Money

Credit union invests in sustainability

BY JANE HATLEY

What do a 1,500-acre tract of nature, a $600 home-energy-efficiency loan and a biofuel-collection site have in common? They are all part of the environment-friendly work that Self-Help/Carolina Mountains Credit Union is doing in Western North Carolina. Like so many in WNC, we at Self-Help/Carolina Mountains have long placed a high priority on sustainability. And as a community-development lender, our role is to provide the flexible financing that can be hard for "green" projects to find.

Founded in Durham in 1980, Self-Help opened its first WNC office in 1984 on Asheville's Wall Street. We merged with Carolina Mountains Credit Union in 2009, adding branches in Hendersonville, Rosman, Penrose and now South Asheville. Our mission is to help create ownership and economic opportunity for all, especially people of color, women, rural residents and low-wealth families and communities.

Self-Help/Carolina Mountains has long recognized the fundamental connection between our economy, communities and the environment. We are known as a "triple bottom line" lender, meaning that we seek to make loans that have positive community impact and positive environmental impact.

Our environmental-lending history in WNC tells a story of diverse investment. It includes helping to finance the Carolina Mountain Land Conservancy's purchase of the World's Edge, 1,568 acres of sparkling waterfalls, sheer cliffs, forested slopes and dramatic views in the Hickory Nut Gorge just 15 miles southeast of Asheville. World's Edge contains a mile-long set of steep slopes on the eastern edge of the Blue Ridge Escarpment, with more than 20,000 feet of streams and waterfalls. The noncontiguous property extends into Henderson, Polk and Rutherford counties.

We also are part of the innovative Neighbor Saves program, run by the WNC Green Building Council and initially funded by the Community Foundation of Western North Carolina. Neighbor Saves provides financing for energy-efficiency upgrades in homes. The program empowers participants to "Save Energy, Save Money, Improve Comfort, Learn Skills and Build Community in a team-based (not just neighbors), FUN environment." Participants get trained by and complete work on each other's homes with an experienced supervisor. Self-Help/Carolina Mountains can provide project financing of up to 100 percent as well as consumer loans for needs such as home heat-pump and furnace replacements.

The first borrower of our WNC Neighbor Saves program received a $600 loan to buy materials to improve the energy performance of her home. She is now able to heat both floors of her house, and her average energy bills are 23 percent lower than last winter. "The Neighbor Saves program has allowed us to save money, lower our energy usage and be more comfortable in our entire home all year round," she reports.

Self-Help/Carolina Mountains has also partnered with Blue Ridge Biofuels to place a cooking-oil recycling bin at our south Asheville branch at 1911 Hendersonville Road. Blue Ridge Biofuels is an employee-owned business that produces and distributes biodiesel for Asheville and WNC. The company collects used cooking oil from restaurants, cafeterias, public bins and other businesses; converts it to biodiesel at its Asheville facility; and distributes it through numerous public pumps and private delivery. Perhaps not surprisingly, this partnership grew out of Self-Help's long-standing relationship with Blue Ridge Biofuels, which began with a loan to help the company purchase its first fuel truck.

Realizing the breadth or our environmental work and its centrality to our mission, we formalized it by creating an Environmental Stewardship Initiative staffed by a full-time manager who identifies high-value operational savings and green benefits for members and borrowers.

As the saying goes, we are all in this together. That certainly holds true with the partnerships that form our environmental work and help us meet our mission. We are honored to work with individuals and organizations in WNC to help them achieve their goals and increase our environmental and economic sustainability — and are eager to do more!

Jane Hatley serves as Self-Help's western regional director. For more info, check out self-help.org/greenloans and ow.ly/f28V9. On Twitter: @SelfHelpGreen.

To learn about becoming a Self-Help/Carolina Mountains member and Green Certificates of Deposit, visit self-help.org/join-us.html or call Hatley at 676-2196, ext. 3473.

KEY SUCCESSES

• **Green lending:** We have provided more than $36 million in loans to businesses that are manufacturing, selling or purchasing environmentally friendly goods and services. Recent projects include green-product retailers, sustainable agriculture practitioners, recycling and biofuels companies, solar installers and major solar-energy providers — including growth capital loans to FLS Energy and Integritive2. We've also provided loans to nonprofits specializing in land conservation.

• **Energy Loan Fund:** With support from Bank of America, we are piloting a specialized $5 million loan fund to finance renewable energy and energy-efficiency upgrades in commercial buildings in Charlotte and seven other target cities nationally. Lessons learned will help us expand energy lending across North Carolina for multifamily housing, small businesses, child-care centers, charter schools and houses of worship. *Self-Help.org/EnergyLoanFund.*

• **Green facilities:** We operate 16 commercial office buildings in downtown locations. We believe that the re-use of historic buildings in downtown locations near public transit is an inherently green activity. In renovating these buildings, we have worked to establish energy-saving and green practices, including digital HVAC controls, efficient lighting and low-VOC finishes.

• **Green commuting:** We offer a green-commuting program to encourage our employees to walk, bike, carpool or ride public transportation.

• **Green deposits:** We offer a Green Term Certificate (CD), which pays the same competitive market interest rates as Self-Help's standard-term certificates and helps to support green lending and other initiatives.

• **Green partnerships:** We collaborate with key environmental organizations, such as the WNC Green Building Council, EVOLVE Energy AdvantageGreen, the N.C. Department of Energy and Natural Resources, the Carolina Recycling Association, the Carolina Farm Stewardship Association and the North Carolina Sustainable Energy Association.

• **Green downtowns:** We support downtown revitalization, a key strategy in combating sprawl and encouraging infill. To date we've invested more than $62 million in the purchase and renovation of buildings in downtown areas.

• **Green homes:** We develop healthy and affordable homes (more than 150 to date) by applying SystemVision and Green Built N.C. guidelines and materials in new-home construction. Our homeowners enjoy energy efficiency and improved air quality, while saving up to 50 percent on their heating and cooling costs.

A drop in the river

WaterRICH promotes rain gardens to protect our watershed

BY NANCY HODGES

Water management in our urban landscape has typically focused on getting water away from structures and to a pipe or stream as quickly as possible. This leads our urban landscapes to be water insensitive and uneconomical. We pay to have rainwater shipped off-site, then pay for it to be cleaned and piped back to our homes for outdoor use.

When we look at the water cycle, you can see that the increase in impervious surfaces, such as roofs, sidewalks, driveways and streets, doesn't allow water to seep into the soil as it once did. This increase in impervious surfaces boosts both the amount of rainwater and the speed that rainwater gets to the stream, reducing its time in our ecosystem being cleansed by the soil and plants. When a high volume of fast-moving water hits our streams during a rainfall, it causes much of the stream-bank erosion and sediment in our streams and rivers — and explains why the French Broad River turns mud-brown when it rains.

Water is vital to all of us, of course — for drinking, cleaning and recreating, along with uses for industry, electricity, and maintaining habitat and landscapes. The WaterRICH program is a resource built to help residents understand how they can be good stewards of our natural resources. The project seeks to increase infiltration of stormwater into the ground and the water table, reduce the use of potable water, improve water quality in the French Broad River watershed and reduce pressure on the existing stormwater system.

Preserving water on a site can make your site WaterRICH through rain gardens and rain harvesting. You can improve your landscape to be healthy without the use of potable water from our city's drinking water. RiverLink developed the WaterRICH program, based on research from North Carolina State University and various rain-garden programs throughout the country, to help homeowners understand rainwater management.

The program offers an online resource guide (riverlink.org/WaterRICH.asp), training programs through RiverLink and the N.C. Cooperative Extension, design and installation support, and professional resources at your fingertips. WaterRICH will teach you how to harvest rainwater, create garden features which promote water seeping into the soil (stormwater features), and that reduce outside water needs. RiverLink can certify homes as WaterRICH after rain harvesting or rain gardens are installed, or if you already have these systems at work in your landscape. Certification promotes full-site efficiency, increased property value, and the transfer of property between different owners.

Nancy Hodges, a registered landscape architect, is RiverLink's watershed resources manager. Along with the WaterRICH program, she also runs the stream-restoration and water-quality programs, and works to develop greenways along the Wilma Dykeman RiverWay and throughout the French Broad River watershed.

Rainy-day project: A team of volunteers installs a rain garden that will capture and treat stormwater.

PHOTO COURTESY OF RIVERLINK

HERE'S WHAT WaterRICH CAN DO FOR YOU

- Reduce use of potable water on landscapes, and consequently, your water bill.
- Increase property values and prevent or fix existing water issues.
- Assist in reducing pollution into our creeks and the French Broad River, which serves more than 1 million people with drinking water and is widely used for recreation.
- Offer step-by-step instructions through the online handbook to create a WaterRICH landscape.
- Provide information on how to design and construct water-quality features, such as rain gardens, through hands-on workshops and trainings.
- Offer access to design professionals specifically trained in residential-scale projects.
- Provide an avenue to have your home certified as WaterRICH.

Improve Your Home, Save Energy and Money, Build Community with an innovative new program:

NEIGHBOR $AVES
Working Together, Saving Energy

Join a team today.

- Complete home energy retrofits such as duct and air sealing, insulation and weatherstripping with friends, co-workers and neighbors.
- Save hundreds of dollars a year for minimal upfront cost.
- Get trained and complete work with an experienced professional.
- Increase your home's efficiency in a fun environment as part of a team.
- 100% financing available from Self-Help Credit Union!

See how much fun Neighbor Saves can be by watching our "Seal It Tight" video on YouTube

"I saved over $100 the first month after going through the Neighbor Saves program and my house is more comfortable too."
– Neighbor Saves Participant

for more information and to sign up and go to www.neighborsaves.org

Neighbor Saves is possible thanks to support from: The Community Foundation of Western North Carolina | SELF HELP CREDIT UNION

Recipes for cleanliness

Scientific research supports green products

BY SUZANNE WUELFING

As the owner of a green-cleaning company, it is my responsibility to determine which products actually work. It is not enough for a product to make things look and smell nice; it must sanitize or disinfect, or it's just cosmetic.

The term "disinfectant" can only be stated, by law, on the labels of products that have been proven to destroy or irreversibly inactivate 99.999 percent of infectious bacteria and/or fungi of specific microorganisms, in accordance with the Environmental Protection Agency's detailed guidelines. To be registered as a "sanitizer" requires a smaller reduction of 99.9 percent. (From Healthy Clean Buildings website, avl.mx/pl.)

Ensuring that your green-cleaning products sanitize or disinfect is especially important in the kitchen. Researchers say disease-causing bacteria and germs from uncooked eggs, meats and vegetables often work their way onto countertops and cleaning tools, and the dampness of sponges, dish cloths and scrubbers provide san ideal breeding ground for these microbes. Unfortunately, it is very difficult to find hard scientific proof of green-cleaning products' properties, since no one is funding such research. One can find endless claims of the anti-fungal, -bacterial, -microbial properties of various essential oils and other favorite "green" cleansers online, but truly peer-reviewed scientific research on the subject is nonexistent. However, I have been able to find peer-reviewed scientific research in journals directed toward the food-preparation industry that has crossover interest for household cleaning.

And sometimes the greenest solution is also the simplest solution.

Suzanne Wuelfing is the owner of Shine Green Cleaning Co., a home, office and post-construction cleaning company in Asheville that provides high-detail, green-cleaning services with an emphasis on reliability, security and customer service. Shine's guiding principles are taking pride in a job well done, making a difference in clients' lives and creating local, living-wage jobs.

CLEANER SPONGES

To easily kill bacteria on kitchen sponges, place a wet sponge into the microwave and run on high for two minutes. In a study published in the *Journal of Environmental Health*, researchers evaluated the effects of zapping sponges and plastic scrubbing pads in the microwave on bacteria and viruses. The sponges and scrubbing pads were soaked in wastewater containing a dangerous mix of fecal bacteria, E. coli and bacterial spores. (Bacterial spores are generally more difficult to kill.) The results showed that two minutes in the microwave at full power killed or inactivated more than 99 percent of all the living germs and the bacterial spores in the sponges and pads, including E. coli. After an additional two minutes — a total of four — none of the bacterial spores survived.

CLEANER COUNTERS

To easily kill bacteria on kitchen counters or cutting boards, keep a spray bottle of hydrogen peroxide and a spray bottle of white vinegar on hand. Spray them both on counters or cutting boards to kill bacteria. This is based on a study by a Virginia Polytechnic Institute food scientist who discovered that a 3 percent hydrogen peroxide solution — the same strength available at the drug store — and plain white or apple cider vinegar, when sprayed one after the other, effectively kill germs. It doesn't matter which you use first: You can spritz with the vinegar then the hydrogen peroxide, or vice versa. Tests showed that pairing the two mists killed virtually all salmonella, shigella and E. coli bacteria on heavily contaminated food and surfaces when used in this fashion.

This isn't DIY Network

If you're thinking about remodeling, don't put a sledgehammer through the kitchen cabinets and toss the sink into the dumpster! That might make good TV, but it doesn't help the environment or our community. Instead, contact our **Deconstruction** team who will gently extract reusable building materials prior to demolition or remodeling. The salvaged building materials and supplies like kitchen cabinets, appliances, flooring, windows and doors will be sold to the public at the ReStore. Proceeds support Habitat's building programs, and you'll get a tax deduction for your donations.

Contact Joel Johnson at 828.777.4158 or jjohnson@ashevillehabitat.org.

Asheville Area Habitat for Humanity®

DECONSTRUCTION
Remove. Recycle. Reuse.

33 Meadow Road, Asheville, NC | ashevillehabitat.org

Energy Friendly

America's finest new homes are built on Superior foundations. Maybe it's because we're the leader in residential precast foundation systems. Or maybe it's because our high-strength precast concrete foundation systems are created in a factory-controlled environment with built-in insulation. Whatever the reason, over 90,000 of America's finest new homes are built on Superior Walls. Maybe it's time you find out why.

The Only NAHB Green Approved Precast Foundation System

NAHB RESEARCH CENTER GREEN APPROVED

Superior Walls® of North Carolina
5045 Hendersonville Road, Fletcher, NC 28732
828-606-8371
www.superiorwallsnc.com

Charged: There are 20 EV charging locations in the Asheville metro area, including this one at Asheville's Public Works building on Charlotte Street.

PHOTOS BY BRIGHTFIELD TRANSPORTATION SOLUTIONS

Solar-driven future

Electric cars aren't science fiction anymore

BY STAN CROSS

We're living in a time when concerns about energy security, climate change and global economic stability occupy our national discourse. We argue about where to drill, how to mine, how to fix the economy, what to do about a warming climate. Meanwhile, we realize the perils and costs of fossil-fuel extraction abroad and at home. We hold our breath as tar sands and hydraulic-fracturing exploration run rampant. We quietly wonder if all this wacky weather is the new normal. Perhaps we are beginning to perceive the complex interconnections that bind humanity's fate with the health and vitality of earth's ecological systems.

Electric vehicles have a chance to provide us an alternative we need. The American Reinvestment and Recovery Act poured billions of dollars into battery, vehicle and charging-station research, development and deployment. President Obama has pledged to put one million electric vehicles, or EVs, on America's roads by 2015. Car manufacturers are coming out with diverse EV models ranging from sports cars to delivery vans. No doubt, widespread EV deployment will dramatically reduce petroleum dependence, create jobs and stimulate economic growth. But if EV charging demand leads to more coal, natural gas and nuclear energy production, then we've got ourselves a "two steps forward, one step back" scenario.

Here in WNC, we've begun to see EVs hit the road. In 2012, approximately 100 EVs were sold in the five-county Asheville metro area, with 2,000 forecasted to be on the region's roads by 2015. Currently, there are approximately 20 EV charging locations in the metro area. Most of the stations are publicly accessible; all were funded entirely or partially by either EV-charger manufacturers, Progress Energy, Advanced Energy or the N.C. Green Business Fund.

Public locations of charging stations include Asheville City Public Works, Land of Sky Regional Council of Governments, UNCA Reuter Center, Asheville Chamber of Commerce and Visitors Center, Biltmore Park Hilton, towns of Black Mountain, Montreat and Hendersonville, Ingles Market in Skyland, Buncombe County's College Street Parking Deck, Cherokee Welcome Center and Haywood and Blue Ridge community colleges. The U.S. Department of Energy's Alternative Fuels Data Center shows the location of these and other stations nationwide (avl.mx/o6).

Four of our local EV-charging locations are owned and operated by Asheville-owned Brightfield Transportation Solutions. Brightfield stations are solar integrated, producing grid-tied solar fuel on the stations' solar PV canopies whenever the sun shines while delivering customers grid-connected EV charging 24/7. Brightfield monitors and ensures that more solar capacity is placed on the grid than charging demand consumes. In addition, all Brightfield stations were designed and manufactured in Asheville with American-made components.

Brightfield TS began through a grant from the American Reinvestment and Recovery Act through the N.C. Commerce Department's N.C. Green Business Fund. Through public/private partnerships with the city of Asheville, Buncombe County and UNCA, three of the Brightfield stations are installed on public property. The project as a whole was supported by many community stakeholders including Land of Sky Regional Council of Governments, AdvantageWest, Buncombe County Board of Commissioners, Asheville City Council, federal and state legislators and Green Opportunities.

EV-infrastructure companies like Brightfield TS see the opportunity to leverage EV deployment as a new market opportunity for solar energy production. It takes approximately 2 kilowatt-hours of solar capacity to drive an EV such as the Nissan Leaf 12,000

miles annually (depending on how you drive). To put it another way, WNC needs 4 megawatts of new solar capacity by 2015 to fuel the 2000 EVs forecasted.

As of 2011, North Carolina ranked eighth in the nation for cumulative installed solar photovoltaic capacity, with 1,142 solar PV systems totaling more than 128 megawatts of capacity registered with the North Carolina Utilities Commission. What if North Carolina legislators committed to supporting increased solar-power generation to fuel the state's emerging EV fleet instead of building new coal, natural gas or nuclear facilities? How many new jobs would be created if we became the nation's first solar-driven state? How many exported fuel dollars could be retained to reinvest in local and renewable energy generation?

Western North Carolina is the perfect place to test this vision: There is abundant sunshine; the region is energy insecure, having to import all the fossil fuels we burn at a cost of more than $3 billion annually; and we suffer from poor air quality and diminished human health when we burn fossil fuels under our persistent mountain-inversion weather pattern.

On a consumer level, EVs currently command a high sticker price, but long-term ownership costs are a fraction of what we're all used to. For example, at $4 a gallon with fuel economy of 30 miles per gallon, an internal combustion engine costs the driver about 13 cents a mile to drive. At 10 cents per kilowatt-hour, an EV will cost 3 cents per mile to drive. Add to that the fact that EVs have next to no maintenance costs, thanks to the simplicity of the high-efficiency electric engine — it has one moving part, the motor, whereas the gasoline-powered vehicle has hundreds of moving parts — and you wind up with EVs more than paying back their upfront investment premium over the 10-year/100,000-mile warrantee period.

Light on costs: The Asheville Police Department's fleet includes EVs, which cost about 3 cents per mile to drive — compared to internal-combustion vehicles at 13 cents/mile.

Regional economic development efforts such as GroWNC and EvolveEnergy Partnership, and the work of the flurry of renewable-energy and alternative-transportation entrepreneurs and businesses in the region, are setting the stage for WNC to be one of the nation's green-economy leaders. EV infrastructure deployment and vehicle ownership, as well as renewable-energy production, are key parts of the region's economic future.

By investing in a solar-driven future, we'll build a more resilient and desirable WNC by strengthening the region's energy security, increasing manufacturing and job growth, and significantly improving environmental and human health.

Stan Cross is co-founder of Brightfield Transportation Solutions. He also serves as Education Director of Warren Wilson College's Environmental Leadership Center. He's been recognized as the 2007 North Carolina Environmental Educator of the Year and received the 2010 North Carolina Coastal Federation's Pelican Award for Outstanding Partnership.

Clean, green energy policy

Are N.C's clean-energy policies at risk?

BY JOAN WALKER

North Carolina's utilities are delivering energy that is reliable, increasingly cleaner and relatively cheap in comparison to other states. And in recent years, energy is becoming a larger economic driver that employs our citizens in every county.

Innovation and free-market competition do not occur as they would in other markets. Most states across the country are served by monopoly providers, meaning there is little incentive or ability to seek innovative ways to create electricity. Yet many states are incorporating more renewable-energy resources and energy-efficiency solutions into their energy mix via new policies and regulations that work for the utilities and the consumers.

Home to the nation's largest utility, North Carolina's highly regulated electricity market has made great strides in the past five years in terms of increased clean-energy choices and overwhelming public support of customers. The state's clean-energy policies, such as the Renewable Energy and Energy Efficiency Portfolio Standard (REPS law), clean-energy-friendly tax policies, and energy-saving building codes, have created business opportunities, reduced energy prices, and driven private investment and jobs in every region of our state.

In recent years, the state's clean-energy industry has grown — even at the height of the recession. As of summer 2012, there were more than 1,100 clean-energy companies employing more than 15,200 (full-time equivalent) workers and generating $3.7 billion in annual revenues, by conservative estimates.

North Carolina's energy sources are becoming cleaner and more diverse. The state is now home to abundant innovations, of which there are: 2,800 solar; 1,250 geothermal; 60 hydroelectric; 50 biomass and 20 wind-energy projects; and 770 LEED and 770 ENERGY STAR-certified buildings. Success stories abound, from the mountains to the coast.

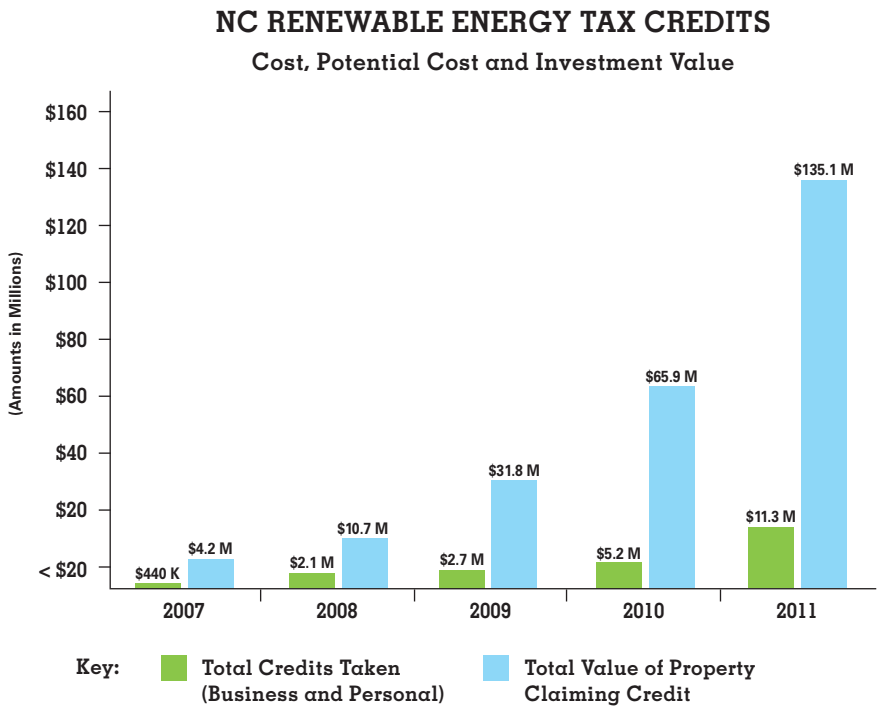


Figure 1 - N.C. DEPARTMENT OF REVENUE DATA

Maintaining N.C's clean-energy policies

North Carolina offers several tax credits for renewable-energy projects. Our state's renewable-energy income-tax credits have been responsible for at least $252 million in direct investment in North Carolina from 2007 to 2011, including at least $135 million in 2011 alone, according to the N.C. Department of Revenue (see figure 1). The direct benefits of these projects plus additional job creation and indirect investments dwarf the cost of the credits ($21.7 million, five-year total) — offering a prime example of investing state dollars to greatly benefit our economy and communities across our state.

As the state tax code is currently written, our state's renewable-energy income-tax credits will remain in place until the end of 2015. There is, however, talk of comprehensive state tax-code reform, and legislators may evaluate the renewable-energy tax credits (and many others) for immediate repeal. The North Carolina Sustainable Energy Association strongly believes the credits are a key driver of the clean-energy industry's success story and will work against early elimination.

Enacted in 2007, North Carolina's REPS law ensures our electric utilities will meet 12.5 percent of

our state's electricity demand with renewable-energy resources and energy-conservation programs by 2021. The REPS law has been extremely successful and is coming in well under budget and far ahead of schedule in most cases, according to the N.C. Utilities Commission and our utilities. (see figure 2)

NCSEA was one of the lead advocates and negotiators of this legislation in 2006 and 2007 and continues to work in partnership with the utilities and regulators on its successful implementation.

NCSEA strongly believes the REPS law has also been a key driver of the clean-energy industry's success story and will work to see that it is not negatively altered. However, some legislators continue to question the need for such a policy.

Giving customers more choices

In 2007, the REPS law opened the door to allowing limited market competition in North Carolina's monopoly electricity market. Now we must ask: Should it serve as a foundation or a ceiling for our state's clean-energy industry's success or electricity customers' access to clean-energy choices? As utility companies become increasingly familiar with conservation and clean-energy options and as technological and business innovations drive down costs, utilities will find themselves in a position to exceed the 12.5-percent clean-energy requirement. NCSEA strongly believes that giving consumers more choices — i.e., how they pay for money-saving conservation and clean-energy projects in their homes and businesses, and how they buy their electricity — is critical to the continued growth of the clean-energy industry, particularly the sector serving residential and commercial customers.

Giving consumers more choices or financing options regarding clean energy is the next step. For example, customers who want to become more energy efficient or install renewable-energy systems might need to spread out this large purchase into monthly payments via their utility bill — this is called "on-bill" financing. Another successful policy, used in more than 20 states across the country, is called "third party" financing and sales of electricity. This option allows a solar company to own, operate and maintain solar panels on a home or business owner's roof and then sell the power generated directly to that customer. Both of these programs are not currently available in North Carolina, but NCSEA is working with legislators, regulators, the utilities and consumers to determine what could work for North Carolina, including possible pilot projects.

Joan Walker is WNC representative for the North Carolina Sustainable Energy Association. Active statewide, NCSEA is the only nonprofit in North Carolina devoted to leading public-policy change and driving market development in ways that will create clean-energy jobs, business opportunities and affordable energy. Visit energync.org to learn more or become a member.

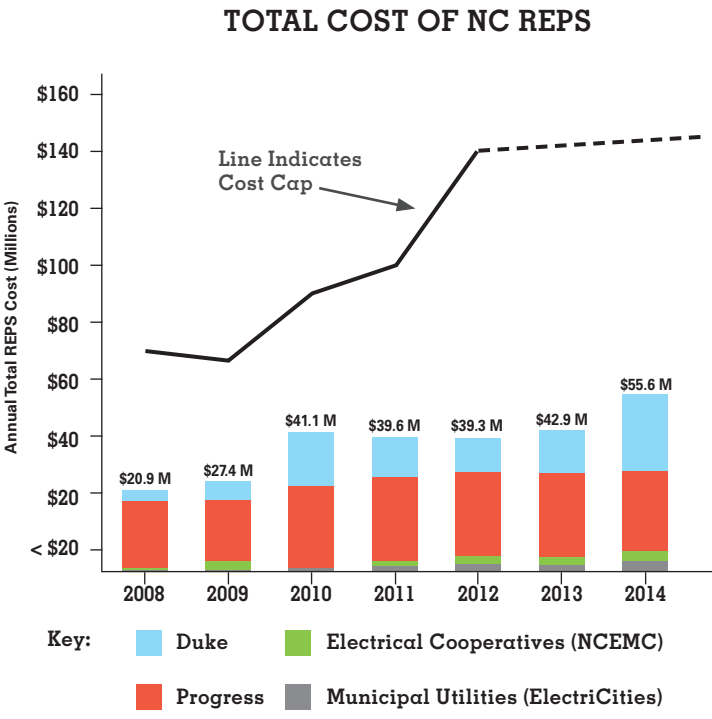


Figure 2 - COURTESY N.C. DEPARTMENT OF REVENUE DATA

If these floors could talk...

BY CATHERINE SILVER

You don't have to compromise when it comes to choosing a floor that contributes to the long-term sustainability of our environment, economic development and your health. In fact, there is a great deal of compromise, or dare I say selfishness, when it comes to the making a sustainable choice. The blinders are put on, the wallet is opened and often a floor is installed that, in truth, did come from a mountain top that was clear cut, or may have been engineered with toxic chemicals, and all because a salesperson doesn't tell the true story. In Hawaii the phrase "talk story" means to chat with friends or to share conversation with friends, so if I may, let's "talk story," relax a little and consider what is right and practical as well.

If looking for a sustainable flooring choice, consider the environmental impact, who is impacted economically and socially, and whether it contributes to healthy living.

Renewable: Cork (above) is sustainably harvested from trees and made into flooring and other products. Bamboo (right) is rapidly renewable, but buyers should research manufacturing practices and consider transportation impacts to get the greenest product.

PHOTOS COURTESY OF U.S. FLOORS

Ask your hardwoods supplier precisely where their stock is coming from. The key is to be honest with yourself and expect honesty from your suppliers. Everyone knows that a grand old oak tree takes more than a generation to mature. Consider the history of your materials.

Though reclaimed wood may cost a little more, consider the work involved to remove nails and debris and what is required to thoughtfully mill it. The beautiful character, depth, strength and stability from reputable

suppliers can be worth every penny. If the price tag challenges your budget, consider a character-grade versus a clear-grade material. You might be surprised at how many options you have. Customizing your floor with consideration to grade, board lengths and finish can be very rewarding and then you can really "talk story" about what history is beneath your feet.

Another option is to select a floor that is sustainably harvested, grown and processed in central Appalachia, which creates a positive impact on the people and forests of economically distressed communities. Carefully working with select tracts of land and landowners assures the protection of local forests and keeps jobs within the region. These local hardwood products are often certified by the Forest Stewardship Council, the gold standard in forest and wood product certification. According to FSC, about 80 percent of hardwoods are harvested illegally.

Bamboo can be another environmentally sound choice. I say "can be" as there is good reason to be wary of the wide array of bamboo products on the market. There is only one company that I am aware of that controls a certified facility maintaining quality from start to finish, controlling the raw materials from harvest to final production. If a supplier cannot provide information about the facility or speak to the health of the product, I would not recommend installing it.

Strand-woven bamboo or "woven" bamboo uses 100 percent of the stalk, utilizing all of the raw materials. It is significantly stronger than many hardwoods on the market, and since bamboo is 100 percent renewable and cut by hand, no damage needs to come to the ecosystem and no forest or land needs to be destroyed.

It is up to the buyer to be discriminating. Look for mature 5- to 6-year-old growth material, as young growth is softer and has presented problems in the past. Look for bamboo that has no added urea-formaldehyde, manufacturing plants that use unique natural plant dyes if it is a stained product, and a company that controls the manufacturing process. Suppliers should welcome the conversation, be informed about the product, and be willing to look into real questions with real environmental impact.

If looking at a floor with adhesives, whether it be a strand-woven product or an engineered floor, ask for U.S. tested and certified small-chamber results. This test measures an air sampling for formaldehyde emissions under pressure in a small chamber for a period of time. You should be comfortable with the results and your supplier should be able to get these results for you. The threshold for formaldehyde is .05 parts per million. The lower that number, the better the resulting indoor air quality.

Cork is another increasingly popular sustainable flooring choice. Things to look for with cork include: density, finish and thickness. There are 100-year-old buildings with cork floors — most significantly, the Library of Congress in Washington, D.C. Cork is resilient, quiet and warm, is a natural fire inhibitor, and serves as an insect repellant.

The cork tree is amazing. Coming from the coastal regions of the Mediterranean with an average life span of 120-200 years, the bark is regenerative as the trees are not cut, maintaining a stable eco-system. Endangered species are protected within the cork tree forests and regulations on the harvesting of cork are strict. Harvesting is often steeped in tradition with several generations of families working with the cork forests. Do look for manufacturers within the United States, which will provide jobs within the region as well as minimize transport costs.

Once you have selected flooring material, a reputable installer is critical to the success of your project. Without consideration to the subfloor, moisture issues, acclimation, product knowledge and craftsmanship, you could be asking for problems. Reduce your stress level and put your confidence in insured professionals who know their business.

It's a great idea to take some time to "talk story" with those that ask questions of their suppliers, the mills, local environmental organizations, those that study energy analysis, those that care enough to learn about the true labor conditions of a manufacturing plant and, of course, the old-timer who walked the upper story of an old mill.

Many of the questions discussed here can be applied to other types of flooring materials such as concrete, vinyl, tile, carpet and other natural fibers and composites. Our green-building community has professionals for all phases of building design. Take advantage of their knowledge and services.

Catherine Silver is the owner of The Arch, Architectural Finishes, Flooring and More. She has degrees in interior design from Michigan State University and elementary education from UNCA. Silver opened The ARCH in 2004 offering sustainable-building products, natural finishes and design, masonry and workshop offerings.

Buying a new HVAC system

BY JAKE SADLER

Your heating, ventilating and air conditioning system — HVAC for short — accounts for nearly half of the typical home's energy use. Its operation is fundamental to a home's indoor air quality, and the comfort of its occupants. Because of the importance of an HVAC system to the overall performance of the home, there are some very important considerations to make if you are purchasing a new HVAC system to replace your existing system or as part of a new home under construction.

Jake Sadler is a former Residential Outreach Coordinator for the WNC Green Building Council.

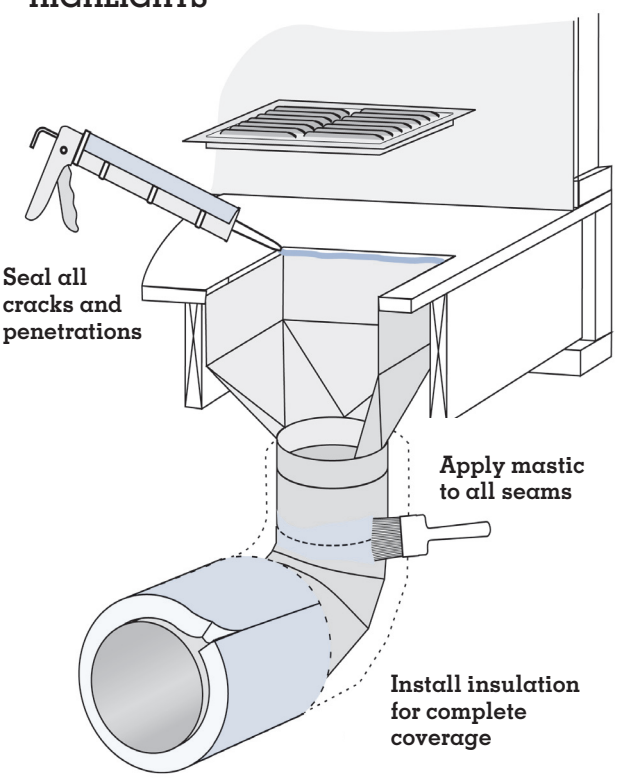
STEP ONE

Choose a licensed contractor to assist you. HVAC systems range from complex to very complex in terms of proper installation, sizing and testing. A highly qualified contractor is essential.

When choosing a contractor, take your time and choose carefully. Remember, you won't benefit from even the best HVAC system in the world if it is not installed properly. To help with this decision, follow these important steps when choosing a contractor:

- Consult the HVAC listings in the Green Building Directory for a list of contractors.
- Ask your friends, family and neighbors for recommendations.
- Ask contractors for references — be sure to find out about installation, performance and if the job was finished on time.
- Find out about any special offers from your utility providers, potential contractors and state tax incentives. For example Progress Energy offers rebates for a number of energy-efficient HVAC options.
- Make sure the contractor is licensed to work on the type of system you need or want. Without a licensed contractor you will most likely void the system's warranty and be unable to claim insurance if something goes wrong.
- Be sure that your HVAC contractor is knowledgeable and encourages the use of energy-efficient HVAC systems. Ask your contractor to perform a "Manual J" and use mastic to seal the ductwork to start with.
- Get estimates! Request itemized bids from different contractors and compare overall costs as well as long-term energy costs for operating the system.
- Protect yourself by signing a proposal or contract which specifies total time, cost and warranty information.

BOOT AND DUCT CONNECTION HIGHLIGHTS



Mind the gaps: By sealing ductwork properly, ensure that air comes out where it's supposed to.

IMAGE COURTESY OF SOUTHFACE ENERGY INSTITUTE

STEP TWO

While you are choosing a contractor, you will gain an idea of what kind of HVAC system you will most likely need for your home. Keep in mind that there are a number of different HVAC options, each of which you will want to consider according to your needs:

• Heat pumps are the most common systems in our area and can provide both heating and cooling. Heat pumps use refrigerant to transfer heat from one place to another, and include both an outdoor and an indoor unit. Heat pumps require a back-up heat source below about 40 degrees. Commonly, heat pumps use electric coils to operate at low temperatures, which will send your electric bill sky high. If you have an outdoor thermostat installed, the electric coils won't kick in until absolutely necessary. Or, consider using a furnace as a backup heat source instead. An even better option is to install a dual-fuel heat pump. When choosing a heat pump, look for a minimum efficiency of 14 SEER and 8.5 HSPF. Because Western North Carolina's moderate climate more often requires heating than cooling, the HSPF-efficiency is the most critical number.

• Furnaces are the most commonly used heating system in the U.S. today. Depending on your needs, furnaces typically operate on natural gas or fuel oil. Fuel-oil units can run on biodiesel if it is available in your area. Keep in mind that if you are combusting gas or oil you will want to be sure to install carbon-monoxide detectors and adhere to building code when installing the system. If you decide on a furnace, be sure to purchase a high-efficiency model of 90 percent AFUE or above.

• Boilers generate heat by burning natural gas or fuel oil to heat water. Like furnaces, you will want to take proper precautions to limit the potential dangers of combusting fuel in your home. Boilers circulate hot water or steam through baseboards, radiators or radiant floor systems, so they do not require duct work. Look for a minimum efficiency of 90 AFUE.

• Central air conditioners are one of the most widely used systems for cooling homes in the U.S. Proper sizing and installation are critical for the performance of this type of system to both cool and dehumidify properly. Look for at least a 14 SEER.

• Geothermal heat pumps are very efficient and reliable heating systems. They are expensive up front, but with the many tax incentives currently available, it is a great time to consider installing one. Because the ground maintains a constant 55-60 degrees below the surface, drawing heat from beneath the earth is an efficient way to utilize a heat-pump system.

• Solar thermal heating utilizes the sun's radiant energy through solar collectors and a heat-exchange unit. The heated water can then be used in a radiant system of with a heat exchanger in forced air systems. The systems can also supply domestic hot water.

STEP THREE

Once you have decided on a contractor and a particular HVAC system, make sure that all the steps are taken to properly size and install your system. There are a number of issues to take into consideration to assure your system is performing at maximum efficiency.

• Properly sizing your HVAC system is absolutely critical to the overall efficiency and performance of the system. Without properly sizing your HVAC you will most likely run higher energy bills and have a hard time making your home comfortable. In order to size your system, your contractor will have to do a Manual J calculation. This is usually required by code, but it is often overlooked, so be sure to request the calculation from your contractor. Keep in mind that oversized equipment is not better: It will cost more up front, shorten the system's lifespan and perform poorly, and not properly dehumidify.

• Sealing your duct-work to minimize leakage is essential for ducted systems. As seen in the following graphs, leaky ducts will dramatically and negatively affect your HVAC performance. Be sure to have your contractor use mastic adhesive around all duct joints — not duct tape. Consider hiring a third party auditor to test the system's leakage with a duct blaster.

• Refrigerant charge is important for systems like central AC or a heat pump. Proper refrigerant charge will assure quality performance and reduce your energy costs and improve the system's efficiency.

• Airflow optimization is critical for HVAC performance. The air circulating in your duct system must be the proper amount. Ask your contractor about performing a Manual D calculation to make sure your ducts are properly sized and test for proper air flow to allow your system to maximize home comfort.

• Install a programmable thermostat. These come in a number of variations which can best suit your needs. A programmable thermostat is easy to use and can improve your HVAC performance and lower energy costs.

TYPICAL FURNACE INSTALLATION

With your new HVAC system installed, you will want to make sure to take care to properly maintain it and maximize its performance to receive the most possible benefit. Keep in mind these tips once you have your system up and running:

- Change your return air filters regularly for ducted systems.
- Have your contractor perform routine tune-ups.
- Tighten electric connections.
- Lubricate moving parts.
- Check gas and oil connections.
- Clean the coils.
- Clean the blowers.
- Have your contractor test the refrigerant charge.
- Check your condensation drain for stoppage.

What to expect when you're deck building

COMPILED BY MATT SIEGEL

Adding or expanding a deck is one of the most common small-building projects. Choosing green materials can be a resource-responsible choice but also adds character to a prominent exterior feature of the home.

PHOTO COURTESY OF MOUNTAIN LAUREL HANDRAIL

DECKING

One of the most important considerations when choosing your decking material is durability. The impact of having to pull up decking can often be even more significant than installing the original decking. Fortunately, there are more and more alternatives to traditional pressure-treated decking.

MATERIAL	DESCRIPTION	BENEFITS AND DRAWBACKS	GREEN TIPS
Locust	Made from naturally rot- and insect-resistant locust wood. If untreated it will change color over time.	Locust does not need to be treated and is locally harvested and processed. It should be milled or sanded to prevent splinters.	Coming mostly from locally milled trees, this is the greenest of the green for decking and is often available at a local saw mill. If you treat locust decking, use an environmentally friendly exterior wood finish.
Recycled Content & Composite	Either all plastic or a mixture of wood and plastic. It comes in a range of colors and textures.	Very durable. but the recycled content can range widely, from 0-100 percent. If not 100 percent recycled, then it is at least, in part, a petroleum product. The highly manufactured nature of synthetic decking does lead to high embodied energy versus real wood products.	Find out from the manufacturer what the post-consumer recycled content of the decking is.
Acetylated "Pickled" Wood	The acetylation process uses acetic acid (concentrated vinegar) to chemically alter wood and reduce its moisture absorption. This is why the wood is sometimes referred to as "pickled."	Acetylation does not require high levels of heat or pressure used for other treated woods. The result is a nontoxic wood that cannot absorb moisture and therefore is 80 percent more stable and resistant to biological attack. However, only one company offers the product, and it is not yet time-tested.	This product is currently only offered by a European company; therefore the shipping impact is great. Hopefully it will be produced in the U.S. in the near future.
MCQ Pressure Treated	Micronized Copper Quaternary, a pressure-treating process that uses a water-borne carrier for very small copper particles as the wood preservative.	MCQ treated lumber's advantage is that the rate of leaching into the soil is much lower than CCA and ACQ treated lumber. The lumber still goes through an energy intensive chemical process and over time will need to be replaced or re-treated for long-term durability.	If you are going to stain or finish this wood, choose an environmentally friendly exterior wood finish. Always try and source wood that is harvested as close to your project as possible to reduce transportation impacts.

RAILINGS & PICKETS

Deck railings and pickets can be so much more than required safety devices. They can be artistic and add character to any deck project. The list below shows some options based on durability and resource efficiency.

MATERIAL	DESCRIPTION	BENEFITS AND DRAWBACKS	GREEN TIPS
Recycled & Composite	Made from either all plastic or a mixture of wood and plastic. It comes in a range of colors and textures.	Very durable, since it is plastic-based, and it will never splinter like wood. But the recycled content can vary widely, from 0-100 percent. If less than 100 percent recycled, then it is at least in part a petroleum product. The highly manufactured nature of synthetic decking does lead to high embodied energy versus real wood products.	Find out from the manufacturer what the percentage of post-consumer recycled content.
Mountain Laurel & Bamboo	These and other natural materials are weather resistant and can create a unique look.	These materials can be harvested in many places for little or no cost. They can be harvested without killing the plant and do not require commercial processing. The drawbacks include the non-standardized shapes and sizes, but many people find this appealing. May be less durable over the long term than purchased materials.	As with any plants, harvest responsibly to allow regrowth, and check with your local code official for approval.
Salvaged Materials	The opportunity to get creative with deck railings is endless. Look at places like metalrecycling yards, Craigslist and the Habitat for Humanity Restore. Ideas include old doors, metal railings and old metal roofing.	The main benefit: It is reused material, so no new products must be created. It also leads to endless character and creativity. Drawbacks include the difficulty in finding the right amount and size of material for your project.	If you are using salvaged materials, make sure that they are free of lead paint and other potential hazards.

For more information and resources on green-building projects, go to **wncgbc.org**.

Thank You to Our Platinum Members:

High Country Timberframe & Gallery Woodworking Co.

JADE MOUNTAIN BUILDERS
828.216.3948
JADEMOUNTAINBUILDERS.COM

MOSAIC
COMMUNITY LIFESTYLE REALTY

deltec HOMES

the HOMESOURCE DESIGN CENTER
New Construction & Remodeling Showroom

J.A.G. & associates CONSTRUCTION

Thank You to Our Gold Members:

Earthtone Builders
The Home of Green Building™

SAGE Builders

SUNDANCE POWER SYSTEMS

SURE FOOT BUILDERS
Craftsmanship of Balance

Robison construction

GRIFFIN ARCHITECTS, P.A.
ARCHITECTURE INTERIOR DESIGN
PLANNING PRESERVATION

THE LUNA GROUP UNLIMITED, INC.

columbia FOREST PRODUCTS
PureBond®
FORMALDEHYDE-FREE TECHNOLOGY

DRA Living
Precision Residential & Commercial Builders

Thank You to Our Silver Members:

84 Lumber
Altamont Environmental, Inc.
Asheville Construction, Inc.
Athos Properties LLC
Beach Builders, Inc.
Blackrock Surveying and Land Design, P.C.
Brookgreen, LLC.
D & J Properties
Eco-Sense Design & Consulting
Forward Construction Inc.
Green earth Developements
Gundersen Woodworking
Harvest the Sun, LLC
High Country Homes, Inc.
Home Life Profesional Realty
Innovative Solar Systems, LLC
Jackie Rocks Green at Dawn Wilson Realty
Jody Whitehurst, REALTOR
Mark A. Sneed Builder
Mathews Architecture, P.A.
Mountain Moss Enterprises
Mountain Sun Building & Design
Rare Earth Builders
Samsel Architects, P.A.
Sineath Construction
Solstice Construction Co, Inc
Thermacraft Solar Solutions, Inc
VandeMusser Design, PLLC
Winter Star Woodworks

WESTERN NORTH CAROLINA GREEN BUILDING COUNCIL

The contents of this directory are approved by the WNC GBC Board of Directors and are intended for informational purposes only. The WNC Green Building Council and *Mountain Xpress* do not endorse or recommend the products or services mentioned herein, and disclaim any and all warranties, express or implied, in any way related to advertisements, events, businesses, organizations or other information presented within the Green Home & Living Guide.

Alternative Building

ACI-Asheville Construction, Inc.

Joe Golino
828-776-6909 / Fax: 828-683-3002
PO Box 6698
Asheville, NC 28816
ashevilleconstruction.com
asheconinc@yahoo.com

Master builder in WNC since 1974 manifesting your dreams from conception to completion. Using quality local materials, labor and suppliers to proceed with your home in a timely and economical manner.

Amarx Construction

Kyle Gilliland
828-775-4001
825-C Merrimon Ave.
Asheville, NC 28804
amarx.net
kyle@amarx.net

Building custom homes in Asheville and surrounding areas, Amarx is able to combine quality, efficiency, and your budget to provide the best experience possible.

Athos Properties

John Moutos
828-777-4057
129 Bleachery Blvd. #57
Asheville, NC 28805
athos-properties.com
info@athos-properties.com

Athos Properties is a leading green builder in the Asheville area. We focus on making home building a healthier, energy efficient and comfortable product.

High Country Timberframe and Gallery Woodworking

Tom Owens
828-264-8971 / Fax: 828-264-8787
P.O. Box 1858
Boone, NC 28067
highcountrytimberframe.com
timberinfo@highcountrytimberframe.com

High Country Timberframe designs & builds both timber framed & panelized homes to meet/exceed the most stringent energy efficiency and indoor air quality standards. Licensed General Contractors NC,SC,VA.

INviro Design & Consulting, LLC

Daya Apunte & Dan Gamble
828-242-8722 / Fax: (888) 803-4880
Asheville, NC
invirodesign.com
info@invirodesign.com

INviro provides holistic design and installation of site-specific, regenerative renovation and off-grid solutions. See our website for a video of our NC Green Business Fund project.

Jade Mountain Builders

Hans Doellgast
828-216-3948 / Fax: 828-628-0978
85 B&B Stables Road
Fairview, NC 28730
Jademountainbuilders.com
Hans@jademountainbuilders.com

Jade Mountain Builders is a team of 31 Craftsmen who pride themselves on taking an ecologically sensitive approach to building homes.

ModalBuild Inc.

Scott Bartholomew
828-712-1297
20 Palmer St.
Asheville, NC 28801
ModalBuild.com
scott@ModalBuild.com

The focus of ModalBuild is non-conventional Green Building of ISBU (shipping container) construction projects.

BRING YOUR OWN BAGS WHEN YOU SHOP

If you shop for groceries once a week, in five years you can keep 250 to 1,000 grocery bags out of our landfills. When 1 ton of plastic bags is reused or recycled, the energy equivalent of 11 barrels of oil is saved!

contents

MudStrawLove, LLC

Steve Kemble and Mollie Curry
828-775-4823
60 Alabama Ave.
Asheville, NC 28806
mudstrawlove.com
connect@mudstrawlove.com

Since 1990-Homes of straw bale, cob, earthbag, slip-straw, adobe. Clay- and lime-based plasters, clay paint, earthen floors. Building projects, workshops, design services, consultation. Permaculture.

SAGE Builders of WNC, Inc.

Doug Keefer
828-713-7208 / Fax: 828-683-1224
299 Morgan Branch Road
Leicester, NC 28748
thesagebuilders.com
info@thesagebuilders.com

SAGE Builders creates Sustainable, Appropriate, Green & Efficient (SAGE) homes. SAGE specializes in building hand-crafted homes using custom woodworking and solar designs.

Architects

Alice Dodson, Architect, PA

Alice Dodson
828-645-9326
45 Lula Cove Road
Weaverville, NC 28787
AliceDodsonArchitect.com
Alice@AliceDodsonArchitect.com

Integrated and affordable residential architectural design, long time experience with alternative energy use and various energy efficient high performing construction.

Chris Larson Architect

Chris Larson
828-253-4621
16 Whisper Creek Lane
Asheville, NC 28804
chrislarsonarchitect.com
chris_larson@bellsouth.net

Daryl S Rantis Architect

Daryl Rantis
479-283-9048
Sandhill Road
Asheville, NC 28806
rantisarchitects.com
daryl@rantisarchitects.com

Providing integrated design/build, Passive House, and Living Building Challenge experience. New Smaller, Simpler, Smarter, plan Books now available. Specializing in urban design for mountain terrain.

Glazer Architecture, PA

Patti Glazer
828-254-5853 / Fax: 828-254-5856
78 1/2 Patton Ave.
Asheville, NC 28801
glazerarchitecture.com
info@glazerarchitecture.com

GriffinArchitects, PA

Robert Griffin
828-274-5979 / Fax: 828-274-1995
One Village Lane
Asheville, NC 28803
GriffinArchitectsPA.com
Robert.G@GriffinArchitectsPA.com

Sustainable Architecture & Interior Design Asheville, NC since 1979-Custom Residential, Additions, Commercial, Preservation, Liturgical...3-D Energy Modeling/Virtual imaging services....Hourly or %

HomeSmith Architecture, PLLC

Frank Kelsch
828-697-5985 / Fax: 828-697-5985
224 S. Grove St. Suite G
Hendersonville, NC 28792
homesmitharch.com
fkelsch@homesmitharch.com

Ken Gaylord Architects/ Black Hawk Construction

Ken Gaylord
828-692-4550 / Fax: 828-692-4577
109 South Main St.
Hendersonville, NC 28792
KENGAYLORD.COM
Project1@kengaylord.com

Kenneth J. Wertheim, Architect

Ken Wertheim
828-298-7280
P.O. Box 9039
Asheville, NC 28815
mtnarc.com
k.wertheim@att.net

Residential Architecture; sustainable green building design practices, high-performance building envelope & advanced technologies, specializing in building systems including timber framing, SIPs & ICF

Legerton Architecture, PA

John Legerton, AIA LEED AP BD+C
828-251-9125
21 North Liberty St.
Asheville, NC 28801
legertonarchitecture.com
info@legertonarchitecture.com

Legerton Architecture specializes in the design of residential, institutional, commercial, and community projects. Sustainable and energy-efficient design is integrated into all of our projects.

Mathews Architecture, PA

Jane Gianvito Mathews, AIA LEED AP
828-253-4300
34 Wall St.
Asheville, NC 28801-2727
mathewsarchitecture.com
firm@mathewsarchitecture.com

We have one earth, one life, one chance. Our focus is on the best sustainable resources, systems and practices in home and workplace designs. Architect for the City of Asheville's 1st LEED structure.

Padgett & Freeman Architects, PA

Maggie Carnevale, AIA, LEED AP
828-254-1963 / Fax: 828-253-3307
30 Choctaw St.
Asheville, NC 28801
pfarchitects.com
info@pfarchitects.com

Rusafova Markulis Architects

Maria Rusafova
828-545-1977
2 Perdue Place
Asheville, NC 28806
rusafova-markulis.com
mariar@rusafova-markulis.com

Samsel Architects, PA

Duncan McPherson
828-253-1124 / Fax: 828-254-7316
60 Biltmore Ave.
Asheville, NC 28801
samselarchitects.com
duncan@samselarchitects.com

Established in 1985, our experience includes EnergyStar and GreenBuilt NC homes and the first LEED Platinum building in WNC. Services include addition/renovation, residential, commercial and retail.

Scott W Bartholomew Architecture

Scott Bartholomew
828-712-1297
14 S. Pack Square, Suite 361
Asheville, NC 28801
swbarchitecture.com
scott@swbarchitecture.com

Asheville Architect, Scott W Bartholomew provides architectural services including green, sustainable designs for residential and commercial projects, remodels and additions.

T.A.D. Architects, PLLC

Tad Dotson, AIA, LEED AP BD+C
828-225-7567
4 Maplewood Road
Asheville, NC 28804
tad@tadarchitects.com

Tim Brown Architecture

Timothy Brown AIA ALA CSI
312-401-1236
340 West Diversey Parkway
Chicago, IL 60657
tbaarch.com
info@tbaarch.com

Virant Architecture, Inc.

Yumiko Virant
828-231-0092
549 Sunset Drive
Asheville, NC 28804
virantdesign.com
info@virantdesign.com

What on Earth Architecture

Jonathan Lucas, Architect, LEED AP
828-236-2947
6 Richard St.
Asheville, NC 28803
whatonertharchitecture.com
jonathan@whatoneartharchitecture.com

Delightful, green architectural design through a fun collaborative process. Flexible, affordable services. 3D computer visualization & solar analysis. Over 24 years experience. LEED AP

BYE-BYE JUNK MAIL

The average adult receives 41 pounds of junk mail each year. 44 percent goes to the landfill unopened. To opt out permanently: You may begin the permanent Opt-Out process online at www.optoutprescreen.com.

Wilson Architects
Aaron Wilson
828-257-4930
309 Kenilworth Road
Asheville, NC 28803
w2arch.com
info@w2arch.com

Builders

A&B Construction & Development, Inc.
Jeremy Bonner
828-258-2000 / Fax: 828-254-6126
P.O. Box 15370
Asheville, NC 28813
a-b-construction.com
info@a-b-construction.com
A&B has been in business for over 30 years doing new construction and renovation for both residential home owners and commercial clients within a 50 mile radius of Asheville NC.

Abode Custom Builders, Inc.
Robert Austin
828-258-1512 / Fax: 828-258-1514
1589 Patton Ave.
Asheville, NC 28806
wncAbode.com
laustin.abode@gmail.com

ACI-Asheville Construction, Inc.
Joe Golino
828-776-6909 / Fax: 828-683-3002
P.O. Box 6698
Asheville, NC 28816
ashevilleconstruction.com
asheconinc@yahoo.com
Master builder in WNC since 1974 manifesting your dreams from conception to completion. Using quality local materials, labor and suppliers to proceed with your home in a timely and economical manner.

Amarx Construction
Kyle Gilliland
828-775-4001
825-C Merrimon Ave. Asheville, NC 28804
amarx.net
kyle@amarx.net
Building custom homes in Asheville and surrounding areas, Amarx is able to combine quality, efficiency, and your budget to provide the best experience possible.

Athos Properties
John Moutos
828-777-4057
129 Bleachery Blvd. #57 Blvd.
Asheville, NC 28805
athos-properties.com
info@athos-properties.com
Athos Properties is a leading green builder in the Asheville area. We focus on making home building a healthier, energy efficient and comfortable product.

Beach Builders, Inc.
Beach Hensley
828-450-1508
Asheville, NC
beachbuildersinc.com
beach@beachbuildersinc.com

Bearwallow Construction
828-553-3792
159 White Pine Drive
Asheville, NC 28805
bearwallowconstruction.com
nathanballinger@hotmail.com
We specialize in energy efficient construction with the building of new homes and remodeling of existing homes. We offer free estimates and work with homeowners for a practical and economical product.

Bellwether Design Build
Brad Rice
828-225-5990 / Fax: 828-225-5989
45 Rosewood Ave. Asheville, NC 28801
bellwetherbuilders.com
brad@bellwetherbuilders.com

Best Built, Inc.
Alan Best
828-506-9943
4879 Crabtree Mountain Road
Clyde, NC
bestbuilt@bellsouth.net

Blue Ridge Energy Systems
Jamie Shelton and Robin Woodward
828-775-8665 or 828-684-8665 / Fax: 828-684-8665
28 Sourwood Lane
Fletcher, NC 28732
blueridgeenergysystems.com
info@blueridgeenergysystems.com
We design and build beautiful super-insulated, passive solar homes for the same price as conventional construction. You can heat and cool one of our highly efficient homes for under $200 annually.

BlueStone Construction, LLC
Kevin Reed
828-693-4484
1421 Solomon Circle
Hendersonville, NC 28739
BlueStoneConstruction.com
info@BlueStoneConstruction.com
We are a high quality custom builder that takes pride in building the finest custom homes in the Asheville and Hendersonville areas. We treat each home as if it were our own.

Bob Callahan, LLC
Bob Callahan
720-260-0001
1070-1 Tunnel Road Suite 10-351
Asheville, NC 28805
casegreen.com
casegreenbob@gmail.com
Hands on building by a perfectionist craftsman for the best in energy conservation (ENERGY STAR HERS<50 before renewables) and indoor air quality. Expertise, pride, accountability, integrity & quality

Brookstone Builders, Inc.
Richard King
828-230-7972
P.O. Box 1105
Black Mountain, NC 28711
brookstonebuildersnc.com
rk@brookstonebuildersnc.com
Brookstone Builders is a Black Mountain and Asheville area custom green builder with a reputation for creative and quality craftsmanship.

Deltec Building Company
Don Thompson
828-257-4907 / Fax: 828-232-4328
69 Bingham Road
Asheville, NC 28806
dthompson@deltechomes.com
Deltec Building Company is a full service turn-key building company specializing in the construction of round and panelized homes.

Demos Builders, Inc.
Jim Demos
828-777-2395
Asheville, NC 28801
demosbuilders.com
jim@demosbuilders.com
We specialize in green new home construction and renovations/additions. Fully licensed and insured. Let us build your green home.

DRA Living, Inc.
Kendra P. Turner, MPA
828-274-4699 / Fax: 828-274-4684
900 Hendersonville Road Suite 309
Asheville, NC 28803
draliving.com
info@draliving.com
DRA Living is committed to providing quality, custom & sustainable precision-built commercial & residential solutions to meet the needs of every customer and community. We demonstrate our dedication

Earthtone Builders
Greg McGuffey
828-230-4469
12 Rich St.
Asheville, NC 28806
earthtonebuilders.com
earthtonebuilders@gmail.com
Builders of beautiful Green Homes here in the Asheville area for almost 10 years. We are a trusted company with great local references and 100 percent client satisfaction. Visit us online or give us a call.

Falcon Development and Construction
David Ross
828-274-3055 / Fax: 828-274-7789
30 Hendersonville Road
Asheville, NC 28803
falconbuilt.com
david@falconbuilt.com
Residential and commercial construction services. 2012 Parade of Homes Best in Show Winner. Specializing in quality green construction and design build of both new homes and remodels of existing.

Fine Line Builders
Tom DeKay
828-749-9615
1005 Pace Mountain Road
Saluda, NC 28773
fineline-builders.com
fineline@tds.net

Forward Construction, Inc.
Jim and Sue Forward
828-298-9532 / Fax: 828-298-2444
24 Smokey Road
Asheville, NC 28803
forwardconstruction.com
jtfbuilder@gmail.com
A family business serving the Asheville area for over thirty years, we offer conscious craftsmanship focused on attention to detail and customer satisfaction one project at a time

Green Light Home Builders, LLC
Jon Sloop
828-450-2484
33 Green Oak Road
Asheville, NC 28804
greenlightcustomhomes.com
jon@greenlightcustomhomes.com

Green Mountain Realty

John Green
828-215-9064 / Fax: 828-684-4542
91 Distant View Drive
Asheville, NC 28803
ashevillencrealty.com
info@ashevillencrealty.com

Green Mountain Realty is the Premier ECO Real Estate firm in Asheville due to the act that we are local developers, licensed green home builders and very experienced real estate professionals.

Greencraft

James and LeAnn Bound
828-713 2316 / Fax: 828-707 9493
P.O. Box 19051
Asheville, NC 28815
ashevillegreenbuilder.com
greencraft.lb@gmail.com

We are committed to serving the Asheville community as a sustainable builder. Our focus is super energy-efficient, high-quality, environmentally sound home building.

High Country Homes, Inc.

Nancy Padgett
828-628-0447 / Fax: 828-628-0447
81 Ledgestone Drive
Fairview, NC 28730
highcountryhomesinc.com
hchomes@bellsouth.net

Known for personalized service & attention to detail, HCH is an NAHB Certified Green Professional with over 25 years of experience in environmentally responsible, quality construction & custom design.

Holbrook & Nichols Construction

John F. Holbrook
828-966-4400 / Fax: 828-966-9696
504 Blue Ridge Road
Lake Toxaway, NC 28747
holbrook-nichols.com
john@holbrook-nichols.com

Holbrook & Nichols Construction has been a leader in the Lake Toxaway area sustainable high end residential construction industry for years.

HomeSource Builders

Tim Alexander
828-252-1022
172 Charlotte St.
Asheville, NC NC
homesourcebuilders.com
info@homesourcebuilders.com

Jade Mountain Builders

Hans Doellgast
828-216-3948 / Fax: 828-628-0978
85 B&B Stables Road
Fairview, NC 28730
Jademountainbuilders.com
Hans@jademountainbuilders.com

Jade Mountain Builders is a team of 31 Craftsmen who pride themselves on taking an ecologically sensitive approach to building homes.

JAG and Associates Construction, Inc.

Jody Guokas
828-216-0914 / Fax: 828-350-1839
20 Battery Park Ave., Suite 814
Asheville, NC 28801
JAGGreen.com
jody@jaggreen.com

Serving all of WNC, JAG Construction has the expertise, craftsmen and experience to bring green projects to life. Our focus is on Sustainable and Sensible home building to best meet each client's need

Jerry R. Brown Construction Co.

Jerry Brown
828-553-2410 / Fax: 828-862-5518
1045 Wilson Road
Pisgah Forest, NC 28768
jerryrbrownconstruction.com
jerrybrown@citcom.net

JL Builders, Co.

Jonathan Landry
828-549-8285 / Fax: 336-217-8194
1550 Sulphur Springs Road
Waynesville, NC 28786
JLBuildersNC.com
Jonathan@JLBuildersNC.com

JSS Homes, LLC

Dan Arrowood
828-215-9622
16 Yorkshire Court
Candler, NC 28715
jsshomesllc.com
arrowood197@bellsouth.net

Ken Gaylord Architects/ Black Hawk Construction

Ken Gaylord
828-692-4550 / Fax: 828-692-4577
109 South Main St.
Hendersonville, NC 28792
KENGAYLORD.COM
Project1@kengaylord.com

Living Stone Construction

Molly Sullivan
828-669-4343 / Fax: 828-357-5557
706 NC Highway 9
Asheville, NC 28711
livingstoneconstruction.com
molly@livingstoneconstruction.com

Living Stone Construction is a nationally award winning, environmentally friendly builder of certified sustainable and green homes including ENERGY STAR and NC Green Built Certification.

WANT MORE?

For more information about green building including resources, calendar and programs visit the WNC Green Building Council website at **wncgbc.org.**

Maple Ridge Construction, Inc.

Joe Yanik
828-681-8880 / Fax: 828-681-9862
Dunnwoody Drive
Arden, NC 28704
Maple Ridge Construction
mapleridgec@yahoo.com

Maple Ridge Construction, Inc. builds custom homes and also renovates existing homes. Our focus is on quality, energy efficiency and low maintenance. We strive to provide the greatest value.

McHugh Designs

Bobby McHugh
828-712-8451
McHugh-designs.com
Rebaloo@bellsouth.net

With affordable in-house design, proven craftsman building techniques, and the use of local timbers and materials this winner of the 2011 WNCGBC Project of the Year is ready to build your next home.

Mike Eubank Construction, Inc.

Mike Eubank
828-667-0513 / Fax: 828-667-0379
140 Ginger Quill Circle
Biltmore Lake, NC 28715
mikeeubankconstruction.com
mikeeubank@att.net

Mountain Realty Builders, LLC

Jim Hunter
828-301-0806 / Fax: 336-217-8401
P.O. Box 19660
Asheville, NC 28815
mountainrealtybuilders.com
jim@mountainrealtybuilders.com

Green home builders, specializing in West Asheville

Mountain Sun Building & Design

Emily Boyd
828-713-0549
48 Beaverdam Knoll Road
Asheville, NC 28804
mountainsunbuilding.com
emily@mountainsunbuilding.com

With 15 years experience in all aspects of green home design and construction, MSB&D builds LEED, Green Built NC and ENERGY STAR homes. We take pride in quality craftsmanship and attention to detail.

Osada Construction

Matt Osada
828-606-5295
138 Charlotte St., Suite 209
Asheville, NC 28801
osadaconstruction.com
matt@osadaconstruction.com

N.C. General Contractor (unlimited license). Certified N.C. Green Built Home Builder. Custom homes: new and remodels. Commercial Construction. Full service contracting. Construction management.

Patricia C. Tipton

Patsy Tipton
828-777-7247 / Fax: 828-890-3435
117 Bradford Farm Road
Mills River, NC 28759
Patsyashev@aol.com

Perkins Enterprises

Erik Perkins
828-788-7781 / Fax: 828-488-3636
100 Willow Ridge Drive
Bryson City, NC 28713
perkinscustomhomes.com
erikrperkins@gmail.com

Preish Construction, Inc.

Mallory Fuller
828-776-4444
1116 Burnside Drive
Asheville, NC 28803
preish.com
homes@preish.com

Rare Earth Builders, Inc.
Mark Bondurant
828-492-0534 / Fax: 828-492-0534
105 Creative Cove Road
Canton, NC 28716
RareEarthBuilders.com
Mark@RareEarthBuilders.com
REB has been building green homes and renovations in Western NC since 1999. In tandem with home building, we build client trust with open financials, conscientious building details and great service.

Ron DeSimone Contracting, LLC
Ron DeSimone
828-775-6092
127 Ladderback Ridge
Waynesville, NC 28785
rondesimonecontracting.com
rondesi@bellsouth.net
Ron DeSimone specializes in designing & building budget concious energy efficient green buildings in the Haywood & Buncombe County area. Licensed & experienced residential & commercial contractor.

RS Motley Construction
Rob Motley
828-776-7470
18 Alabama Ave.
Asheville, NC 28806
rmotley80@hotmail.com
RS Motley Construction specializes in the quality construction of smaller, green homes and unique green landscapes.

SAGE Builders of WNC, Inc.
Doug Keefer
828-713-7208 / Fax: 828-683-1224
299 Morgan Branch Road
Leicester, NC 28748
thesagebuilders.com
info@thesagebuilders.com
SAGE Builders creates Sustainable, Appropriate, Green & Efficient (SAGE) homes. SAGE specializes in building hand-crafted homes using custom woodworking and solar designs.

Sineath Construction Co.
Allyson Sineath
828-682-4886 / Fax: 828-682-0676
P.O. Box 1603
Burnsville, NC 28714
sineathconstruction.com
info@sineathconstruction.com

Solstice Construction Co., Inc.
Aaron Burdett
828-290-9596
P.O. Box 474
Saluda, NC 28773
solsticeconstruction.net
solstice.co@gmail.com

SouthEast Ecological Design, Inc.
Kevin Ward
828-768-6448
503 Old Farm Road
Marshall, NC 28753
ecologicaldesign.net
info@ecologicaldesign.net
SEED is an ecological general contracting company and green design/build firm serving WNC since 1999. We are organized to approach land use and custom building holistically and sensibly.

Springtime Homes
Brian Knight
828-329-2146
185 Courtland Place
Asheville, NC 28801
SpringtimeHomes.com
springtimehomes@gmail.com
Home builders specializing in passive solar, energy efficiency and indoor air quality. Consistently breaking the region's blower door test records; the most cost effective path to energy efficiency.

Standing Stone Builders, Inc.
Dave Ulrichs
828-713-2771
80 Village Pointe Lane
Asheville, NC 28803
standingstonebuilders.com
daveulrichs@gmail.com
We are a hands-on, green, custom home builder based in Asheville, NC. Driven by a quality vs. quantity mentality, we give the homes we build unparalleled focus. We love our work and it shows!

Stewart Builders, Inc.
Mary Stewart
828-452-0056 / Fax: 828-452-5849
P.O. Box 83
Waynesville, NC 28786
stewartbuilders.net
marestew@gmail.com
LEED AP, Cert. Green Professional, Acc. Master Builder, Unlimited license, Res. & Comm. New & remodel. 20 years in WNC, outstanding reputation. Affordable luxury.

Sure Foot Builders Inc.
Raymond Thompson
828-242-0925
11 Blanton St.
Asheville, NC 28801
surefootbuilders.com
surefootbuilders@gmail.com
We are a design and build firm currently focused on 900 sf to 3000 sf homes in the Asheville area. Our business practice is focused on the home's value to the user and community through time.

The William Baxter Co.
Bill Baxter
828-506-8759
P.O. Box 104
Almond, NC 28702
thewmbaxterco@aol.com

Thompson Properties, Inc.
John Thomnpson
828-684-7750 / Fax: 828-684-7808
452 Butler Bridge Road Suite A-1
Fletcher, NC 28732
ThompsonPropertiesInc.com
info@thompsonpropertiesinc.com

Timberline Custom Homes, LLC
Mark Montini
828-776-1511 / Fax: 828-628-6800
P.O. Box 15111
Asheville, NC 28813
timberlinecustoms.com
timberlinehomes@att.net
Timberline has built custom homes in the Asheville area for over 10 years including Green Built, log and timberframe. Our president holds an unlimited builder's license and is a registered engineer.

Virant Design, Inc.
Tom Virant
828-231-0092
549 Sunset Drive
Asheville, NC 28804
virantdesign.com
info@virantdesign.com

Winter Star Woodworks
Jon Pertee
828-284-4248 / Fax: 828-675-0926
330 Sully Lane
Burnsville, NC 28714
winterstarwoodworks.com
jonpertee@winterstarwoodworks.com
Building small homes for nice people since 1988.

Wright Family Custom Homes, LLC
Tim Wright
828-779-1697 / Fax: 828-274-8013
P.O. 25067
Asheville, NC 28813
wrightfamilycustomhomes.com
twright@wrightfamilycustomhomes.com

Building Performance Contractors

Green Opportunities
Torin Kexel
828-398-4158
220 Livingston St.
Asheville, NC 28801
greenopportunities.org
torin@greenopportunities.org
The GO Energy Team provides energy audits, building performance contracting and BPI certification trainings for industry professionals. We support a triple bottom line. People-Planet-Prosperity.

Cleaning

Shine Green Cleaning Co, Inc.
Suzanne Wuelfing
828-582-6112
825 C Merrimon Ave. #262
Asheville, NC 28804
shinegreencleaning.com
suzanne@shinecleaningco.com

Crawlspace Sealing

Appalachian Improvements, LLC
Jordan Wellman
828-712-5142
60 Gibson Road
Asheville, NC 28804
appalachianimprovements@yahoo.com
Focusing on green renovations and improvements to your home for more that 10 years. Specializing in Environmental Mold Remediation utilizing GreenzKleen enzyme technology.

SHOWER POWER

Most showerheads use 2 to 3.5 gallons of water per minute. By changing out your showerhead — at a cost of less than $10 — for one that uses 1.5-1.75 gallons per minute you can save 6,000 to 10,000 gallons of water a year. The payback period on a showerhead can be as little as two weeks.

J Coleman Waterproofing of WNC, Inc.

Jan Coleman
828-299-8506 / Fax: same
505 Lafayette Ave.
Asheville, NC 28805
jcolemanwaterproofing.com
jan@jcolemanwaterproofing.com

Below grade waterproofing Tuff-N-Dri R3,5,10 or any combo.Slab on grade to seal plate R5-10 Air Moisture Barriers EnViroDri. Encapsulated crawlspaces.Interior Drains. www.jcolemanwaterproofing.com

Developers

Green Mountain Realty

John Green
828-215-9064 / Fax: 828-684-4542
91 Distant View Drive
Asheville, NC 28803
ashevillencrealty.com
info@ashevillencrealty.com

Green Mountain Realty is the Premier ECO Real Estate firm in Asheville due to the act that we are local developers, licensed green home builders and very experienced real estate professionals.

JAG and Associates Construction, Inc.

Jody Guokas
828-216-0914 / Fax: 828-350-1839
20 Battery Park Ave., Suite 814
Asheville, NC 28801
JAGGreen.com
jody@jaggreen.com

Serving all of WNC, JAG Construction has the expertise, craftsmen and experience to bring green projects to life. Our focus is on Sustainable and Sensible home building to best meet each client's need

The Villages at Crest Mountain

Clint Lasher
828-252-7787
6 Celebration Place
Asheville, NC 28806
villagesatcrestmountain.com
clasher@crestmtn.com

Engineers

Altamont Environmental, Inc.

Stu Ryman, P.G.
828-281-3350
231 Haywood St.
Asheville, NC 28801
altamontenvironmental.com
sryman@altamontenvironmental.com

VandeMusser Design, PLLC

Amy Musser
828-348-4723 / Fax: 828-253-8347
26 Crabapple Lane
Asheville, NC 28804
vandemusser.com
info@vandemusser.com

Engineering design services include HVAC system and rainwater cistern design for residential projects in North Carolina. More than 15 years of experience.

Finishes: Exterior

Delkote Machine Finishing

Larry Payne
828-232-4322 / Fax: 828-232-4328
69 Bingham Road
Asheville, NC 28806
delkote.com
lpayne@delkote.com

We specialize in determining the optimum insulation system for each home: one that is cost effective and high performing. We also offer machine-finished siding to enhance the durability of your home.

Finishes: Interior

Build it Naturally

Mike Benito / Chase Thomas
828-254-2668 / Fax: 828-254-3778
76 Biltmore Ave.
Asheville, NC 28801
builditnaturally.com
mike@builditnaturally.com / chase@builditnaturally.com

Sustainable, durable, and non-toxic building materials. Covering the full spectrum of finish interiors including paints & finishes, flooring, counters, cabinets, tile, architectural accents & more.

Gundersen Woodworking

Sten Gundersen
828-682-2406
36 White Flower Drive
Burnsville, NC 28714
stengund.com
stengundersen@hotmail.com

Full service architectural millwork (stairs, doors, moulding) timber-framing, cabinetry, wood countertops and furniture. 4-axis CNC router services for ultimate versatility, efficiency and precision.

Mountain Marble & Granite, Inc.

Laura Ford
828-225-0001 / Fax: 828-225-0002
91 Thompson St.
Asheville, NC 28803
mountainmarble.com
laura@mountainmarble.com

Full-service local finished stone, recycled quartz, IceStone, Vetrazzo, and Richlite fabrication and installation.

EAT LOCAL

Support local farmers and businesses while filling your belly with good-for-you food.

The Arch Architectural Finishes Flooring and More

Catherine Silver
828-253 5455 / Fax: (919) 640-8580
2000 Riverside Drive Unit 10
Asheville, NC 28804
thearchnc.com
cmsilver@thearchnc.com

American Clay Earth plaster, Nat hydraulic lime, applicator services, workshops. FornoBravo ovens,fireplaces,complete installations.Sustainable flooring EcoTimber,EcoFusion, Cork, Reclaimed, Art Tile

Flooring

The Arch Architectural Finishes Flooring and More

Catherine Silver
828-253 5455 / Fax: (919) 640-8580
2000 Riverside Drive Unit 10
Asheville, NC 28804
thearchnc.com
cmsilver@thearchnc.com

American Clay Earth plaster, Nat hydraulic lime, applicator services, workshops. FornoBravo ovens,fireplaces,complete installations.Sustainable flooring EcoTimber,EcoFusion, Cork, Reclaimed, Art Tile

Whole Log Lumber

Jim Stowell
828-697-0357 / Fax: 828-696-2938
688 Blueberry Farm Road
Zirconia, NC 28790
wholeloglumber.com
wholeloglumber@hughes.net

Reclaiming Antique Wood since 1984: WNC's OLDEST SUPPLIER! Specializing in Artisan Floors, Mantels and other components of fine wood interiors-including WOCA Penetrating,Hardening Oil.(VOC-free)

Furnishings

Ironwood Studios, LLC

Thomas Gibson
828-423-0385
97-B Roberts St.
Asheville, NC 28801
ironwoodcustomcabinetry.com
tom@ironwoodstudios.org

Home Energy Raters

Eco-Sense

Hunter Dendy
828-505-3853
8 Castle St.
Asheville, NC 28803
ecosensedesign.com
hunter@ecosensedesign.com

Eco-Sense provides solutions for healthy environments and improving energy efficiency. Certifying homes for NC Green Built, LEED for Homes and Energy Star for Homes Programs.

Home Energy Solutions, Inc.

Rob Howard
828-217-0506
12 Mockingbird Lane
Granite Falls, NC 28630
homeenergysol.com
rob@homeenergysol.com

Air Leakage and Duct Leakage Testing for North Carolina Energy Code Compliance, Green Building Consulting, HERS Ratings, Energy Audits, Healthy Home Inspections, and Home Performance Contracting

VandeMusser Design, PLLC

Amy Musser / Matthew Vande
828-348-4723 / Fax: 828-253-8347
26 Crabapple Lane
Asheville, NC 28804
vandemusser.com
info@vandemusser.com

A green home energy rating company providing certifications for ENERGY STAR, Green Built NC, NAHB Green, and LEED, as well as green design services for homes. More than 15 years of experience.

HVAC

Air Craftsman Heating & Cooling, Inc.

George Willis
828-299-1809 / Fax: 828-299-1676
38 Old Charlotte Highway
Asheville, NC 28803
aircraftsmanheating.com
george@aircraftsmanheating.com

Asheville Geothermal, Inc.

Rick Clemenzi
828-712-6786
P.O. Box 18757
Asheville, NC 28814
ashevillegeothermal.com
info@ashevillegeothermal.com

Asheville Geothermal is WNC's only specialty geothermal HVAC contractor. IGSHPA Certified Installer and Installer Trainer, Certified Geo Designer. Visit our website for tax credits, quote, and more.

Gentry Heating and Cooling

Jeff Granius
828-274-2520 x231 /
Fax: 828-686-6375
100 Buckeye Acess Road
Swannanoa, NC 28778
gentryheatinginc.com
jeff@gentryheatinginc.com

WEB GUIDE

You can also see the Green Home & Living Guide online at:

WNCGreenGuide.com

Bullman Heating & Air
828-658-2468

Bullman Heating & Air

Jennifer Jones
828-658-2468 / Fax: 828-658-1001
10 Red Roof Lane
Asheville, NC 28804
bullmanheating.com
jjones@bullmanheating.com

Harvest the Sun, LLC

Kingsley Pugh
828-713-7463 / Fax: 828-505-0999
25 Delaware Ave.
Asheville, NC 28806
harvestthesun.org
harvestthesun@gmail.com

High quality, custom designed radiant heat,solar thermal and solar electric systems. Our personalized approach to business means friendly, more reliable service at an affordable price.

Thermacraft Solar Solutions, Inc.

Michael Pope
828-285-8825 / Fax: 828-683-3355
P.O. Box 8833
Asheville, NC 28814
thermacraft.com
gosolar@thermacraft.com

Serving WNC since 1988, Thermacraft specializes in the custom design, installation and service of Solar Electric, Solar Thermal, and Radiant Floor Heating systems.NABCEP certified in PV & Hot Water

Indoor Air Quality

Blue Ridge Radon Solutions

Dudley Wilson
828-252-2212
86 Memory Lane
Asheville, NC
dudleydwilson@gmail.com

Blue Ridge Radon Solutions provides radon testing and mitigation, including passive radon systems and consultation during construction. Serving all of Western North Carolina.

Columbia Forest Products

Richard Poindexter, CGP, LEED AP BD+C
800-637-1609 / Fax: 336-605-6969
7900 Triad Center Drive, Suite 200
Greensboro, NC 27409
columbiaforestproducts.com
rpoindexter@cfpwood.com

North America's largest manufacturer of decorative hardwood plywood (including Old Fort, NC). FSC Certified. CARB & LEED Compliant. Innovator of soy-based formaldehyde free PureBond technology.

Your Ventilation Specialist

Green R, Inc.

Ron Pariseau
828-680-9615 / Fax: 866-751-0401
885 Crossroads Parkway, Suite A-8
Mars Hill, NC 28754
greenrinc.com
ron@greenrinc.com

Ventilation is key to the Indoor Air Quality of your energy efficient home. Give us a call and we can help you select the right equipment from bathroom fans to whole house fresh air exchange equipment.

Ground Air Manager

Stephen Wolfe
828-301-4722
Asheville, NC 28804
wolfecraft1@gmail.com

Insulation

Delkote Machine Finishing

Larry Payne
828-232-4322 / Fax: 828-232-4328
69 Bingham Road
Asheville, NC 28806
delkote.com
lpayne@delkote.com

We specialize in determining the optimum insulation system for each home: one that is cost effective and high performing. We also offer machine-finished siding to enhance the durability of your home.

Interior Designers

Alchemy Design Studio

Traci Kearns
828-255-5110 / Fax: 828-255-5109
60 Biltmore Ave.
Asheville, NC 28801
alchemy-interiors.com
info@alchemy-interiors.com

Alchemy Design Studio offers comprehensive interior design services for residential and commercial projects with a focus on modern and sustainable design in both new construction and re-models.

Allard & Roberts Interior Design, Inc.

Talli Roberts or Sharon Allard
828-271-4350 / Fax: 828-253-2139
84 W. Walnut St. #201
Asheville, NC 28801
allardandroberts.com
info@allardandroberts.com

Green Built Environments

Victoria Schomer
828-707-2919
25 Saint Dunstans Circle
Asheville, NC 28803
greenbuilt-e.com
vschomer@greenbuilt-e.com

I've been working on green renovations and healthy interior design for 25 years. I recently became a real estate broker to help identify green potentials in properties. ASID, LEED AP, REGREEN Trained.

GriffinArchitects, PA

Robert Griffin
828-274-5979 / Fax: 828-274-1995
One Village Lane
Asheville, NC 28803
GriffinArchitectsPA.com
Robert.G@GriffinArchitectsPA.com

Sustainable Architecture & Interior Design Asheville, NC since 1979-Custom Residential, Additions, Commercial, Preservation, Liturgical...3-D Energy Modeling/Virtual imaging services....Hourly or percent

Stewart Consultants, LLC

Lou Stewart
828-450-1320
Asheville, NC
LouStewart.com
Lou@LouStewart.com

Lou specializes in eco chic renovations and custom designs in the Asheville area. From one room to your entire home, Lou can help design your space to reflect your style and stay within your budget.

Interior Finishers

MudStrawLove, LLC

Steve Kemble and Mollie Curry
828-775-4823
60 Alabama Ave.
Asheville, NC 28806
mudstrawlove.com
connect@mudstrawlove.com

Since 1990-Homes of straw bale, cob, earthbag, slip-straw, adobe. Clay- and lime-based plasters, clay paint, earthen floors. Building projects, workshops, design services, consultation. Permaculture.

Whole Log Lumber
Jim Stowell
828-697-0357 / Fax: 828-696-2938
688 Blueberry Farm Road
Zirconia, NC 28790
wholeloglumber.com
wholeloglumber@hughes.net
Reclaiming Antique Wood since 1984: WNC's OLDEST SUPPLIER! Specializing in Artisan Floors, Mantels and other components of fine wood interiors-including WOCA Penetrating,Hardening Oil.(VOC-free)

Land Planning

Altamont Environmental, Inc.
Stu Ryman, P.G.
828-281-3350
231 Haywood St.
Asheville, NC 28801
altamontenvironmental.com
sryman@altamontenvironmental.com

Jade Mountain Hardscapes
Hans Doellgast
828-216-3948 / Fax: 828-628-0978
85 B&B Stables Road
Fairview, NC 28730
Jademountainbuilders.com
Hans@jademountainbuilders.com
Jade Mountain Hardscapes is an ecologically minded foundation, grading, and hardscaping company. We specialize in stitching homes into challenging sites with bounders, timbers, and native plants.

Mountains-to-Sea Ecological
Kevin Caldwell
828-551-8225
87 Ivy Bluffs Road
Marshall, NC 28753
MTSecological.com
info@mtsecological.com
We perform botanical & wildlife surveys and land planning for Low Impact Development. We ID, protect, & utilize plant, wildlife, timber, soil and other resources of the land that are otherwise lost.

Otter & Arrow Land Planning, PLLC
Kevin Tate
828-505-2630 / Fax: 828-505-2631
21 Battery Park Ave., Suite 203
Asheville, NC 28801
otterandarrow.com
kevin@otterandarrow.com
Sustainable Design, Native Plant Landscaping, Erosion Control, City/County Permitting, Land Planning, Road Layout, Single Family Homes, Multi-Family, Large Acreage Tracts of Land, Color Renderings

V&V Land Management and Resource Recovery, LLC
Carrie Vogler
828-777-6637
PO Box 7
Del Rio, TN 37727
voglerllc.com
carrie@voglerllc.com
Planning and execution of sustainable property improvements including forestry mulching, driveway building and repair, boulder walls and dry-stacked masonry, tree services, consulting and mapping.

Landscape Architects

Equinox Environmental
David Tuch
828-253-6856
37 Haywood St.
Asheville, NC 28801
equinoxenvironmental.com
info@equinoxenvironmental.com
Blending our unique skills and personal touch with sustainable solutions for land planning and landscape architecture projects and protecting or restoring land and water resources.

Jerald A. Snow, Landscape Architect LEED Green Associate
Jerry Snow
828-712-0454
30 Watauga St.
Asheville, NC 28801
jeraldasnowlandscapearchitect.com
jeraldasnow@gmail.com
Practicing landscape architecture with an emphasis on environmentally sound site design and a preference for native plant material and sustainable products as a path to preserving our land and water resources.

Otter & Arrow Land Planning, PLLC
Kevin Tate
828-505-2630 / Fax: 828-505-2631
21 Battery Park Ave., Suite 203
Asheville, NC 28801
otterandarrow.com
kevin@otterandarrow.com
Sustainable Design, Native Plant Landscaping, Erosion Control, City/County Permitting, Land Planning, Road Layout, Single Family Homes, Multi-Family, Large Acreage Tracts of Land, Color Renderings

Landscapers

Carolina Trailbuilders
Paul or Claudine Cremer
828-658-0294 / Fax: 828-658-0294
P.O. Box #809
Weaverville, NC 28787
carolinatrailbuilders.com
carolinatrails@frontier.com
Specializing in the design and construction of rolling contoured, sustainable hiking, mountain biking, ATV and equestrian trails, as well as the building of garden paths, steps, bridges and overlooks.

Circle of Stone
David Reed
828-545-9056
P.O. Box 1571
Asheville, NC 28802
stonescaping.com
davidreed@stonescaping.com
24 years of bringing stonework into the home and landscape. Dry stone walls, steps and boulderscapes increase access to sloped property, while adding year round interest to outdoor garden spaces.

Equinox Environmental
Fred Grogan
828-253-6856
37 Haywood St.
Asheville, NC 28801
equinoxenvironmental.com
info@equinoxenvironmental.com
Providing design-build services that blend our expertise in design, ecology, and horticulture to create sustainable landscapes that are unique, artistic, and infused with character.

Evergreen Landscaping Services, Inc.
Paul or Claudine Cremer
828-658-0294 / Fax: 828-658-0294
P.O. Box #809
Weaverville, NC 28787
evergreenland@frontier.com

Jade Mountain Hardscapes
Hans Doellgast
828-216-3948 / Fax: 828-628-0978
85 B&B Stables Road
Fairview, NC 28730
Jademountainbuilders.com
Hans@jademountainbuilders.com
Jade Mountain Hardscapes is an ecologically minded foundation, grading, and hardscaping company. We specialize in stitching homes into challenging sites with bounders, timbers, and native plants.

Living Roofs, Inc.
828-252-4449
Asheville, NC 28803
livingroofsinc.com
info@livingroofsinc.com
LRI is a leading green roof and green wall installation company based in Asheville. We work with all types of projects. Please visit our website to see our work and to learn more about our services.

Mountain Moss Enterprises
Rachel Martin
828-577-1321
40 Holly Ridge Road
Pisgah Forest, NC 28768
mountainmoss.com
mossinannie@gmail.com
In addition to eco-friendly mosses for sale, specialized expertise in moss gardening applications enhance our niche landscape services: Site consultations, creative designs and turn-key installations.

Otter & Arrow Land Planning, PLLC
Kevin Tate
828-505-2630 / Fax: 828-505-2631
21 Battery Park Ave., Suite 203
Asheville, NC 28801
otterandarrow.com
kevin@otterandarrow.com
Sustainable Design, Native Plant Landscaping, Erosion Control, City/County Permitting, Land Planning, Road Layout, Single Family Homes, Multi-Family, Large Acreage Tracts of Land, Color Renderings

Moonlighting of WNC
John DeBoer
828-702-2829
Asheville, NC 28803
moonlightingwnc.com
john@moonlightingwnc.com
Landscape/Architectural Lighting Professionals, specializing in Energy Efficient Low Voltage Landscape Lighting systems.

Lighting

Moonlighting of WNC
John DeBoer
828-702-2829
Asheville, NC 28803
moonlightingwnc.com
john@moonlightingwnc.com
Landscape/Architectural Lighting Professionals, specializing in Energy Efficient Low Voltage Landscape Lighting systems.

Lodging

Asheville Green Cottage
Victoria Schomer
828-707-2919
25 Saint Dunstans Circle
Asheville, NC 28803
ashevillegreencottage.com
info@ashevillegreencottage.com
In an historic home, our amenities include a green and healthy environment, catering to any vegetarian requests, with a lovely ambiance of different international themes. Located near Biltmore Estate.

Pest Control

Terminix Service, Inc.
Russell Barnes
828-253-3816 / Fax: 828-253-3898
232 Swannanoa River Road
Asheville, NC 28813
TrustTerminix.com
rbarnes@trustterminix.com

Plumbing Supply

Filters For Tap
Edward Cortright
828-775-9174
174 Beverly Road
Asheville, NC 28805
filtersfortap.com
ed@filtersfortap.com
Ed is a certified water specialist providing water testing & water filtration solutions that are effective at protecting your health, reducing our water consumption & reducing our carbon footprint.

Realtors

Green Built Environments
Victoria Schomer
828-707-2919
25 Saint Dunstans Circle
Asheville, NC 28803
greenbuilt-e.com
vschomer@greenbuilt-e.com
I've been working on green renovations and healthy interior design for 25 years. I recently became a real estate broker to help identify green potentials in properties. ASID, LEED AP, REGREEN Trained.

Green Mountain Realty
John Green
828-215-9064 / Fax: 828-684-4542
91 Distant View Drive
Asheville, NC 28803
ashevillencrealty.com
info@ashevillencrealty.com
Green Mountain Realty is the Premier ECO Real Estate firm in Asheville due to the act that we are local developers, licensed green home builders and very experienced real estate professionals.

Jackie Rocks Green! at Dawn Wilson Realty
Jackie Tatelman
828-713-5193
P.O. Box 1596
Black Mountain, NC NC
DawnWilsonRealty.com
Jackie@DawnWilsonRealty.com
Let me help you navigate the shades of Green- Whether buying/selling a home or sustainable tract of land. I have first hand experience of solar & green building. Serving Asheville & beyond.

Jody Whitehurst, REALTOR, ECO
Town and Mountain Realty
828-215-3981
261 Asheland Ave.
Asheivlle, NC 28801
jodywhitehurst.com
jody@jodywhitehurst.com
Buying or selling real estate in Western North Carolina can be a complex journey. Let me simplify your experience through hard work, thorough research, and thoughtful communication.

Love The Green Team Keller Williams
Mary Love
828-279-6723
86 Asheland Ave. Asheville, NC 28801
lovethegreen.org
marylovethegreen@gmail.com
We create long term relationships with buyers and sellers seeking sustainable homes and communities. Our team specializes in Buncombe Co. and has a large referral network throughout NC.

Mary Ellen Brown
HomeLife Professional Realty
828-280-7254 / Fax: 828-575-2339
Hendersonville Road
Asheville, NC 28803
GreenWithRealty.com
mebrown@homelifepr.com
Green Real Estate Solutions are at your finger tips with Eco-Certified ME Brown:knowledge, hard work & cheerful guidance: we ask smart questions & get smart answers for buyers, sellers, or renovators.

SHUT DOWN

Save energy and wear and tear on your hardware by shutting down your computer at night. You'll save an average of $90 of electricity a year.

Mike Figura, ECO Certified Realtor
Mike Figura
828-337-8190 / Fax: 800-533-1491
64 Biltmore Ave.
Asheville, NC 28801
mymosaicrealty.com
mike@mymosaicrealty.com
My approach to real estate is to advance a nurtured, balanced and attentive relationship with my clients and the community that I serve. Call or email for a free consultation over coffee or tea.

Recycling

Asheville Area Habitat for Humanity
Joel Johnson
828-777-4158
33 Meadow Road
Asheville, NC 28803
ashevillehabitat.org
jjohnson@ashevillehabitat.org
Habitat's experienced Deconstruction team removes usable building materials from structures and sells them to the public in the Habitat ReStore. Proceeds support Habitat's building programs.

Renewable Energy

Asheville Geothermal, Inc.
Rick Clemenzi
828-712-6786
P.O. Box 18757
Asheville, NC 28814
ashevillegeothermal.com
info@ashevillegeothermal.com
Asheville Geothermal is WNC's only specialty geothermal HVAC contractor. IGSHPA Certified Installer and Installer Trainer, Certified Geo Designer. Visit our website for tax credits, quote, and more.

Blue Ridge Biofuels
Woodrow Eaton
828-253-1034 / Fax: 828-253-8882
109 Roberts St.
Asheville, NC 28801
blueridgebiofuels.com
info@blueridgebiofuels.com
Sustainable biodiesel made from renewable resources. Biodiesel can be used in any diesel engine without modification. Biodiesel is better for the environment, your engine, and our economy. Fuel Local!

Harvest the Sun, LLC
Kingsley Pugh
828-713-7463 / Fax: 828-505-0999
25 Delaware Ave.
Asheville, NC 28806
harvestthesun.org
harvestthesun@gmail.com
High quality, custom designed radiant heat,solar thermal and solar electric systems. Our personalized approach to business means friendly, more reliable service at an affordable price.

INviro Design & Consulting, LLC
Daya Apunte & Dan Gamble
828-242-8722 / Fax: (888) 803-4880
Asheville, NC
invirodesign.com
info@invirodesign.com
INviro provides holistic design and installation of site-specific, regenerative renovation and off-grid solutions. See our website for a video of our NC Green Business Fund project.

savENRG Passive Thermal Management
Harshul Gupta
828-761-1PCM / Fax: 828-418-1002
1465 Sand Hill Road Suite #2016
Candler, NC 28715
rgees.com
info@rgees.com

STOP IDLING

Idling for more than 10 seconds wastes more gas than is needed for startup. Overall, Americans idle away 2.9 billion gallons of gas a year, worth around $78.2 billion.

Solar Dynamics, Inc.

Ole Sorensen
828-665-8507
40 Green Valley Road
Asheville, NC 28806
solardynamicsnc.com
ole@solardynamicsnc.com

Solar Hot Water,Solar Electric, Wind Power, Radiant Floor Heat. Custom designs, installations and repairs. Serving North Carolina for the past 13 years with reliability and customer satisfaction.

Sundance Power Systems

Erika Schneider
828-645-2080
11 Salem Hill Road
Weaverville, NC 28787
sundancepower.com
erika@sundancepower.com

Empowering people with Solar since 1995, Sundance provides unparalleled value and quality for residential and commercial clean energy solutions throughout the region.

Thermacraft Solar Solutions, Inc.

Michael Pope
828-285-8825 / Fax: 828-683-3355
P.O. Box 8833
Asheville, NC 28814
thermacraft.com
gosolar@thermacraft.com

Serving WNC since 1988, Thermacraft specializes in the custom design, installation and service of Solar Electric, Solar Thermal, and Radiant Floor Heating systems. NABCEP certified in PV & Hot Water

Renovators

A&B Construction & Development, Inc.

Jeremy Bonner
828-258-2000 / Fax: 828-254-6126
P.O. Box 15370
Asheville, NC 28813
a-b-construction.com
info@a-b-construction.com

A&B has been in business for over 30 years doing new construction and renovation for both residential home owners and commercial clients within a 50 mile radius of Asheville NC.

ACI-Asheville Construction, Inc.

Joe Golino
828-776-6909 / Fax: 828-683-3002
P.O. Box 6698
Asheville, NC 28816
ashevilleconstruction.com
asheconinc@yahoo.com

Master builder in WNC since 1974 manifesting your dreams from conception to completion. Using quality local materials, labor and suppliers to proceed with your home in a timely and economical manner.

Amarx Construction

Kyle Gilliland
828-775-4001
825-C Merrimon Ave.
Asheville, NC 28804
amarx.net
kyle@amarx.net

Building custom homes in Asheville and surrounding areas, Amarx is able to combine quality, efficiency, and your budget to provide the best experience possible.

Appalachian Improvements, LLC

Jordan Wellman
828-712-5142
60 Gibson Road
Asheville, NC 28804
appalachianimprovements@yahoo.com

Focusing on green renovations and improvements to your home for more that 10 years. Specializing in Environmental Mold Remediation utilizing GreenzKleen enzyme technology.

Athos Properties

John Moutos
828-777-4057
129 Bleachery Blvd. #57
Asheville, NC 28805
athos-properties.com
info@athos-properties.com

Athos Properties is a leading green builder in the Asheville area. We focus on making home building a healthier, energy efficient and comfortable product.

Builddwell, Inc.

Rane Adamson
828-768-0828
P.O. BOX 706
Hot Springs, NC 28743
builddwellinc.com
builddwell@gmail.com

Builddwell, inc. is a full service General Contractor offering green remodeling, renovations and custom built homes to Madison and Buncombe counties with integrity and attention to detail.

Builtwright Construction, Inc.

Andy Gardner
828-545-7630 / Fax: 828-575-5314
P.O. Box 8753
Asheville, NC 28814
builtwright-construction.com
info@builtwright-construction.com

Specializing in custom residential construction of high quality new homes & renovations in Asheville & surrounding areas. Check our our website for more information about what we are doing today.

Burdett Building & Remodeling, LLC

Bill Burdett
828-693-6036
P.O. Box 381
Zirconia, NC 28790
burdettwilliam@bellsouth.net

Demos Builders, Inc.

Jim Demos
828-777-2395
Asheville, NC 28801
demosbuilders.com
jim@demosbuilders.com

We specialize in green new home construction and renovations/additions. Fully licensed and insured. Let us build your green home.

Duinkerken Homes

Kate Duinkerken
828-645-2728
10 Lakeview Lane
Weaverville, NC 28787
duinkerkenhomes.com
dhomes@charter.net

Earthtone Builders

Greg McGuffey
828-230-4469
12 Rich St.
Asheville, NC 28806
earthtonebuilders.com
earthtonebuilders@gmail.com

Builders of beautiful Green Homes here in the Asheville area for almost 10 years. We are a trusted company with great local references and 100 percent client satisfaction. Visit us online or give us a call.

Falcon Development and Construction

David Ross
828-274-3055 / Fax: 828-274-7789
30 Hendersonville Road
Asheville, NC 28803
falconbuilt.com
david@falconbuilt.com

Residential and commercial construction services. 2012 Parade of Homes Best in Show Winner. Specializing in quality green construction and design build of both new homes and remodels of existing.

Forward Construction, Inc.

Jim and Sue Forward
828-298-9532 / Fax: 828-298-2444
24 Smokey Road Asheville, NC 28803
forwardconstruction.com
jtfbuilder@gmail.com

A family business serving the Asheville area for over thirty years, we offer conscious craftsmanship focused on attention to detail and customer satisfaction one project at a time

Going Green Builders

Ryan Jacques
828-577-3472
222 Dogwood Hills Drive
Brevard, NC 28712
goinggreenbuilders.info
goingreenbuilders@gmail.com

We will beat any competitors price and build a healthier more efficient home. We also specialize in remodels, additions, and roofing. Check us out on the web to learn more.

Green Built Environments

Victoria Schomer
828-707-2919
25 Saint Dunstans Circle
Asheville, NC 28803
greenbuilt-e.com
vschomer@greenbuilt-e.com

I've been working on green renovations and healthy interior design for 25 years. I recently became a real estate broker to help identify green potentials in properties. ASID, LEED AP, REGREEN Trained.

High Country Homes, Inc.

Nancy Padgett
828-628-0447 / Fax: 828-628-0447
81 Ledgestone Drive
Fairview, NC 28730
highcountryhomesinc.com
hchomes@bellsouth.net

Known for personalized service & attention to detail, HCH is an NAHB Certified Green Professional with over 25 years of experience in environmentally responsible, quality construction & custom design.

Jade Mountain Builders
Hans Doellgast
828-216-3948 / Fax: 828-628-0978
85 B&B Stables Road
Fairview, NC 28730
Jademountainbuilders.com
Hans@jademountainbuilders.com
Jade Mountain Builders is a team of 31 Craftsmen who pride themselves on taking an ecologically sensitive approach to building homes.

JAG and Associates Construction, Inc.
Jody Guokas
828-216-0914 / Fax: 828-350-1839
20 Battery Park Ave., Suite 814
Asheville, NC 28801
JAGGreen.com
jody@jaggreen.com
Serving all of WNC, JAG Construction has the expertise, craftsmen and experience to bring green projects to life. Our focus is on Sustainable and Sensible home building to best meet each client's need

Mountain Sun Building & Design
Emily Boyd
828-713-0549
48 Beaverdam Knoll Road
Asheville, NC 28804
mountainsunbuilding.com
emily@mountainsunbuilding.com
With 15 years experience in all aspects of green home design and construction, MSB&D builds LEED, Green Built NC and ENERGY STAR homes. We take pride in quality craftsmanship and attention to detail.

Rare Earth Builders, Inc.
Mark Bondurant
828-492-0534 / Fax: 828-492-0534
105 Creative Cove Road
Canton, NC 28716
RareEarthBuilders.com
Mark@RareEarthBuilders.com
REB has been building green homes and renovations in Western NC since 1999. In tandem with home building, we build client trust with open financials, conscientious building details and great service.

SouthEast Ecological Design, Inc.
Kevin Ward
828-768-6448
503 Old Farm Road
Marshall, NC 28753
ecologicaldesign.net
info@ecologicaldesign.net
SEED is an ecological general contracting company and green design/build firm serving WNC since 1999. We are organized to approach land use and custom building holistically and sensibly.

Standing Stone Builders, Inc.
Dave Ulrichs
828-713-2771
80 Village Pointe Lane
Asheville, NC 28803
standingstonebuilders.com
daveulrichs@gmail.com
We are a hands-on, green, custom home builder based in Asheville, NC. Driven by a quality vs. quantity mentality, we give the homes we build unparalleled focus. We love our work and it shows!

Stewart Builders, Inc.
Mary Stewart
828-452-0056 / Fax: 828-452-5849
P.O. Box 83
Waynesville, NC 28786
stewartbuilders.net
marestew@gmail.com
LEED AP, Cert. Green Professional, Acc. Master Builder, Unlimited license, Res. & Comm. New & remodel. 20 years in WNC, outstanding reputation. Affordable luxury.

Sure Foot Builders, Inc.
Raymond Thompson
828-242-0925
11 Blanton St.
Asheville, NC 28801
surefootbuilders.com
surefootbuilders@gmail.com
We are a design and build firm currently focused on 900- to 3000-sqaure-foot homes in the Asheville area. Our business practice is focused on the home's value to the user and community through time.

Residential Designers

Earthtone Builders
Greg McGuffey
828-230-4469
12 Rich St.
Asheville, NC 28806
earthtonebuilders.com
earthtonebuilders@gmail.com
Builders of beautiful Green Homes here in the Asheville area for almost 10 years. We are a trusted company with great local references and 100 percent client satisfaction. Visit us online or give us a call.

McHugh Designs
Bobby McHugh
828-712-8451
McHugh-designs.com
Rebaloo@bellsouth.net
With affordable in-house design, proven craftsman building techniques, and the use of local timbers and materials this winner of the 2011 WNCGBC Project of the Year is ready to build your next home.

Mountain Sun Building & Design
Emily Boyd
828-713-0549
48 Beaverdam Knoll Road
Asheville, NC 28804
mountainsunbuilding.com
emily@mountainsunbuilding.com
With 15 years experience in all aspects of green home design and construction, MSB&D builds LEED, Green Built NC and ENERGY STAR homes. We take pride in quality craftsmanship and attention to detail.

SouthEast Ecological Design, Inc.
Kevin Ward
828-768-6448
503 Old Farm Road
Marshall, NC 28753
ecologicaldesign.net
info@ecologicaldesign.net
SEED is an ecological general contracting company and green design/build firm serving WNC since 1999. We are organized to approach land use and custom building holistically and sensibly.

Stan Jones Earthships
Stanley Jones
828-329-1641
P.O. Box 18935
Asheville, NC 28814
sdj0011@gmail.com

Restaurants

Dine Green Asheville
828-407-0679
Asheville, NC
dinegreenasheville.com
info@DinegreenAsheville.com
Asheville is America's First Green Dining Destination. FIND CERTIFIED GREEN RESTAURANTS

Reuse Retail

Asheville Area Habitat for Humanity ReStore
Scott Stetson
828-254-6706
31 Meadow Road
Asheville, NC 28803
ashevillehabitat.org
sstetson@ashevillehabitat.org
The Asheville ReStore sells donated items to the general public. Find building materials, appliances, furniture and much more. Proceeds support Habitat's building programs. Shop, Donate, Volunteer.

Roofers

Living Roofs, Inc.
828-252-4449
Asheville, NC 28803
livingroofsinc.com
info@livingroofsinc.com
LRI is a leading green roof and green wall installation company based in Asheville. We work with all types of projects. Please visit our website to see our work and to learn more about our services.

WATER SAVING TIPS FOR THE GARDEN

- Water in the early morning, when temperatures are cooler, to minimize evaporation.
- Collect and use rainwater for watering your garden.
- Direct downspouts or gutters toward shrubs or trees.
- Mulch plants and trees to retain water in the soil.
- Install a drip-irrigation system around your trees and shrubs to water more efficiently.

index of advertisers

Salvage

Asheville Area Habitat for Humanity

Joel Johnson
828-777-4158
33 Meadow Road
Asheville, NC 28803
ashevillehabitat.org
jjohnson@ashevillehabitat.org

Habitat's experienced Deconstruction team removes usable building materials from structures and sells them to the public in the Habitat ReStore. Proceeds support Habitat's building programs.

Site Work

Bob Callahan, LLC

Bob Callahan
720-260-0001
1070-1 Tunnel Road Suite 10-351
Asheville, NC 28805
casegreen.com
casegreenbob@gmail.com

Hands-on building by a perfectionist craftsman for the best in energy conservation (ENERGY STAR HERS<50 before renewables) and indoor air quality. Expertise, pride, accountability, integrity & quality

Jade Mountain Hardscapes

Hans Doellgast
828-216-3948 / Fax: 828-628-0978
85 B&B Stables Road
Fairview, NC 28730
Jademountainbuilders.com
Hans@jademountainbuilders.com

Jade Mountain Hardscapes is an ecologically minded foundation, grading, and hardscaping company. We specialize in stitching homes into challenging sites with bounders, timbers, and native plants.

Rare Earth Builders, Inc.

Mark Bondurant
828-492-0534 / Fax: 828-492-0534
105 Creative Cove Road
Canton, NC 28716
RareEarthBuilders.com
Mark@RareEarthBuilders.com

REB has been building green homes and renovations in Western NC since 1999. In tandem with home building, we build client trust with open financials, conscientious building details and great service.

V&V Land Management and Resource Recovery, LLC

Carrie Vogler
828-777-6637
P.O. Box 7
Del Rio, TN 37727
voglerllc.com
carrie@voglerllc.com

Planning and execution of sustainable property improvements including forestry mulching, driveway building and repair, boulder walls and dry-stacked masonry, tree services, consulting and mapping.

Structural Materials

High Country Timberframe and Gallery Woodworking

Tom Owens
828-264-8971 / Fax: 828-264-8787
P.O. Box 1858
Boone, NC 28067
highcountrytimberframe.com
timberinfo@highcountrytimberframe.com

High Country Timberframe designs & builds both timber framed & panelized homes to meet/exceed the most stringent energy efficiency and indoor air quality standards. Licensed General Contractors NC,SC,VA.

SUMhouse
Mark Barker
828-777-2430
113 Forest Hills Dr Drive
Black Mountain, NC 28711
sumhouse.org
mark.barker24@gmail.com

Surveyors

Kee Mapping & Surveying
Brad Kee
828-575-9021
P.O. Box 2566 Asheville, NC 28802
keemapping.com
brad@keemap.com
Kee Mapping & Surveying serves WNC with professional and comprehensive surveying services. We provide our clients with top quality products in a timely fashion and are dedicated to your satisfaction.

Sustainable Wood Products

Architectural Woodcraft, Inc.
Craig Weis
828-258-9977 / Fax: 828-258-2184
199 Amboy Road Asheville, NC 28806
architecturalwoodcraft.com
archwoodcraft@aol.com
Locally made cabinets, doors, and ENERGY STAR windows. Implementing green finishes and Bamboo sustainable and reclaimed woods. Restoration specialists.

Columbia Forest Products
Richard Poindexter, CGP, LEED AP BD+C
800-637-1609 / Fax: 336-605-6969
7900 Triad Center Drive, Suite 200
Greensboro, NC 27409
columbiaforestproducts.com
rpoindexter@cfpwood.com
North America's largest manufacturer of decorative hardwood plywood (including Old Fort, NC). FSC Certified. CARB & LEED Compliant. Innovator of soy-based formaldehyde free PureBond technology.

Sunrise Sawmill, Inc.
Don or Michelle Shuford
828-277-0120
68 West Chapel Road
Asheville, NC 28803
sunrisesawmill.com
sunrisesawmill@aol.com

WHOLE LOG LUMBER
Jim Stowell
828-697-0357 / Fax: 828-696-2938
688 Blueberry Farm Road
Zirconia, NC 28790
wholeloglumber.com
wholeloglumber@hughes.net
Reclaiming Antique Wood since 1984: WNC's OLDEST SUPPLIER! Specializing in Artisan Floors, Mantels and other components of fine wood interiors-including WOCA Penetrating,Hardening Oil.(VOC-free)

System Built Homes

Deltec Homes
Leigha Dickens
828-253-0483 / Fax: 828-232-4328
69 Bingham Road
Asheville, NC 28806
deltechomes.com
ldickens@deltechomes.com
We have produced energy-efficient, round homes for more than 40 years. Our homes are panelized in a controlled setting and provide a low-waste, high-performance structure.

DRA Living, Inc.
Kendra P. Turner, MPA
828-274-4699 / Fax: 828-274-4684
900 Hendersonville Road Suite 309
Asheville, NC 28803
draliving.com
info@draliving.com
DRA Living is committed to providing quality, custom & sustainable precision-built commercial & residential solutions to meet the needs of every customer and community. We demonstrate our dedication

Training

Green Opportunities
Torin Kexel
828-398-4158
220 Livingston St.
Asheville, NC 28801
greenopportunities.org
torin@greenopportunities.org
The GO Energy Team provides energy audits, building performance contracting and BPI certification trainings for industry professionals. We support a triple bottom line. People-Planet-Prosperity.

Southern Green Living Expo
Mandy Berger
828-255-2526
172 Charlotte St.
Asheville, NC 28801
southerngreenlivingexpo.com
mandy@southerngreenlivingexpo.com
The Southern Green Living Expo is an annual event showcasing the best of the Southern region's eco-friendly products and services, green opportunities, knowledge and success in sustainability and conservative environmental stewardship.

Wall System Installers

High Country Timberframe and Gallery Woodworking
Tom Owens
828-264-8971 / Fax: 828-264-8787
P.O. Box 1858
Boone, NC 28067
highcountrytimberframe.com
timberinfo@highcountrytimberframe.com
High Country Timberframe designs & builds both timber framed & panelized homes to meet/exceed the most stringent energy efficiency and indoor air quality standards. Licensed General Contractors NC,SC,VA.

MudStrawLove, LLC
Steve Kemble and Mollie Curry
828-775-4823
60 Alabama Ave. Asheville, NC 28806
mudstrawlove.com
connect@mudstrawlove.com
Since 1990-Homes of straw bale, cob, earthbag, slip-straw, adobe. Clay- and lime-based plasters, clay paint, earthen floors. Building projects, workshops, design services, consultation. Permaculture.

Water Conservation

Aqua Pro by Little Green Frog
Jason Rector
828-255-0772
115 A Elk Mountain Road
Asheville, NC 28803
aquaprosolutions.com
jason@aquaprosolutions.com

Filters For Tap
Edward Cortright
828-775-9174
174 Beverly Road
Asheville, NC 28805
filtersfortap.com
ed@filtersfortap.com
Ed is a certified water specialist providing water testing & water filtration solutions that are effective at protecting your health, reducing our water consumption & reducing our carbon footprint.

ONLINE ACCESS
You can also see the Green Home & Living Guide online at:
WNCGreenGuide.com

Windows & Doors

Architectural Woodcraft, Inc.

Craig Weis
828-258-9977 / Fax: 828-258-2184
199 Amboy Road
Asheville, NC 28806
architecturalwoodcraft.com
archwoodcraft@aol.com

Locally made cabinets, doors, and ENERGY STAR windows. Implementing green finishes and Bamboo sustainable and reclaimed woods. Restoration specialists.

Woodworkers and Cabinetry

Architectural Woodcraft, Inc.

Craig Weis
828-258-9977 / Fax: 828-258-2184
199 Amboy Road
Asheville, NC 28806
architecturalwoodcraft.com
archwoodcraft@aol.com

Locally made cabinets, doors, and ENERGY STAR windows. Implementing green finishes and Bamboo sustainable and reclaimed woods. Restoration specialists.

columbia FOREST PRODUCTS
PureBond HARDWOOD PLYWOOD

Columbia Forest Products

Richard Poindexter, CGP, LEED AP BD+C
800-637-1609 / Fax: 336-605-6969
7900 Triad Center Drive, Suite 200
Greensboro, NC 27409
columbiaforestproducts.com
rpoindexter@cfpwood.com

North America's largest manufacturer of decorative hardwood plywood (including Old Fort, NC). FSC Certified. CARB & LEED Compliant. Innovator of soy-based formaldehyde free PureBond technology.

Forward Construction, Inc.

Jim and Sue Forward
828-298-9532 / Fax: 828-298-2444
24 Smokey Road
Asheville, NC 28803
forwardconstruction.com
jtfbuilder@gmail.com

A family business serving the Asheville area for over thirty years, we offer conscious craftsmanship focused on attention to detail and customer satisfaction one project at a time

Gundersen Woodworking

Sten Gundersen
828-682-2406
36 White Flower Drive
Burnsville, NC 28714
stengund.com
stengundersen@hotmail.com

Full service architectural millwork (stairs, doors, moulding) timber-framing, cabinetry, wood countertops and furniture. 4-axis CNC router services for ultimate versatility, efficiency and precision.

Ironwood Studios, LLC

Thomas Gibson
828-423-0385
97-B Roberts St.
Asheville, NC 28801
ironwoodcustomcabinetry.com
tom@ironwoodstudios.org

Liberty Wood Products

Don Hill
828-524-7958 / Fax: 828-369-7652
874 Lotla Church Road
Franklin, NC 28734
LibertyWoodProducts.net
don@LibertyWoodProducts.net

SAGE Builders

SAGE Builders of WNC, Inc.

Doug Keefer
828-713-7208 / Fax: 828-683-1224
299 Morgan Branch Road
Leicester, NC 28748
thesagebuilders.com
info@thesagebuilders.com

SAGE Builders creates Sustainable, Appropriate, Green & Efficient (SAGE) homes. SAGE specializes in building hand-crafted homes using custom woodworking and solar designs.

Additional Resources

Asheville Home Builders Association

Caroline Sutton
828-299-7001 / Fax: 828-299-7001
14 Mimidis Lane
Swannanoa, NC 28778
AshevilleHBA.com
Info@AshevilleHBA.com

A trade association with 500+ members dedicated to promoting professionalism within the industry. A leading home building resource in WNC through education, networking and consumer events.

Progress Energy

Progress Energy

Dan Stancil
855-679-4906
P.O. Box 31192
Raleigh, NC 27622
progress-energy.com/newhomes
newhomesupport@mascohs.com

Progress Energy's Residential New Construction Program provides cash rebates to builders and developers who build energy-efficient homes and multi-family residences in the company's service area.

SOUTHERN GREEN LIVING EXPO

Southern Green Living Expo

Mandy Berger
828-255-2526
172 Charlotte St.
Asheville, NC 28801
southerngreenlivingexpo.com
mandy@southerngreenlivingexpo.com

The Southern Green Living Expo is an annual event showcasing the best of the Southern region's eco-friendly products and services, green opportunities, knowledge and success in sustainability and conservative environmental stewardship.

glossary

Advanced Framing: Framing techniques that use less lumber, thereby reducing material cost and use of natural resources, and increasing the level of insulation as a result. Also known as Optimum Value Engineering. (9)

Air Barrier: A rigid material installed around a building frame to prevent or reduce the infiltration of air into the interior of a structure. To improve energy efficiency by maintaining conditioned air inside the home and improving the efficacy of insulation, an air barrier is installed. Air barriers are not vapor barriers. (1)

Air Infiltration: Uncontrolled inward air leakage to conditioned spaces through unintentional openings in ceilings, floors and walls from unconditioned spaces or the outdoors. (2)

Batt Insulation: The most common and widely available type of insulation. It comes in the form of pre-cut blankets or rolls and consists of flexible fibers, most commonly fiberglass, but is also available in cotton. It's held together with a binder. (10)

Building Envelope: The exterior surface of a building's construction: the walls, windows, floors, roof and floor. Also called building shell. (2)

Cellulose Insulation: A blown-in insulation material that is a mixture of waste paper and fire retardant. It high in recycled content, has no added formaldehyde and is blown in for easy installation around obstacles in the wall cavity. (2)

Combustion Safety: For health and safety, locate combustion appliances outside of the conditioned envelope or use sealed or direct combustion appliances. Provide carbon-monoxide monitoring. (3)

Daylighting: The controlled admission of natural light into a space through glazing with the intent of reducing or eliminating electric lighting. Daylighting creates a stimulating and productive environment for building occupants. (2)

Energy Modeling: Process to determine the energy use of a building based on software analysis. Can be used to provide a cost-benefit analysis with upgrades for energy efficiency. (2)

Engineered Lumber: Composite wood products made from lumber, fiber or veneer, and glue. These products can be environmentally preferable to dimensional lumber, as they allow the use of waste wood and small-diameter trees to produce structural building materials, but can also increase off-gassing into the home. (2)

Fly Ash: A fine, glass powder recovered from the gases of burning coal during the production of electricity. Fly ash can be used to replace a portion of cement in the concrete, providing some distinct quality advantages. (2)

Forest Stewardship Council (FSC): A third-party certification organization, evaluating the sustainability of forest products. FSC-certified wood products have met specific criteria in areas such as forest management, labor conditions and fair trade. (2)

Formaldehyde: A colorless, pungent and irritating gas. H2C0 is used chiefly as a disinfectant, preservative and in synthesizing other compounds like resins. It is the component of many types of glue in wood products and may cause respiratory problems. (2, 3)

Graywater Reuse: A strategy for reducing wastewater outputs from a building by diverting the graywater into productive uses such as subsurface irrigation, or on-site treatment and use for nonpotable functions such as toilet flushing. Graywater includes water from bathtubs, showers, bathroom wash basins, and water from clothes-washer and laundry tubs. (2)

Greenguard: Certification that a product meets emission thresholds for formaldehyde, total aldehydes, total volatile organic compounds (TVOCs), and one-tenth of the threshold limit value (TLV) — a regulatory standard — for many other compounds. The program also assesses emissions of other chemicals of concern. (7)

Green Label: A certification program by the Carpet and Rug Institute for carpet and adhesives meeting specified criteria for release of volatile compounds. (2)

Green Seal: A nonprofit that has certified products to an environmental standard since 1992. Green Seal now provides third-party certification for a wide range of products, including paints, adhesives, lamps, chillers, windows, cleaners and occupancy sensors. (7)

Green Roof: Green roofs maintain living plants in a growing medium on top of a membrane and drainage system. Green roofs are considered a sustainable building strategy in that they have the capacity to reduce stormwater runoff from a site, modulate temperatures in and around the building, have thermal insulating properties, can provide habitat for wildlife and open space for humans, and provide other benefits. (2)

Ground Source Heat Pump: A heat pump that uses the ground temperature instead of air temperature to cool or heat a home. Usually this is accomplished with underground water pipes that transfer the ground temperature into the heat pump. (3)

Heating, Ventilation and Air Conditioning (HVAC): General term for the heating, ventilation and air-conditioning system in a building. System efficiency and design impact the overall energy performance of a home and its indoor environmental quality. (2)

Heat Recovery Ventilator: An air-to-air heat exchanger with balanced exhaust and supply fans that is an energy-efficient way to meet necessary ventilation needs without producing drafts or air pressure imbalance on a heating or cooling system. (2)

Indoor Air Quality (IAQ): The nature of the air inside the space that affects the health and well-being of building occupants. IAQ is heavily influenced by both choice of building materials (and cleaning procedures) and ventilation rates. (1, 2)

Infill: Developing on empty lots of land within an urban area rather than on new undeveloped land outside the city. Infill development helps prevent urban sprawl and can help with economic revitalization. (1)

Insulated Concrete Forms (ICF): This wall structural system provides a strong and well-insulated wall system by using blocks fabricated from rigid insulation to create permanent forms for a poured concrete core. (3)

Kilowatt-hour (kWh): A measure of energy equal to the amount of power multiplied by the amount of time the power is used. It is most often used to describe amounts of electrical energy. A 100-watt light bulb burning for 10 hours uses one kilowatt-hour of power. (3)

Load Calculation: A heat-gain-and-loss calculation necessary to properly size the heating and cooling equipment to adequately and efficiently provide comfort and dehumidification for a particular building. Room-by-room load calculations should be performed, taking into account actual insulation levels, windows, building orientation, number of occupants, system location, air tightness, etc.

Low VOC: See "Volatile Organic Compound" for more information. (2)

Minimum Efficiency Reporting Value (MERV): A number from 1 to 16 that is relative to an air filter's efficiency. For the cleanest air, a user should select the highest MERV filter that their unit is capable of forcing air through, based on the limit of the unit's fan power. (4)

Mixed-Use Development: A development that includes diverse use types, including elements of housing, retail and office space. (1)

Net Metering: A metering and billing arrangement that allows on-site energy generators to send excess electricity flows to the regional power grid. (2)

Passive-Solar Homes: Homes optimally designed to take advantage of the sun for heating in the winter and are shaded with an overhang, trellis etc. in the summer and swing months. These homes have calculated amounts of thermal mass (concrete, tile, stone etc.) and glass, insulation for the window "collectors," and their solar features are oriented to the south. A passive-solar home is one in which the building itself is the solar collector and heat-storage system. (3)

Payback Period: The time estimated for a capital investment to pay for itself, calculated by relating the cost of the investment to the profit it will earn or savings it will incur. (1)

Performance Contracting: A contracting service that provides customers with a comprehensive set of energy-efficiency, renewable-energy and distributed-generation measures and often comes with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project. (11)

Pervious Paving: Paving surfaces designed to allow water infiltration and reduce stormwater runoff. (2)

Photovoltaics (PVs): Solid-state cells (typically made from silicon) that directly convert sunlight into electricity. (1)

R-value: A unit of thermal resistance used for comparing insulating values of different materials; the higher the R-value, the greater it's insulating properties. (2)

Radiant Barrier: A material (typically an aluminum foil) that is good at blocking the transfer of radiant heat across a space because it has a low emissivity. In a hot climate, it is often installed in attics under the roof decking to keep the attic cooler. (1)

Radiant Floor Heat: A thermal mass floor with pipes laid underneath to transfer heat generated either by a solar collector or other type of liquid heating system. (3)

Radon: A colorless, naturally occurring, radioactive, inert gas formed by radioactive decay of radium atoms in soil or rocks. When trapped in buildings, concentrations build up, and can cause health hazards. (1, 2)

Rainwater Catchment/Harvest: On-site rainwater harvest and storage systems used to offset potable water needs for a building and/or landscape. (2)

Rain Garden (Bioretention): A landscape feature that incorporates deep porous soils and specially designed plantings to gather, store and treat stormwater. (3)

Rapidly Renewable Materials: Material that is considered to be an agricultural product that takes 10 years or less to grow or raise and to harvest in an ongoing and sustainable fashion. Examples include bamboo flooring, biocomposite veneers, fiber-based finishes, wool and cotton insulation. (2, 3)

Recycled Content: The content in a material or product derived from recycled materials versus virgin materials. Recycled content can be materials from recycling programs (post-consumer) or waste materials from the production process of an industrial/agricultural source (post-industrial). (2, 3)

Retrofit: The replacement, upgrade or improvement of a piece of equipment or structure in an existing building or facility. (1)

Salvage: Building materials diverted from the waste stream intended for reuse. Commonly salvaged materials include structural beams and

posts, flooring, doors, cabinetry, brick and decorative items. (2)

Scientific Certification Systems (SCS): A third-party assessment body that offers evaluation and certification services to a broad range of manufacturing sectors. Their Eco Product Certifications include: Environmentally Preferable Products, Sustainable Choice, four Indoor Air Quality Certifications and Material Content. (8)

Seasonal Energy Efficiency Ratio (SEER): The measure of the energy efficiency for air conditioners and the cooling side of heat pumps. The higher this number, the better, with code being 14 SEER. (1)

Solar Electric Systems: Electricity-producing systems that directly convert the sun's energy into electricity. Photovoltaic systems consist of solar panels, an inverter and controller, and are either off grid or grid tied. (1)

Solar Heat Gain Coefficient (SHGC): The fraction of solar radiation admitted through a window or screen, both directly transmitted and absorbed, and subsequently released into the living space. (1)

Solar Thermal Systems: Energy-producing systems that gather the sun's radiant energy to heat air or water for use as domestic hot water or space heating.

Spray Foam Insulation: The insulation is applied as a liquid that is sprayed through a nozzle into wall, ceiling and floor cavities, where it expands to fill every nook and cranny. Spray foam insulation makes it easy to completely fill wall cavities with insulation and to perform air sealing in the same step. (9)

Stormwater Management: To protect the local ecology and hydrology, limit and control stormwater runoff by providing for on-site storage and filtration. Pervious pavement systems, reduced amounts of impervious pavement (concrete, asphalt), rainwater collection, green roofs, rain gardens (bioretention) and constructed wetlands are methods to accomplish this. (3)

Straw-Bale Construction: Alternative building method using bales of straw for wall systems in place of standard construction materials. (2)

Structural Insulated Panel (SIP): Manufactured panels consisting of a sandwich of polystyrene between two layers of engineered wood paneling. SIPs can be used for walls, roof or flooring, and result in a structure very resistant to air infiltration. (2)

Thermal Mass: A mass (often stone, tile, concrete or brick) used to store heat and reduce temperature fluctuation in a space by releasing heat slowly over time. Used in passive-solar design. (2, 3)

Universal Design: The design of products and environments that are usable by all people, regardless of age or physical ability, to the greatest extent possible, without adaptation or specialized design. (6)

Ventilation: The process by which outside air is conveyed to an indoor space. Energy-efficient homes must be air tight, but to maintain healthy indoor air it is necessary to provide controlled fresh air to the building interior at recommended rates. (2, 3)

Volatile Organic Compound (VOC): Carbon compounds that become a gas at normal room temperatures. This class of chemical compounds can cause nausea, tremors, headaches and, some doctors believe, long-lasting harm. VOCs can be emitted by oil-based paints, solvent-based finishes, formaldehyde-laden products and other products on or in construction materials. (2, 3)

WaterSense: Modeled after Energy Star, the EPA's new water-efficiency program seeks to educate consumers about water efficiency through an easily identifiable logo. Products include fixtures, faucets, showerheads, irrigation systems and toilets. WaterSense differs from Energy Star in that a product's conformance to EPA standards must be independently tested before qualifying for the label. (7)

Wind Power: Systems that convert air movement into mechanical or electrical energy. Driven by the wind, turbine blades turn a generator or power a mechanical pump. Wind generators include a tower and wind turbine, and can be off-grid or grid-tied. (2, 3)

Xeriscaping: Landscaping design for conserving water that uses drought-resistant or drought-tolerant plants. (2)

Sources:

(1) Sourcebook Glossary, www.austinenergy.com/Energy Efficiency/Programs/Green Building/Sourcebook/sourcebookGlossary.pdf

(2) City of Seattle, www.cityofseattle.net/dclu/GreenBuilding/OurProgram/Resources/Greenbuildingglossary/default.asp

(3) 2007 N.C. Sustainable Energy Association's Tour Book

(4) www.filterair.info/articles/article.cfm/ArticleID/7AF95A61-EAF8-4C90-BFA98EE-04B0DD02B

(5) Environmental Building News, "Defining Recycled Content," December 2008, www.buildinggreen.com/auth/article.cfm/2008/11/24/Defining-Recycled-Content/

(6) www.universaldesign.org/universaldesign1.htm

(7) Environmental Building News, "Behind the Logos: Understanding Green Product Certifications," January 2008, www.buildinggreen.com/auth/article.cfm?filename=170101a.xml&printable=yes

(8) www.scscertified.com/ecoproducts/

(9) www.toolbase.org

(10) http://apps1.eere.energy.gov/consumer/your_home/insulation_airsealing/index.cfm/mytopic=11520

(11) www.energystar.gov/ia/partners/spp_res/Introduction_to_Performance_Contracting.pdf

Let the *Beauty*
we love be what we do.
there are hundreds
of ways to kneel and
kiss the ground. – *Rumi*

Floors • Custom Doors • Stairs and Stairparts
Mantels, Beams and Timbers • Paneling
Trims and Casings • VOC-free finishing

Whole Log LUMBER COMPANY
Antique Wood Specialists

688 Blueberry Farm Rd.
Zirconia, NC 28790
828.697.0357
www.wholeloglumber.com

ARTISAN FLOORS AND RECLAIMED WOOD INTERIORS • SELLING "GREEN" SINCE 1984

ENERGY EFFICIENCY

it's a beautiful thing.

BLUE RIDGE
ENERGY SYSTEMS

Naturally better homes.
EST. 1977

The homes we build are wonders to behold. But what you may find most attractive is this: they can be heated and cooled for approximately $200 annually. We'd be delighted to show you how our super energy efficient, incredibly comfortable and easy-to-maintain homes can be built for the same price as conventional construction.

Visit us at BlueRidgeEnergySystems.com or call (828) 775-8665.

INSPIRING DESIGN. EXTRAORDINARY EFFICIENCY. ASTONISHING AFFORDABILITY.