
20TH ANNIVERSARY
GREENBUILT ALLIANCE
2001-2021
GREEN BUILDING DIRECTORY 2021-22
20/20 Vision
Using Lessons of the Past to Inspire Possibilities of the Future
Blueprints for Going Green
New Green Built Homes Checklist Clarifies Steps to Better Building
Climate-Conscious Buildings with Low Embodied Energy
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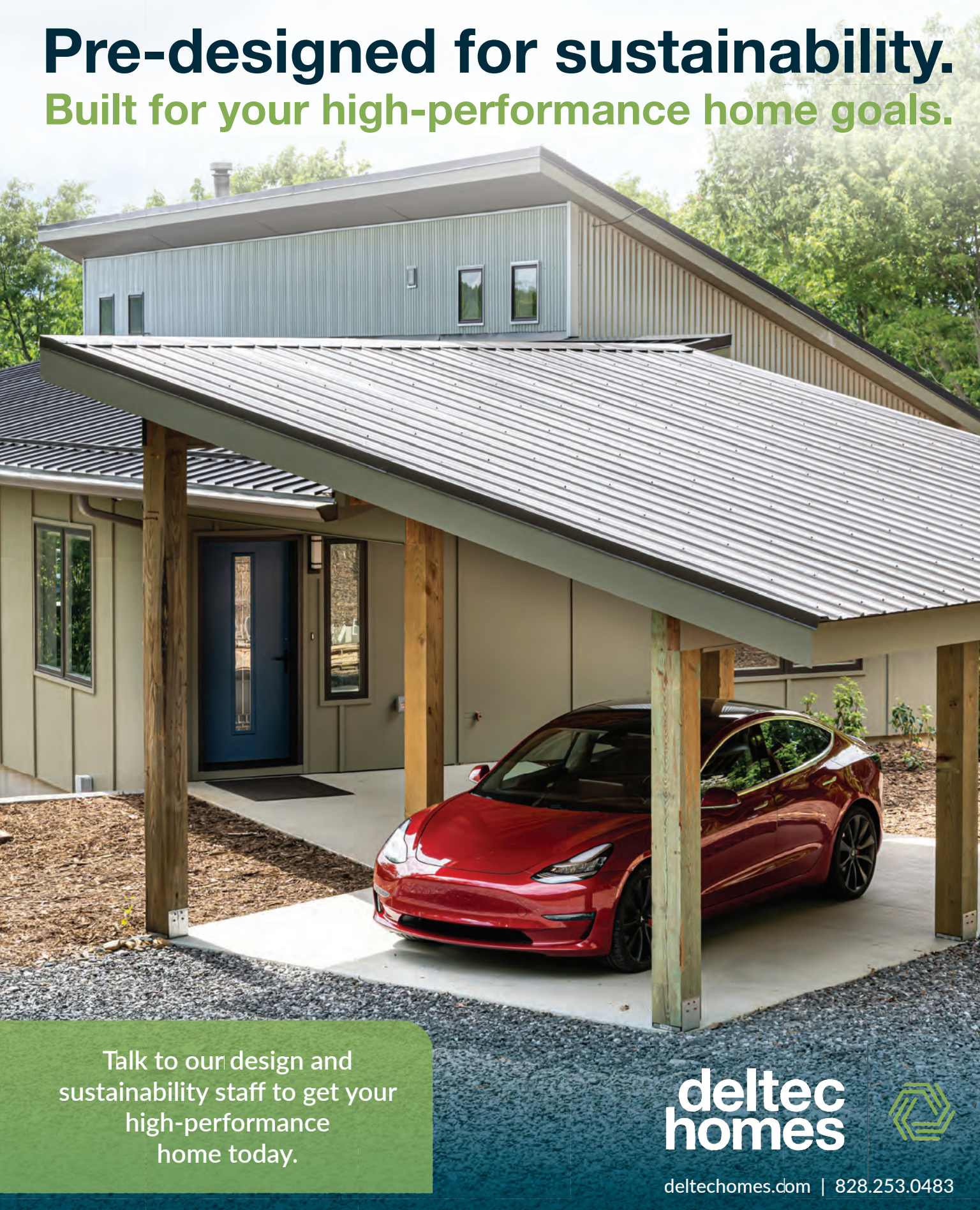

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Inside

Dedication

After nearly two decades of involvement, longtime Green Built Alliance staff member Maggie Leslie decided this year to make a change and move on to new adventures.

Maggie was one of the early volunteers who helped grow the Western North Carolina Green Building Council (the legacy organization that is now Green Built Alliance). She became a board member in 2003 and served as treasurer. Maggie kept the books, planned tours, and helped with the certification program on a volunteer basis over the next three years. In 2006, Maggie became the director of the Green Built Homes certification program. Maggie has been the glue that held our organization together through a recession, major program and name changes, extensive growth, new employees and a pandemic.

She has made an indelible impact on growing our organization as well as the sustainability of buildings not only here in our region but across the entire state of North Carolina. We wish you well Maggie, and will always be deeply grateful for your loyalty and dedication.

STAFF

Sam Ruark
EXECUTIVE DIRECTOR

Cari Barcas
COMMUNITY ENGAGEMENT DIRECTOR

Josh LittleJohn
GREEN BUILT HOMES PROGRAM MANAGER

Sophie Mullinax
BLUE HORIZONS PROJECT MANAGER

Beatrice Nathan
BLUE HORIZONS PROJECT COORDINATOR

Kelvin Bonilla
ENERGY SAVERS NETWORK PROJECT MANAGER

Steffi Rausch
ENERGY SAVERS NETWORK OPERATIONS COORDINATOR

Daniel Suber
ENERGY SAVERS NETWORK CREW MEMBER

Hannah Egan
OUTREACH AND RESOURCE COORDINATOR

Amber Gilot
BOOKKEEPER

On the Cover

Robin Cape and Bruce Kelly converted this 1977 ranch into a low-energy, high-performance homestead. Cape and her daughter, Lucy Ballentine, tend their garden of perennials, vegetables and small fruits. The home also has 33 solar panels and a 3,000-gallon rainwater collection system.

A SHOT ABOVE PHOTO

Published in partnership with
The Smoky Mountain News

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GREENBUILT ALLIANCE

2021 BOARD OF DIRECTORS

Robin Cape
CHAIR
Bold Mountain Team at Nest Realty
The efforts we make today for a more sustainable community will have a huge impact on the future. Green Built Alliance supports real world investments in that future with our work.

Rob Johnson
VICE CHAIR
JAG Construction
I share the vision of making green building the baseline for residential construction in our region and beyond.

Leesa Childress Sluder
TREASURER
Earth Equity Advisors
Green Built Alliance highlights the theme of using business as a force for good in the world, and helps fight climate change through earth-friendly practices.

Jamie Shelton
SECRETARY
SouthLight Builders
It's a pleasure and a necessity to support an organization that's doing so much to move our community's buildings in a more sustainable and healthier direction.

Chrissy Burton
Fisher Architects
Green Built Alliance's programs serve diverse groups within our community and respond to its unique needs. We are building a brighter environmental future together.

Paul Capua
Capua Law
Green Built Alliance does so much to support sustainability in our community, and I feel privileged to work alongside the other board members to continue that mission.

Santiago Cely
Homeward Bound of WNC
I believe our built environment must be not only affordable in financial terms but most importantly environmentally affordable.

Leigha Dickens
Deltec Homes
Green Built Alliance is a critical hub of sustainable building knowledge and culture, both of which are critical to a widespread adoption of more sustainable buildings in our region.

Stephens Smith Farrell
Architect
Green Built Alliance does more to mitigate climate change and promote social justice than any other organization of its size and, in fact, more than many much larger organizations.

Susannah Horton
Landscape Architect

Talbott Ingram
Gentry Heating
I aim to help Western North Carolina create healthy and efficient spaces for all.

Mary Love
Love The Green Real Estate Consulting
Green Built Alliance's dedication to educating the general public, contractors, realtors, and fellow nonprofits is why I am a loyal supporter.

Alesha Reardon
Buncombe County Schools
I enjoy being a part of the Green Built Alliance board because it allows me to play a more integral role in green building, energy efficiency, and sustainability in our community.

Raymond Thompson
Sure Foot Builders
I enjoy imagining a clean comfortable life for my children to grow and thrive in. Green building is part of that imagination, which is why I'm here doing this.

Deborah Wright
A-B Tech
We have to leave a better planet for our kids and the next generation to enjoy. Being affiliated with Green Built Alliance is a great way of being a part of that promise.

Ben Yoke
Sugar Hollow Solar
We don't have the right to despoil the environment that future generations must inherit.

Thanks to our board for their leadership, guidance and support!

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Welcome to the Directory

Green Built Alliance has now been serving Western North Carolina for more than 20 years. Looking at it another way, that's more than 240 months, 1,042 weeks, 7,300 days, or 175,200 hours.

Time is a funny, elusory thing. Some days seem to stretch indefinitely, while in retrospect, the years still slip through our fingers. Some of us feel especially aware of this contradiction now, having spent the majority of the past two years in a pandemic during which time seemed to simultaneously drag on forever and fly by in the blink of an eye.

Our nonprofit's staff has been reflecting on the passage of time this year more than most as Green Built Alliance marks the milestone of its 20-year anniversary.

For those of you who have been with us since the beginning or for many years now, thank you for your ongoing involvement and enduring support. For those of you who have only come to know us in recent years or perhaps even just now in this directory reading, we're glad you're here.

New connections and long-time supporters alike may enjoy taking a walk down memory lane to reflect on the history of Green Built Alliance and the way we've grown over the recent decades through an article on page 40.

Much has changed over the past two decades since our organization got its start, and yet our commitment to our original mission of "promoting environmentally sustainable and healthy building practices through community education" has never wavered.

Highlights from this year

As we marked the start of our 20th anniversary year, **Green Built Homes** officially rolled out Version 3.0 of its certification checklist in January 2021. Updated and revised to stay current with changing building codes and increase simplicity for participants, the program now places more emphasis on regenerative elements, including the addition of a Net Zero Water Ready Certification and a pilot Regenerative Certification.

For a look at some of the past year's most innovative projects, including the Appalachian State University residence halls that brought our program across the 2,000-certification milestone, explore the eight case studies on recent Green Built Homes certifications from pages 14 to 31.

In the spring of 2021, we celebrated a moment six years in the making as the much-anticipated solar electric system was installed on the roof of Asheville's Isaac Dickson Elementary School, thanks to a community fundraising campaign led by our Appalachian Offsets program. For more on this project and what's next for **Appalachian Offsets**, read the article on page 62.

Our **Blue Horizons Project** has stayed busy throughout this year running its Solarize Asheville-Buncombe campaign, which aims to increase the region's adoption of and access to affordable solar installations. With innovative components including funding free solar systems for limited-income families and supporting workforce development, the Solarize Asheville-Buncombe campaign is featured in an article on page 50.

Also under the Blue Horizons Project umbrella, our **Energy Savers Network** program has begun work to make efficiency improvements on 1,000 homes over the next year through a partnership with the Housing Authority of Asheville. For more information on this effort and ways to get involved, read the full story on page 60.

Hopes for the future

The past couple of years have looked very different from what most of us expected for the start of this new decade. From the emergence of a global pandemic to the acceleration of the climate crisis, it can feel challenging to process the maelstrom confronting our communities.

These are turbulent times to be sure, and yet having the resilience to hold on to hope is key to our ability to stay engaged for the future. Despair paralyzes, while hope energizes.

Although it may not be happening as fast as many of us would like, electrification and renewables are increasingly a part of our new normal. New generations of leaders are driving efforts to help shift the conversation and inspire action.

As we sit poised at this infection point, we have tools within each of our personal power to make a difference. With U.S. buildings accounting for 40 percent of our country's total energy use and carbon emissions, we know that our homes and workplaces are excellent places within each of our agencies to implement improvements.

Whether we are in the privileged position of being able to choose to build a new home in a green way from the ground up, or simply have the chance to make the meaningful small and steady sustainable upgrades to our existing houses, the homefront is one place where we all can effect positive change.

Actions taken individually and collectively in these crucial decades ahead can make a difference, and we still have the opportunity to correct our course. We must not squander this opportunity to do everything in our power to benefit our planet and the generations to come.

20/20 vision

This is an interesting moment in which to be celebrating our organization's 20-year anniversary.

Two decades ago, our founders were ahead of their time as their foresight brought this nonprofit to life. Two decades from now, our community will be heading into 2042, the year by which the City of Asheville and Buncombe County have committed to completing a community-wide transition to 100 percent renewable energy with the help of our nonprofit's Blue Horizons Project program.

As the need for green building has become more urgent and obvious in the past two decades, the truth of these words from the introduction of our first Green Building Directory published in 2002 has grown even clearer: "The growth and development of our cities and communities has a major impact on our environment. How and where we build is one of the most important factors in our future health and happiness."

Today, we look back at our founders with gratitude for their prescience and perseverance in charting a new course and imagining the promise of a more sustainable future for our community. We hope in 20 years from now, we'll be able to look back on the coming decades with the knowledge that we continued to rise to the challenge and did everything we could do to meet the moment.

This is all of our shared work. Green Built Alliance is grateful and humbled to be partnering with each of you in advancing sustainability in the built environment and preserving this planet we call home.

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greenbuilt.org facebook.com/greenbuiltorg instagram.com/greenbuiltorg twitter.com/greenbuiltorg

Climate-Conscious Building

Creating a Net-Zero Home with Low Embodied Energy

The view of 16 North Belgium Lane from the deck side. DON NICHOLSON PHOTOS

BY DON NICHOLSON

Becky and Noell Tin split their time between Asheville and Charlotte with work projects in both cities, and 16 North Belgium Lane in West Asheville was planned as their second home.

After struggling to find a home within the existing Asheville stock that had the size and configuration they needed, they saw available land in the net-zero subdivision we are developing at Green Path Commons and were intrigued by our strong personal commitment to climate action.

The Tins had been sympathetic to actions that curb climate change, but had not studied the topic in depth. Central to their decision to have us design a net-zero home for them were the climate concerns expressed by their children.

They approached net-zero building as a grand adventure; their enthusiasm matched ours. They learned the nuances of the home's envelope, thermal bridging, heat pumps, and the importance of a home's basic energy efficiency relative to that of rooftop solar.

We worked with them to design a small 850-square-foot house that flows seamlessly to the deck, yard, and adjoining community garden and pavilion. Their experience illustrates how important it is for builders to introduce their clients to the merits of energy-efficient homes and enlist them to spread the word.

Our longstanding approach to energy efficiency — LED lights, ENERGY STAR®-certified appliances, mini splits with high SEER (seasonal energy efficiency ratio of 33) and HSPF (heat seasonal performance factor of 14), heat pump water heater, heat pump dryer, R-30 walls and R-65 ceiling — gave the project a Home Energy Rating System (HERS) Score without solar of 28.

The solar photovoltaic (PV) system on the roof brings the HERS down to 1. The elements work together; the thermally tight envelope allowed us to use just two small single-head mini splits. This is possible because heat has time to diffuse from room to room before slowly dissipating through the walls and ceiling. A small PV array of 3.55kW is needed to power the home.

We decided to support the house on helical piles instead of concrete footers. Helical piles are stout galvanized steel pipes with a twist of steel plate at the end (15-inch diameter). The pile is like a giant twist drill bit that can be screwed into the ground by a track hoe with a torque drive. They are often used for poor soils, such as fill dirt. Our soil is great soil, so why use helical piles? Concrete foundations contribute significantly to greenhouse gas; steel is less offensive. The end of life for a helical pile is to be unscrewed and reused or recycled.

Helical piles affect the work site in a positive way. Even before finalizing the house plan, we graded then seeded the sloping lot to provide a building area. The process was clean, automatic and systematic. We had a nice area with U-brackets sticking up every eight feet, ready for girders, and no piles of dirt.

The 700-square-foot deck looks towards the community garden. Our target was to integrate the home with this setting. We

Project Team

Builder — Nicholson and Sun
Helical Piles — Goliath Tech WNC
Engineering — Engineering Support Services
Solar Contractor — C.M. Wilson Inc.
Insulation — Pisgah Insulation
HVAC Contractor — General Heating & Air Conditioning
HVAC Equipment — R. E. Michel
Electrical — Crown Electric
Heat Pump Water Heater — Victory Plumbing
HERS Rater — Vandemusser Design

Video Tour

Watch a video tour of of this home at greenbuilt.org.

kept the deck low; no railing required. A low deck results in a low but critical crawl space. The ground in the insulated crawl space gives a source of heat for the heat pump water heater (HPWH). A HPWH has a carbon footprint that is a quarter that of either a gas or a typical electric water heater.

To support a low-pitch roof, we stand sheathed 2x4, 24-inch o.c. perimeter walls and span them with plywood I-beams. To accelerate this stage, we use 24-inch-by-24-inch windows that require neither jack studs nor headers. Every eliminated stud improves thermal resistance. It's a waterproof empty box; a perfect arrangement for checking the whole envelope and making it into an airtight volume.

The walls are R-15. The stud bays are free of any obstacles and insulating is very fast. We cover the insulated wall with 6-mil poly caulked at top and bottom.

Readers may be alarmed at the mention of a plastic vapor barrier because of condensation problems that plagued some homes. This is totally different; the vapor barrier is sandwiched between two layers of R-15 where the temperature is always moderate, and not cold enough to result in condensation.

We built a second R-15 interior perimeter wall. The underside of the roof and the band are sprayed, 2.5 inches of closed cell foam, and R-49 fiberglass batts go in. The spray foam seals the top of the poly. Sealing penetrations in the subfloor makes the envelope almost free of infiltration except at doors and windows. The home has six doors; to maintain low infiltration, all windows are fixed glass.

The home has an air change per hour, ACH50, of 1. Considering that the house is long and small, this is an excellent value. It is much easier to get a low ACH50 on a large blockish home because it has much more air volume, yet it doesn't have much more in the way of exterior surface, doors, and windows.

The house is topped with 3.55kW of bifacial PV. Most PV has photo active layers on one face and the other is opaque; bifacial PV has active layers on front and back. We were eager to gain some experience with bifacial even though its application on this home, flush mounted on the roof, will generate only a small additional amount.

Adopting heavy insulation allows us to take advantage of single-head mini splits. We use only two mini splits to heat five rooms; because of the performance of the thermal envelope, the heat has plenty of time to diffuse from room to room before it slowly diffuses to the outside.

If we can source them, we will switch to R-13 cellulose batts. Cellulose is superior to fiberglass; it has a negative carbon footprint. Unfortunately, batts are not available locally; they are available by the truckload from Michigan.

The Green Built Homes rating system does not assign points for low embodied energy, but does offer credit for calculating and offsetting it. Embodied energy relates to the greenhouse gases generated in making the stuff a home is composed of; for example, concrete, wood, appliances, and solar panels. It is very hard to evaluate embodied energy. It is this author's policy position that there should be a federal carbon price, which would give a market signal informing builders about the carbon footprint of materials. (Learn more at energyinnovationact.org.)

Small homes use less energy to operate and take less energy to build, and their materials have lower embodied energy. Is this reflected by HERS? No! A big home with a low HERS Score can use more energy than a small home with a high HERS Score. Net zero, as a designation, is an equalizer between big and small homes, and this project achieved Green Built Homes' Platinum Net Zero level of certification.

Climate alarms are sounding louder and louder. It is imperative to reduce the size of our homes, reduce embodied energy, and promote net zero.

Don Nicholson is retired from Oak Ridge National Laboratory, where he was a theoretical physicist for thirty years. He continues to work in that field as a research professor in the Department of Physics and Astronomy at the University of North Carolina Asheville. In 2015, he and his son, Donald, formed Nicholson and Sun, a residential building company dedicated to climate solutions. Connect with Don at nicholsonandsun.com.

The view from the deck.

David Nicholson and Don Nicholson discuss the U-brackets attached to the helical piles.

At this point, the house is a waterproof, airtight box. Note the staggered stud wall with sandwiched air barrier.

A House of the Hill

The Value of Site Integration in Sustainable Residential Development

BY CARRIE VOGLER

It was May 2014 when we first received an inquiry about forestry mulching a building lot in Weaverville to clear unwanted brush and invasive vegetation.

Forestry mulching is a unique technology for mechanically grinding the vegetation into mulch without disturbing the topsoil.

On this property, the work uncovered steep uneven terrain with large protruding boulders and lots of water, primarily crossing the site in two rocky drainages, but also oozing out of the mountainside after rainfall. The walkable area comprised less than a quarter of an acre, but clearing the understory revealed enough to allow the process of site development and house design to begin.

As specialists in residential site development, it is common for us to find that owners and builders become "house centric," focusing primarily on the more tantalizing details of the home such as kitchens and bathrooms.

In reality, the greatest impact a new home can have on the environment and on its occupants lies in its site integration.

The planning of the location, orientation, altitude of the house and the impact area affects everything about how the home is experienced; from vehicular approach, parking, entrance and exit, stairways, drainage, gutter tie ins, privacy, foot access around the house, and landscaping, to solar and wind exposure and more.

In the mountains, technical site preparation becomes a significant part of a building budget, and must be thoroughly explored during the planning process. The commonplace method of cutting a wedge out of the mountain to create a flat spot is a poor strategy that often leads to problems around the house; poor drainage and failing cut slopes behind the home, and landslides resulting from poorly compacted fill slopes are far too common.

One of our long-time company mantras sums it up well: "If you tear up a mountainside to build it, it's not green built."

The client was very specific about a few features of the project.

It would be an owner/contractor-built house large enough to accommodate the in-laws when that time came, and designed to look old and rustic, appearing as a natural part of the landscape rather than an imposition upon it.

He wanted a home with the highest possible efficiency rating including certification through Green Built Homes and LEED for Homes, as well as ADA compliance to allow for aging in place. A separate three-car garage with office space above also had to be integrated into the site.

The initial team assembled in 2016 included the geotechnical engineer, landslide geologist, civil engineer, grading specialists, architect and builder.

Once the landslide assessment came back on the acceptable end

"No house should ever be on a hill or on anything. It should be of the hill. Belonging to it. Hill and house should live together, each the happier for the other."

— Frank Lloyd Wright

This water feature was an opportunity to capture and enhance water flow, while adding leisure space. V&V LAND MANAGEMENT PHOTOS

The property is pictured here prior to the beginning of site work.

An engineer visits to discuss the retention of the upper driveway and the effect on water flow.

of the scale, the civil engineer provided the site design showing protection of the watershed and creeks, limiting the disturbance to improving the driveway access and the immediate building area. An existing logging road was improved, creating a circular driveway to assist the flow of construction vehicles through the building site; space was at a premium. The remainder of the property was to stay in its natural state: hardwood forest with meandering game trails and plenty of boulders.

Mature trees, including poplars and white pines, were cut from the building footprint and taken off-site for milling and kiln drying to be used in the finished house for beams, trim and paneling.

The structural retention required on this site was extensive in order to accommodate the grade of the property without an unnecessarily expansive disturbance zone. In order to maintain the desired aesthetic, all but one of the retaining walls were constructed using traditional dry-stack techniques, with a more cut-and-clean finish closer to the house, and more rustic boulder-stacked retention walls along the driveway access. The ancient dry-stack technique requires considerable skill, but allows for a greater base thickness to the walls, as well as excellent handling of settling and drainage — both important factors in this project. Wall construction was overseen by the geotechnical engineer at every step.

The house pad itself was constructed in "lifts" — compacted layers of dirt pretested for its cleanliness and ability to compact (proctored) interspersed with geotechnical biaxial mesh, geogrid, all installed like a layer cake at correct levels of hydration.

The weather played a role in the project, with significant weeks lost to rain, and a subsequent dry period when tanks of water were brought to site to spray the construction zone and assist compaction.

Utility tie ins were carefully planned out. With water, electric, propane and internet for two adjacent buildings and an aesthetic desire to keep all pipes, wires and lines out of sight, the underground utility layout was an intricate web avoiding conflicts and setbacks. The landscape plan also accommodated the tie ins, keeping cleanouts, hubs and meters out of view.

There was very little usable space around the house, but additional parking and outdoor areas were required, so a Verti-Block wall was built employing the same biaxial geogrid intervals. Verti-block is pre-cast concrete blocks, hollow, weighing 1,800 pounds, stacked by an excavator and backfilled with appropriate material. Using washed gravel as backfill instead of compacted earth allowed absolute drainage away from the exterior of the house.

The interconnectivity of the two buildings and the various access points was a critical component for the flow of the house. Five exterior stone staircases of various sizes and styles were constructed, as well as a handicap ramp.

Now that the house has been inhabited for two years, the success of the design is evident by the lack of any of the common issues experienced in mountain houses. Correct site integration creates the foundation for a house where the features become a comfortable part of everyday living, an aesthetically attractive presentation devoid of annoyances or, worse, expensive failures.

Carrie Vogler is a project coordinator for V&V Land Management and responsible for overseeing the forestry crew. V&V specializes in sustainable residential development in the mountains of Western North Carolina and East Tennessee. Carrie at voglerllc.com.

Project Team

Landslide Assessment — Appalachian Landslide Consultants
Geotechnical Engineering — Gentry Geotechnical
Civil Engineering — Asheville Civil Engineers
Architect — Stephens Smith Farrell Architect
Additional Design Work — V&V Land Management
Structural Engineer — Medlock Engineering
Site Grading and Wall Construction — V&V Land Management
Mechanical — Vandemusser Design
House Walls — Superior Walls
Builder — Ed Dulaney
Landscaping — V&V Land Management
Landscape Maintenance — Aria Floral

Vertical cedar siding was used to create visually pleasing lines to connect different sets of windows together. THOM GAINES PHOTOS

Growing Family, Building Green

Crafting a New Net-Zero Home to Last for Generations

BY MARK WULFF AND JOSH BROWN

When Mark Wulff and Ariana DeToro-Forlenza met in 2004 as instructors at an outdoor school, there were nights when they slept in the open air with nothing but a sleeping bag between them and the sky.

When they bought their first home in 2011, 900 square feet in West Asheville was plenty for their active lifestyle — it was a roof over their heads. After one decade, two kids, and years of experience building homes for others, what used to feel cozy was beginning to feel cramped.

"We started dreaming of our new home years before we started building it," said Wulff, a founder and owner of Brown Wulff Homes. "But from my experience building, I know that a house has to be responsive to the land it's on, so we didn't make any specific design decisions before we found our lot."

When they finally found their lot in Malvern Walk, they had the canvas they needed. With the help of their architect, they set out to design an energy-efficient, creative, family-friendly home with a few critical priorities to guide them:

- Green building practices, including an all-electric energy model
- Lots of glass to fill spaces with light and take advantage of southwest views
- A connection between indoor and outdoor living spaces

"Ari and I never want to lose that connection with our environment that has been an important part of our careers and lives," Wulff said. "As we grow, we encounter new ways to act on our ideals. For our family right now, that means building and maintaining a house in a way that is thoughtful about our energy use and the impact we have on the climate. We understand the environmental impact that building a new house has, so we were committed to building a house that would utilize those resources to build a home that we hope will last for generations."

When they broke ground on the project, they decided to pursue the highest level of Green Built Homes certification they could achieve, without breaking the bank. They wanted to prove that building green can be cost effective and easier to achieve than some might think. They knew from experience that it would require

Project Team

Builder — Brown Wulff Homes
Architect — Assembly Architecture & Build
Solar Contractor — Sugar Hollow Solar
HVAC Contractor — Stickels Service Co.
HERS Rater — Vandemusser Design

The open kitchen-dining-porch area seamlessly connects the inside living space with the outdoors.

paying attention to the details and making smart, and sometimes tough, choices along the way.

A specific example that highlights the decision-making process during the build came when it was time to sheath the exterior walls. Initially they hoped to include both ZIP R-sheathing for additional insulation and a rainscreen to extend the life of the sheathing and siding. After costing out both options, the budget forced them to choose between the two.

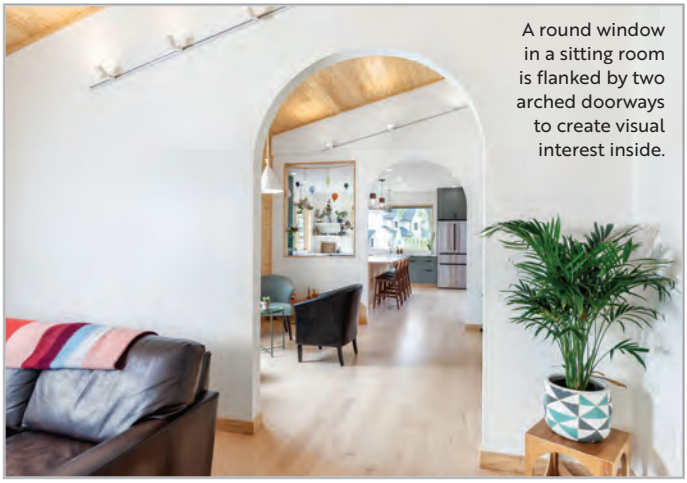
After researching and talking with other green-building experts, they decided that the cost of the ZIP R-sheathing was not worth the resulting increase in R-value and that the payback on choosing that system would be prohibitively long. They opted instead for a rainscreen behind all the siding that will allow the sheathing and siding to breathe and extend the life of the exterior of the home.

Not all choices were as difficult. The cost benefit of installing a residential photovoltaic solar system was clear and it was a commitment from the very beginning of the project.

"I believe we've passed the tipping point for solar," Mark said. "Solar might not be everyone's choice yet, but it should be a part of every new build conversation. I would encourage anyone building a new home to think of solar as part of the build cost and not a future add-on project."

After rebates and credits, the system should pay for itself in just over nine years. Some other energy-conscious decisions that also made the cut include a heat pump water heater, induction cooktop, electric vehicle charging hookup, and a variable speed heat pump.

Everyone can see when someone chooses solar, but there is another part of the building story that's literally more hidden, and maybe more important.



A round window in a sitting room is flanked by two arched doorways to create visual interest inside.

"Attention to detail can often do more for a house than the latest new material or technological innovation," said Josh Brown, the other founder and owner of Brown Wulff Homes. "On this house, that meant spending an extra day or two over the project using primarily tape, caulk, and spray foam to create an exceptionally tight building envelope."

In order to ensure they were on track during the build, they opted to have the house blower door tested prior to insulation and sheetrock being installed, and then again when the house was completed.

"Construction of a house can often happen in pretty distinct silos and we feel it's our job to bridge the gaps between all the different sub-contractors," Brown said. "Sometimes this means we do a little extra work, but often it is just ensuring that communication is clear and followed through on."

As they proved with the results, what makes something well built can also make it green. The Malvern Walk home has some impressive achievements to go along with its striking appearance:

Green Built Homes' Platinum Net Zero certification

Home Energy Rating System (HERS) Score of 10, which means it has 90 percent better energy efficiency than the average home 0.49 ACH50, which denotes an exceptionally tight house and an energy recovery ventilator for fresh air circulation 8.1 kW photovoltaic solar system should provide 90 percent or more of needed energy

Mark and Ariana now have more roof over their heads than they once did. If you look closely, you can see that the pitch of the rooflines follow the slope of the land on which it's built. It's just one way that their connection with the environment stays intact even as their housing needs evolve.

For them, it's a little strange to no longer be living in such close quarters, but It helps their adjustment to know that their house will produce more energy than it uses and it's built to last for generations.

They always knew their children and grandchildren would inherit the earth. Now they'll inherit a place to call home.

Josh Brown and Mark Wulff are the founders and owners of Brown Wulff Homes. Connect with Josh and Mark at brownwulffhomes.com.

The home is located in The Villages at Crest Mountain in Asheville, a neighborhood with small lot sizes and community gardens where most homes are certified through Green Built Homes. JENNIFER BANKS PHOTOS

No Need to Move Mountains

Small Details Deliver Dynamite Score on Custom Home

BY JENNIFER BANKS

As builders, we occasionally have to explain the benefits of constructing a Green Built Home to our clients. But when Peter and Diane Burkard approached us about building their new house, they already knew they wanted to build green.

"I didn't have to sell them on it," said Zach Banks, owner of Corner Rock Building Co. "They were already on board. It just fit with who they are."

Peter and Diane weren't particularly focused on the scorecard. They wanted their new house to reflect their environmental values, and Peter was hoping they would earn a gold-level certification from the Green Built Homes program.

Happily, their home did indeed earn gold-level certification. When they learned they had also attained a net-zero certification, they were delighted. But when they learned their home ranked in the top 10 highest scoring projects for Green Built Homes in 2020, all they could say was one word: "Wow!"

The Burkards' home is located in The Villages at Crest Mountain in Asheville. Neighborhood features such as small lot sizes and community gardens counted towards Peter and Diane's high sustainability rating. Most of the homes built in their community are certified through Green Built Homes, and many have earned fantastic scores. Even so, it was something special for this project to attain Green Built Homes' Gold Net Zero level of certification.

The item that earned them the most points on the Green Built Homes checklist was their rooftop solar photovoltaic system. But solar alone didn't set this house apart. Interestingly, it wasn't any single component of the house that pushed their score so high. Rather, it was expertise and lots of little details that made the difference.

The Burkards wanted to find a builder with experience in eco-friendly building.

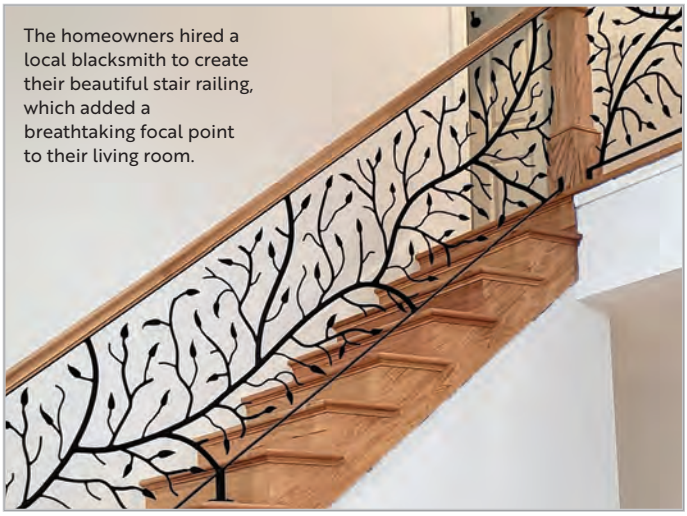
"We let Zach know what our desires were, and he just took the ball and ran with it," Peter said.

Advanced framing techniques such as "California corners," "sandwiched headers," and 2x6 exterior walls were used to allow for better insulation and decrease the amount of energy a home consumes.

"As a default, we use several eco-friendly construction techniques on most of our houses, regardless of their participation in the program," Banks said. "Green building just makes sense from a practical perspective. There are a lot of little things you can do early in the construction process to make a home very energy efficient."

Attics are notorious for energy leaks, so open-cell foam insulation was used in the roof deck and gable ends to create a tight seal. The rest of the house got the same attention to detail when it comes to energy efficiency.

"To get the house tighter, we do several things," Banks said. "We caulk the bottom plate of the ex-



The homeowners hired a local blacksmith to create their beautiful stair railing, which added a breathtaking focal point to their living room.

Project Team

Builder — Corner Rock Building Co.
Designer — Devitt Custom Home Design
Solar Contractor — SolFarm Solar Co.
HVAC Contractor — Ace Heating & Cooling
HERS Rater — Vandemusser Design

terior wall to the subfloor. We use open-cell insulation behind any fixture that is against an exterior wall, such as a bathtub or fireplace. We tape the seams on structural sheathing, and we caulk and tape around windows when they are installed to make them air-tight."

At our suggestion, the Burkards chose to install a very efficient HVAC system. The dual-fuel system uses the home's solar-supplied electricity to run a high-efficiency heat pump for the bulk of the year. When the temps dip extremely low in the winter, a high-efficiency natural gas furnace kicks in to keep the house comfortable.

The builder wasn't the only expert involved in achieving such an outstanding result. During the building process, the energy rater suggested some small changes that led to the big score.

"One of the suggestions was to up the R-value of the insulation in the floors and ceilings from R-19 to R-30 on this house," Banks said.

The cost was negligible for the Burkards, but contributed greatly to the home's phenomenal Home Energy Rating System (HERS) Score of 9. (By comparison, the average house score is 100.)

The bulk of the credit goes, of course, to the homeowners themselves. Peter and Diane selected all the appliances and finishes for their home with environmental responsibility in mind. A myriad of seemingly small decisions — ceiling fans, low-flow faucets, LED lights, eco-friendly paint and countertops, no carpet or exotic hardwood, a programmable thermostat, etc. — all added up. Another example can be found in their decision to hire a local blacksmith to create their beautiful stair railing, which added one single point to their score and a breathtaking focal point to their living room.

The Burkards enjoy very low utility bills because the house has produced more energy than it consumes since the day they moved in. Their typical monthly bill is around $16 — the utility company's minimum. The solar panels should pay for themselves in only 12 years, and the Burkards think their home has already increased in resale value due to the fantastic Green Built Homes score.

Monumental efforts aren't necessary to build sustainably. Peter and Diane's house proves that little things really can make a big difference. When asked if they would recommend the Green Built Homes certification program to others, their response was once again just one word: "Absolutely!"

Jennifer Banks is a co-owner of Corner Rock Building Co., along with her husband Zach. As the director of special projects, her work is never monotonous. Jennifer loves to help clients build homes that are beautiful, comfortable and uncommon. Connect with Jennifer at cornerrockbuilding.com.

Achieving Green Built Homes' Platinum Net Zero level of certification, the home is located in the Shelburne Woods neighborhood being developed in West Asheville. EMILY BOYD PHOTOS

Living Their Values

EPA Employees Build Dream Green Home in Asheville

BY HANNAH MCLEOD

After 60 years of combined federal service at the U.S. Environmental Protection Agency, Tony Wayne and Kimber Scavo's decision to build green was a logical extension of their lifelong work to address climate change.

When determining where to build their new green home, Asheville was also a no brainer.

"I am so impressed that Asheville is leading the way in North Carolina for sustainable residential architecture and that builders in this community are committed to a healthy environment and renewable energy," Scavo said. "Renewable energy, like solar, is our future. We have to shift as a whole community to more sustainable practices for our planet and our own health."

Landing a Home Energy Rating System (HERS) Score of -9 and achieving Green Built Homes' Platinum Net Zero level of certification, the couple's new home is located in the Shelburne Woods neighborhood being developed in West Asheville by Mountain Sun Building & Design.

In addition to the environmentally friendly and energy efficient homes, the subdivision features green spaces planted with native, edible plants and common areas along the creek that back up to the future Rhododendron Creek Greenway.

The homeowners moved from North Carolina's Triangle Area, where they worked for the EPA, to Asheville to build a house that aligned with their core values.

The process of creating this green home started long before the building stage. A key early step was to determine the optimal position of the home to benefit from the ample natural light. The house's structure would be incorporated into the existing landscape to minimize interruption to the native ecology.

On this piece of property, several large poplars needed to be cut down to make room for the home. These trees were milled and used to clad ceilings and walls in the home.

The paint used on the house was also important to the homeowners. In working with the EPA, they knew that paint containing volatile organic compounds (VOCs) contributes to indoor air pollution as well as ground-level ozone, which is harmful to human health. The house was painted with VOC-free paint to reduce the release of carcinogens into the atmosphere.

To ensure efficiency, the home is equipped with EPA-certified WaterSense fixtures that use less water than other products. The home is also well insulated with

Project Team

Builder — Mountain Sun Building & Design
HVAC Contractor — Fair Air Heating & Cooling
HERS Rater — Vandemusser Design
Solar Panels — Asheville Solar Co.

The home is equipped with EPA-certified WaterSense fixtures and energy-efficient appliances.

spray foam to minimize air leakage.

"There's no uninsulated or unconditioned space in the house," Mountain Sun Cofounder Emily Boyd said.

The first priority is to build the most energy-efficient home possible before adding solar to the equation. When a house has energy-efficient appliances and fixtures, tight insulation and a high-performing HVAC system, a smaller photovoltaic array can generate more than enough energy to power the home.

Beyond the components built into the house that delivered its stellar HERS Score, the location also plays a role. This home was built in an in-fill location on a lot within an existing neighborhood where amenities and resources are already available. Another benefit to the ecological footprint is the walkable location in an already developed, green neighborhood. And when adventure calls and driving is a must, the solar panels atop the home power a car-charging station in the parking area.

Though the homeowners have now relocated to Asheville, Scavo still works remotely with the EPA.

"I have decided to stay at EPA because we are doing exciting things now addressing climate change and supporting renewable energy," she said. "I have high hopes that the Raleigh-Durham area will look to Asheville and start making similar choices in more sustainable residential builds."

Hannah McLeod is a reporter at Smoky Mountain News, with which Green Built Alliance partners to publish its annual Green Building Directory.

A key early step in the build process was to determine the optimal position of the home to benefit from the ample natural light.

Built for the Future

Passive Solar Net-Zero Home Made to Last

BY SUSANNA SHETLEY

Builder Gus Katsigiannis of Familia Enterprises partnered with recurring clients Mark McCraw and Beth Lassiter to build his first net-zero home in the Falconhurst neighborhood of Asheville.

The team first met while Familia was renovating the clients' 100-year-old house. Their relationship deepened when Familia built a sustainable home for Lassiter's mother that achieved Green Built Homes' gold level of certification. The team's next collaboration was to embark on building this net-zero home on spec as a joint investment project.

"We owe it to the wonderful world we live in to not to set it on fire," Lassiter said. "That's how the future should work — to put houses out there that are beautiful, easy to live in, and make people happy, but that also honor the earth."

A passive solar design was purchased from another local builder and modified to meet the unique needs of this particular project. As with most passive solar designs, the plan would work with the home's windows and solar energy to extract heat from the sun. The layout of the site was also integral to the design.

"The orientation of the lot was perfect for this project," Katsigiannis said. "It offers ideal southern exposure."

The southern exposure and a unique type of window work in conjunction with a heat sink to absorb solar energy. The team installed an 8-inch thick concrete slab on the first floor and stained it a dark color. When the sun shines during the winter, it hits the dark floor, which captures the heat and energy from the sun then releases it slowly to heat the home.

"To work correctly, this type of energy sourcing is a mix of lot lay-

Project Team

Builder — Familia Enterprises
Passive Solar Design — Springtime Builders
HVAC Contractor — Asheville Comfort Systems
Solar — Sundance Power Systems
Electrician — Crown Electric
Plumbing — Classic Plumbing
HERS Rater — Vandemusser Design

The exterior of the house is a combination of rough-cut pine timbers and poplar bark, all regionally sourced. RYAN THEEDE PHOTOS

Many materials were procured from local sources including live-edge wood on the windowsills and in the kitchen. Other than a gas stovetop, the team selected all electric appliances to leverage power from the solar panels.

out direction, using a heat sink of some kind, window placement, overhang placement, and installing the correct glass that allows the heat to come through and heat that pad," Katsigiannis said. "It's pretty cool and it's free."

Additionally, you can control the amount of heat with creative use of automated blinds and curtains. These specially designed window hangings work with the timing and angle of the sun, opening and closing as needed to allow for maximum heat capture .

According to the homeowners, if the sun is out, the heat never kicks on, even during winter months when outside temperatures approach freezing.

"It's basic and primitive in nature," Katsigiannis said. "I appreciate efficiency, and I don't want to leave the earth worse than I found it. My goal is to build homes that require minimal maintenance. I want the house to look the same in 25 years as it did the day we finished it."

Along with the heat pad inside, the home has an active solar system on the exterior with 6 kW of panels on the roof. Other than a gas stovetop, the team selected all electric appliances to leverage power from the solar panels.

Lassiter served as a project manager during the build, working behind the scenes on design tasks and product selection.

"At every step, we were intentional about sustainability and sourcing local products," Lassiter said.

Other green-building elements of the project included an on-demand water heater, low-flow faucets and showerheads, and low-VOC interior paint and finishes on the flooring. The cabinetry is made of regionally sourced green-rated plywood. Many materials were procured from local sources including live-edge wood on the windowsills and in the kitchen.

The team focused on outdoor space as well to ensure the homeowners could enjoy the property's natural features. A covered porch was built on the side of the house adjacent to the kitchen and dining room. Native plants and fruit-bearing shrubs were added to the landscaping.

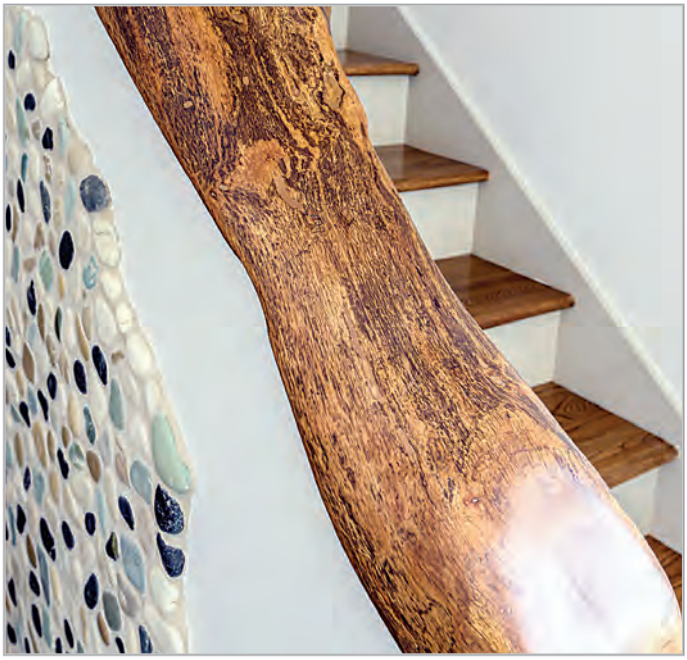
"We tried to create a combination of beauty and privacy," Katsigiannis said. "You can still see your neighbors, but we tried to block off the street as much as possible."

The exterior of the house is a combination of rough-cut pine timbers and poplar bark, all regionally sourced. A permeable driveway and sidewalk were installed to better manage the water coming off the house. The team dug a hole and lined it with rock to create a catch basin, which allows the water more time to seep into the earth.

This 1,750 square-foot net zero house ultimately earned Green Built Homes' Platinum Net Zero level of certification in the summer of 2020, with a Home Energy Rating System (HERS) Score of -6. When the build was complete, a couple from Boston purchased the home.

"Quality fit and finish are big for me," Katsigiannis said. "It's all about my son driving by this house with his kids when I'm gone and saying, 'Hey, my dad built that house. Look how good it looks.' That's true pride in what I do."

Susanna Shetley is a reporter at Smoky Mountain News, with which Green Built Alliance partners to publish its annual Green Building Directory.



Because the house is located on a property with a big drop-off, it made sense to have a full-size, daylight basement with finished living space and radiant-floor heating, which uses an electric boiler instead of gas heating. JOSH SCALA PHOTOS

The Green Lifestyle

Solar Installer Gets Green Home of His Own

The home achieved Green Built Homes' Platinum Net Zero level of certification with a Home Energy Rating System (HERS) Score of -9.

BY HANNAH MCLEOD

Cameron Donnell has built his career in the green-building industry, previously working as an energy auditor and currently serving as a solar-energy consultant at Sugar Hollow Solar.

Donnell and his wife, Whitney, began work with Josh Scala of Green Source Construction Management in 2019 to build their own green home. And yes, he installed the solar panels himself, with the help of some coworkers.

Given his background in the industry, Donnell knew going into the project that he and his wife wanted to create a net-zero energy home, something Scala's company strives for regularly and was excited to support.

"Going in, they were all about being net zero, which was sweet," said Scala.

The Donnells' home achieved Green Built Homes' Platinum Net Zero level of certification with a Home Energy Rating System (HERS) Score of -9. A building with a HERS Score of 0 is considered net zero. With a negative HERS score, this home will create more energy throughout the year than it will use, making it what some call a positive-energy home.

Because the house is located on a property with a relatively big drop-off, it made the most sense to have a full-size, daylight basement with finished living space, instead of trying to create another half-story above it. The basement has radiant-floor heating, which uses an electric boiler instead of gas heating.

"Sometimes it's hard to get people into the all electric because they want to cook with gas or they want gas logs," Scala said. "But typically when it comes down to it, they realize it's the way to go. To be truly net zero, you have to have no gas."

Scala has watched as the green-building industry has become more accessible over the years. Pricing has become more aligned with traditional construction costs as green building increases in popularity.

When Scala started building in Western North Carolina, he was driving from his home in Black Mountain to job sites in Asheville daily. Today, all his work is in Black Mountain, with several homes being built within a mile of his house.

The chance to build a home for the Donnells was a special opportunity for Scala. He said the project reflected to him the way that the green-building industry is gradually coming within reach of a wider variety of people.

> *"Going in, they were all about being net zero, which was sweet."*
>
> **— Josh Scala**

"This was cool because she's a nurse and he's a solar guy and I got to build a house for regular folks," said Scala. "A lot of times people think it costs more money to build than it is to buy. With a new house, you get everything that you want, where you want it, why you want it, without sacrificing cost. But this was the first time I built a house for somebody my own age. It was good to do."

Creating a green building or a green home isn't only about what goes into a project; it's also about everything that comes out the other end. Scala works hard to be intentional about disposing of construction site waste. All the extra materials — cuts of drywall, wood shavings, concrete, insulation, plastic and metal — have to go somewhere. Statistics show that 40 percent of materials delivered to a construction site end up in a landfill. Scala reduces materials purchased on the front end, reuses materials where feasible, and recycles excess materials whenever possible.

Green building is the future of building — more efficient, cost friendly and environmentally viable. That's how Scala and the Donnells see it. That is why they choose to stay on the cutting edge of the industry.

Hannah McLeod is a reporter at Smoky Mountain News, with which Green Built Alliance partners to publish its annual Green Building Directory.

Project Team

Builder — Green Source Construction Management
HVAC Contractor — Indoor Air Solutions
HVAC Equipment — Trane 15 SEER heat pump
Ventilation Equipment — Panasonic bath fan
HERS Rater — Vandemusser Design
Solar Panels — Sugar Hollow Solar

Since 2012, all newly constructed and renovated campus residence halls at Appalachian State University have been LEED certified. This project, however, deepened the commitment by certifying through Green Built Homes. APPALACHIAN STATE UNIVERSITY PHOTOS

Residence Halls Go Green

App State Invests in Sustainably Certified Homes for Students

BY SUSANNA SHETLEY

A new residence hall completed at Appalachian State University in the summer of 2021 was the culmination of years of work and evidence of a commitment to sustainability that runs throughout the school's culture.

School officials decided to certify the new residence hall through Green Built Alliance's Green Built Homes certification system to ensure the project would be held to the highest sustainability standards.

"Sustainability is in our DNA," said Lee Ball, chief sustainability officer at Appalachian State University. "Here at Appalachian State, sustainability is a tradition instead of a trend. The institution attracts faculty, students, and staff who care deeply about both people and places."

The university began the planning process for this project in 2016 with Chancellor Sheri Everts' vision to develop new residence halls and replace 1,700 on-campus beds in residence hall facilities which the university had been using for 50 to 70 years.

"Be assured these buildings are far more than brick and mortar," said Everts. "They are homes for our students — places where they will make memories, build community and discover what it means to live and learn like a Mountaineer."

The developer and contractor selection process began in fall 2017, the design process began in spring 2018, and construction began in spring 2019.

"Beyond the need for additional beds and parking, Chancellor Everts and her leadership team recognized the importance of modernizing our residence halls to meet the expectations of prospective students in the future, which included developing a cost-effective, sustainable project," Associate Vice Chancellor for Student Affairs Matt Dull said.

App State partnered with RISE: A Real Estate Company to complete the multiphase, $191 million

housing project to replace seven residence halls with the intent of making the new buildings highly efficient and sustainable. RISE and App State collaborated with Choate Construction on the project.

"Construction proved to be challenging and extremely rewarding for the Choate project team by overcoming unprecedented challenges presented by the COVID-19 pandemic," Choate Project Manager Jay Merando said. "Unlike many projects where construction activities were suspended or timelines increased, this was not contemplated due to the fall semester move-in schedule. To overcome this, construction crews were spaced out through multiple shifts, weekend work and supplemental forces."

According to the RISE website, the multiphase Public-Private Partnership development stands as a bold campus transformation. RISE is delivering more than 2,300 beds to the university all while maintaining housing capacity. Six old residence halls are being sequentially demolished and replaced, representing more than 600,000 square feet of new construction. Each phase is described below and despite the COVID-19 pandemic, the project timeline has remained intact.

Phase 1: During the initial phase, two residence halls —Thunder Hill Hall (Building 100) and Raven Rocks Hall (Building 200) — were developed and constructed on what had been the stadium parking lot, totaling 912 beds. Both opened for residents in August 2020. Also as part of the first phase, a parking deck with 477 spaces opened in August 2019 at the site of the former Winkler Hall, adding 250 more spaces to that area of campus. This phase also involved replacement of a steam line in the area.

Phase 2: Construction of Laurel Creek Hall (Building 300) began February 14, 2020. The building was dried in a year later. By June 2021, all apartments and corridors were completed and inspected, and the HVAC, sprinkler and elevator systems were operating. The building will open for students in August 2021 with approximately 640 beds.

Phase 3: As part of phase three, site work and the pouring of foundations and footers began in February 2021 for New River Hall (Building 400), which will have 750 beds. New River Hall replaces Justice Hall, which was demolished during summer to fall of 2020. Demolition of Gardner and Coltrane Halls will be completed in December 2021 and the area will become surface parking.

Since 2012, all newly constructed and renovated campus residence halls have been LEED certified. This project, however, deepened the commitment by certifying through Green Built Homes.

"Working with the Green Built Alliance offered us a level of partnership that allowed us to build upon and go beyond LEED standards. We chose to work with the Green Built Alliance and participate in their Green Built Homes certification program because they are a North Carolina-based accreditation program focused on working with the university throughout the project development and implementation," Dull said. "Involving the team at Green Built Alliance in our early design reviews with the architect allowed us access to early-project actionable feedback for creating sustainable on-campus housing."

The collaborative team is waiting on a few remaining pieces of information before submitting to Green Built Alliance for final review.

"In buildings such as the new App State dormitory buildings, a lot of those components are separated from one another — dorm rooms (sleeping areas), laundry areas, cooking facilities, lounge areas, et cetera," said Matthew Vande of Vandemusser Design, who serves as the green rater on this project. "How the whole building is energy modeled becomes more complex, and how to quantify the greenness of various building strategies becomes a little more complicated."

With sustainability at the core of the App State project, the collaborative team has included numerous green elements. Focus areas include the following.

Air sealing and insulation: Airtightness testing was completed to ensure that in addition to the entire building being well sealed, the separations between each residence hall unit also provided a high level of air sealing and insulation to isolate sounds, odors and humidity.

Tree planting and repurposing: App State Grounds Department relocated the iconic gingko trees outside the project limits. For building 100, the team planted 39 new trees, and for building 200, they planted 25 trees. Additionally, 80 percent of the trees that had to be cleared from the site were taken to be milled and made into another usable product.

Resource efficiency: Low-flow and WaterSense-labeled plumbing fixtures were installed to reduce water usage and support water conservation. ENERGY STAR®-certified equipment was used for the shower and kitchen exhaust fans, dishwashers and apartment dryers. Energy-efficient refrigerators and appliances were installed. High-efficiency heating equipment was installed, and 75 percent of the buildings have ductless heating and cooling systems. LED lights were used throughout all buildings, and outdoor lighting controls are in place to automate usage.

Automated and innovative features: Both buildings have automated systems, which improve energy efficiency and lower operating and maintenance costs. They foster better indoor air quality as well as occupant comfort and productivity. The new buildings are connected to the App State steam plant via a newly installed underground high pressure steam line, which is used to generate domestic hot water through a Leslie heat exchanger to student units and laundry services. The steam also serves in the HVAC process by feeding the glycol loop to the rooftop air units.

Environmentally preferable materials: The team was intentional in using sustainable materials throughout all spaces. Independent certifying programs assured the materials were in compliance with stringent indoor air quality standards. Such materials included products that were GREENGUARD Gold certified and CARB II-compliant with no added formaldehyde, as well as low-VOC paints and coatings.

"For App State, the investment in these residence halls — and the other significant infrastructure projects initiated under Chancellor Everts' leadership — represents our deep commitment to providing students an environment in which they can grow and flourish," Ball said.

Susanna Shetley is a reporter at Smoky Mountain News, with which Green Built Alliance partners to publish its annual Green Building Directory.

The team was intentional in using sustainable materials throughout all spaces. Independent certifying programs assured the materials were in compliance with stringent indoor air quality standards.

Greening the Forest

The First LEED home in Biltmore Forest

Soon-to-be certified at the silver level through LEED for Homes, the recently completed Cedarcliff residence is the first LEED project in Biltmore Forest.
CARRIE MCLACHLAN PHOTOS

BY MARGARET CHANDLER

The town of Biltmore Forest, with its stately homes and tree-lined streets, is one of the Asheville area's most prestigious communities.

Soon-to-be certified at the silver level through LEED for Homes, the recently completed Cedarcliff residence is the first LEED project in Biltmore Forest. The home showcases the fact that new construction and cutting-edge energy-efficiency strategies can blend seamlessly into established neighborhoods.

Our clients, a young family of five, purchased an existing home in Biltmore Forest in 2015. The home was in a state of disrepair and had significant mold issues. These challenges led the owners to rebuild rather than undertake the gut renovation needed to bring the existing structure up to their family's long-term needs.

The homeowners are both professional engineers who have a keen interest in innovative building technology. Their excitement to push the envelope on environmentally responsible design inspired the project team to pursue LEED certification, and their detailed research on construction technology was integral to the

Project Team

Architect — Samsel Architects
Landscape Architect — Osgood Landscape Architecture
Builder — Jade Mountain Builders
HVAC Contractor — Bullman Heating & Air
HERS Rater — Vandemusser Design
LEED Rater — Vandemusser Design

home's achieving near-net-zero energy usage.

The key to this project's success was a fully integrated design team. The owners, architects, contractor, mechanical engineer, and landscape architects all championed the sustainability goals, starting early in the project. Each party contributed significantly to the end result: a high-performing, elegant home that blends seamlessly into Biltmore Forest's residential atmosphere.

The design and construction team employed several strategies to optimize the home's energy performance. To prevent conditioned air from leaking out of the home, the owners requested that penetrations through the building envelope be kept to a minimum. All vents and exhausts were combined into a single outlet wherever possible, and a ventless clothes dryer was installed. Based on guidance from the mechanical engineer, triple-glazed super-insulated European windows are installed throughout the house.

Since the demolished home already had a basement, this project was an ideal candidate for prefabricated Superior Walls. They are a factory-finished concrete product, which means there is no on-site foundation construction waste. They provide continuous external insulation, minimizing thermal bridging at the foundation and keeping the basement warm.

Above grade, the exterior walls were constructed with a continuous exterior rigid insulation ZIP panel system, with an R-value of 9. The walls are 2x6 wood framing, with the stud cavities filled with open-cell foamed-in-place insulation to supplement the ZIP system. The functional R-value of the exterior walls is around R-30.

The project team chose to design the new house and hardscape areas as close in size and location to the previously constructed areas as possible in order to preserve most of the existing trees and native plantings on the site.

In addition to these energy-conserving measures, a 10.5-kW photovoltaic array was installed on the roof, in conjunction with a Tesla Powerwall residential energy storage system.

The above listed technologies allowed the home to achieve a HERS energy rating of 3, which means that it is more energy efficient than 97 percent of houses in the US. In super-energy-efficient homes like this one however, it is not unusual to see the actual energy usage at net-zero, due to the owners' increased awareness of the home's energy usage.

Part of Biltmore Forest's appeal lies in the name. It is characterized by heavily wooded, established forests that stretch across the home sites. Great care was taken to not only preserve the site's wooded character, but to improve it. A dense hemlock forest shields the home site from the road, but it had been neglected and overrun with invasive English ivy. The landscape architects developed a plan to remove the invasive species and diseased trees from the site. New eastern hemlock trees replaced the removed trees, and a maintenance plan was implemented to safeguard the improved hemlock forest from the wooly adelgid, an insect that has ravaged 90 percent of the eastern hemlocks in North America.

Video Tour

Watch a video tour of of this home at greenbuilt.org.

The project team chose to design the new house and hardscape areas as close in size and location to the previously constructed areas as possible. This approach allowed most of the existing trees and native plantings on the site to remain. Preserving the most valuable trees gave the team some leeway to strategically remove trees for daylighting the interior while maintaining the site's forest charm.

With these techniques and the collaboration of skilled designers, builders, and consultants, we were able to design a beautiful, high-functioning home for a family who will be able to enjoy it for years to come.

Margaret Chandler is an architect with Samsel Architects. She has worked in sustainable design since earning her degrees at Clemson University, and briefly lived in a treehouse off the grid in Austin, TX. Margaret has spent years serving on the AIA Asheville Executive Committee in a variety of roles. Connect with Margaret at samselarchitects.com.

Built for the Cold

Passive Solar Home in North Carolina's Coldest Climate Zone

BY LEIGHA DICKENS

There's something special about the North Carolina High Country. Home to ski lodges, Christmas tree farms, and quaint downtowns, these remote and rugged mountains offer the perfect place for tranquility and solitude.

Tranquility and solitude were just what Jim and Deb were looking for in their new home. Having spent 13 years traveling in and living out of an Airstream, simplicity had become a way of life for them. They wanted to translate that way of life into a permanent, ecologically friendly home on a high-elevation piece of south-facing land in Ashe County in the northwest corner of North Carolina.

Energy nerds will recognize the area as a cold weather anomaly in our state, with mild summers and a winter more akin to what you might find in Ohio or Pennsylvania rather than in the rest of the south. Building practices designed for cold climates would be necessary to ensure the frugal-energy living that Jim and Deb sought with their home.

A systems-built approach

Jim and Deb selected the "Ridgeline" shell package offered by my company. Based on the net-zero home lived in and designed by Matt Vande of Vandemusser Design, the structural shell components, including open-stud wall panels, roof trusses, and floor trusses, are pre-assembled in our facility in Asheville. We focus on sustainable manufacturing practices, using renewable site electricity to power our operations, and offsetting the carbon associated with shipping our homes to the jobsite through Appalachian Offsets.

The layout is optimized for passive solar heating, featuring a long south-facing main wall and clerestory wall in which to locate thoughtfully sized windows and overhangs designed to shade these windows in summer but leave them open to accept heat gain in winter. With an interior tile floor and stone accent wall offering thermal mass, a high solar heat gain Low-E coating was selected to harvest the maximum amount of heat from these south-facing windows.

The wall system uses 2x6 framing, plywood sheathing plus one inch of exterior insulation and drainable housewrap, offering increased R-value and moisture durability. The roof and floor truss system offers deep trusses for thick insulation levels, and uses a raised-heel truss design. Building the key structural components of a home in a factory allows for very precise construction tolerances, resulting in a structure that fits together very well with few cracks and gaps, further delivering air tightness. Plus, keeping those components indoors until it's time to go up on site reduces their exposure to the elements, while building in a factory and using parts and pieces sized to match the available sizes of common building materials allows for greater material efficiency. Throughout the build, the project had no need to keep a traditional dumpster on site, and only had to haul waste away from the jobsite four times.

For the foundation, which would be part heated space, part garage (to house the Airstream, of course), Jim and Deb likewise chose a systems-built approach, using a precast and pre-insulated concrete foundation system. The result was a structure that became "dried in" within just a few weeks,

A passive solar home in the woods near Boone, N.C.
RYAN THEEDE PHOTO

A systems-built approach to this project included structural shell components built in a factory. DELTEC HOMES PHOTO

Tile flooring in the main living and kitchen area acts as thermal mass to hold heat harvested by south-facing windows, tuned with a Low-E coating that allows higher transmission of heat from the sun than a typical window. RYAN THEEDE PHOTO

allowing the interior finishing to proceed while protected from wind and rain.

An all-electric approach

Jim and Deb were very interested in making their home as frugal on energy consumption as possible, and had done the research — complete with spreadsheets — toward that end. I worked with them in my role as a green building consultant for our customers to hone that research. We used energy modeling during the design to consider the energy impact of different options. Minus the wood stove, the home ended up using all-electric appliances, featuring a combination ducted and ductless mini-split heat pump, equipped with hyperheat to offer highly efficient heating, without a backup, even in subzero temperatures. A heat pump water heater located in the basement provides highly efficient water heating, potentially saving $200 a year or more when compared to a regular electric tank water heater. They even used a heat pump dryer.

If you're noticing a trend with so many uses of the phrase "heat pump," you're on to something. By manipulating refrigerants to essentially move heat around, rather than burn a fossil fuel to create it, heat pumps actually output more heating energy than they consume in electricity to run the pumps. Heating, water heating, and clothes drying are some of the biggest energy expenditures in a home, so covering these functions with all-electric heat pumps can have a dramatic effect on home efficiency, and make the home more ready to be powered with renewable solar energy. Jim and Deb hope to add a solar photovoltaic array to their home down the road.

Get the build process right

Jim and Deb also understood the importance of the right building process for ensuring a home is built in a high-performance way.

They used the ENERGY STAR® third-party certification program, which offers a list of above-code practices that must be followed and requires performance testing once the home is complete. This helps ensure that small but critical building science details are not missed.

As part of this process, their home received a final HERS score of 48, indicating a home that is 62 percent more energy efficient than the average new home on the block.

Project Team

Design — Vandemusser Design
Structural Shell Kit — Deltec Homes
General Contractor — Hess Construction
Building-Science Consulting — Deltec Homes
HERS Rater — Southern Energy Management

Leigha Dickens is the green building and sustainability manager with Deltec Homes, where she uses a background in physics and environmental studies from University of North Carolina Asheville to educate clients about the science of green building and the interconnected impact of home building. She also manages Deltec's sustainable manufacturing efforts, and serves on Green Built Alliance's Board of Directors. Connect with Leigha at deltechomes.com.

The owners found their dream home site with a 1977 ranch house sitting squarely in the middle.
ROBIN CAPE PHOTOS

Ranch Remodel

Transforming a Typical 1970s Home into a High-Efficiency Homestead

BY ROBIN CAPE

It has always appealed to me to live in a home that uses fewer resources than average.

My first home was a salvaged 1800s log cabin rescued from the kudzu in the woods above Durham, N.C. It was fitted with four solar panels, six deep-cell batteries, solar hot water, a composting toilet, a gas refrigerator and cook stove, and a wood stove for heat.

Thanks to the tax incentives available at the time, I was able to enter the world of alternative energy for just a few thousand dollars. Using simple solar tools, we managed our daily energy use with the forecasted sun. On the evenings of the days when I had driven to my part-time job 25 miles away, I would plug my house into our small truck to supplement our energy, rinsing and wringing out the laundry after it had rolled around in the sudsy tub in the bed of the truck and hanging it to dry on the line out back.

It was 28 years later in an Asheville subdivision where my husband and I found our dream home site with a 1977 ranch house sitting squarely in the middle. Close to town and our work, with lots of sun, we had faith we could transform this version of the standard American home into a low-energy, high-performance homestead for our family.

The house needed remodeling to meet our needs so we made our plans and then took it down to the studs, moving walls to accommodate a larger kitchen and master bedroom and bath, and converting a bedroom to our shared office.

The first step was to address the building envelope. As students of sustainability, we had learned that as much as 40 percent of a home's heating and cooling loads can be reduced by improving the walls, windows and insulative values of the home. Our choice of a higher efficiency fiberglass window increased our overall envelope performance while also allowing us to open the interior to more light and views.

After moving walls around, we removed the paneling to replace it with sheetrock. In the process, we realized that the original fiberglass insulation was not filling the wall cavities completely, gapping at the top and bottom, and not offering a complete insulative barrier. We decided to replace all the old fiberglass insulation in the walls and ceiling (offering it to another home remodeler for reuse) with a whole-home foam insulation system.

Over time, we discovered that a spray-foam system could contribute to increased moisture in attic spaces and so we made the decision to install a dehumidifier in the attic as a preventative measure.

The appliances we purchased were ENERGY STAR® certified and have proved to be good stewards of our electrical usage.

Solar and electric

Our new home was perfectly situated with a large south-facing roof over the two-story garage that served as the perfect site for new solar panels. In 2012, we installed 27 solar panels, initially leaving enough roof space for a solar hot water system. Through an energy evaluation, we were advised that more photovoltaic (PV) panels and a heat pump water heater would be a better option for us.

In 2019, we added six new PV panels to that roof space and supplemented the whole system with two batteries to provide us with backup security in case of power outages. Our home is at the end of an electrical distribution line and we were often the last folks to be serviced if the power goes out.

A solar monitoring system ties it all together and allows us to watch how the system performs, as well as to know when the power is off because frankly we hardly notice when it is. A secondary electric panel, dedicated to the primary circuits that we want supported by the batteries, offers us a core stability when the main grid is down.

On average, we export more energy to the grid than we use. The bulk of our usage comes from the nighttime hours when we charge our electric car. We are now researching smart-home energy monitors to help us see in real time where our main usage is so we can make informed decisions on any future upgrades.

That same solar orientation baked the front rooms of our home in the summer and made the front porch virtually impossible to enjoy. We designed a vaulted ceiling porch to be built across the front, shading our living room and office during the hot summer days without blocking the light in the winter.

We used sustainably harvested ipe wood for the deck, ceiling fans to help move the air, and added a secondary, unroofed deck for night star gazing and great plant growing. Overlooking our front gardens, this restful space has become a favorite spot for us to entertain, work and relax, rain or shine.

When the aging HVAC system needed replacement, we chose a geothermal heating system as a replacement. By leveraging geothermal energy, we benefit from a base exchange temperature much closer to the desired indoor temperature than can be achieved with a traditional heat exchange system that uses outdoor air. This system utilized the existing ducts in our home, adding two 250-foot deep wells to provide the approximate 59-degree temperature that is common in the ground around Asheville.

For redundancy, we installed a woodstove in the downstairs util-

Project Team

Construction — Aaron Johnston and Gordon Harrod
Contractor — Robin Cape
Solar — Sundance Power Systems and SolFarm Solar Co.
Solar Monitoring System — SolarEdge
Insulation — Home Energy Partners
Electrical — Electra City
Plumbing — John Holt
Rainwater System — Asheville Drainage
Geothermal — Bullman Heating & Air
Attic Dehumidification — Conservation Pros
Energy Resource Support — Vandemusser Design

ity room located right below the main living space as an alternate heat source should the need arise. A vented propane log set in the living room fireplace warms us in the brief times we need it, allowing us to keep our overall home temperature low.

In 2015, we leased our first electric vehicle. Now in our sixth year of EV ownership, we are happy to be able to direct the energy from our batteries to charge our car at night if need be, allowing us to drive on sunshine.

While pursuing a certificate in Climate and Society in connection with my master's degree at University of North Carolina Asheville, I took the opportunity to study the value and success of our home-renovation efforts on our overall greenhouse-gas impacts. Ironically, we noticed some of our largest energy reductions by switching all our old incandescent and compact fluorescent bulbs to LEDs. One of my favorite finds has been LED battery bulbs that charge in our lamps during regular usage and provide us with another source of backup lighting during power outages.

Outdoor spaces

In 2020, we installed a 3,000-gallon rainwater collection system both to balance the flow of water on our property and to support the irrigation of our gardens. It is such a delight to be able to water our gardens with the rainwater we have collected. Rain gauges in the garden help us understand how much water we have collected and need to use. Our system fills up with just two inches of rain and allows us to direct the saved water throughout the garden with a soaker hose network to reduce waste.

We are currently designing a greenhouse for the southwest side of our home that will capture the sunlight and heat during winter and allow me to grow more vegetables year round. I am hopeful that I can retire the LED fluorescent grow lights once this project is finished and further reduce our overall annual footprint.

Our love of gardening has led us to reduce the lawn to a third of the size it was when we purchased the property, adding perennials, vegetables and small fruits to the well-mulched beds that ring the slowly disappearing grass. These beds are home to millions of earthworms and help us recognize the success of our soil-building activities.

Our chicken coop is a working compost bin, transforming the weeds, household and garden trimmings, and community-salvaged leaves into rich, healthy soil.

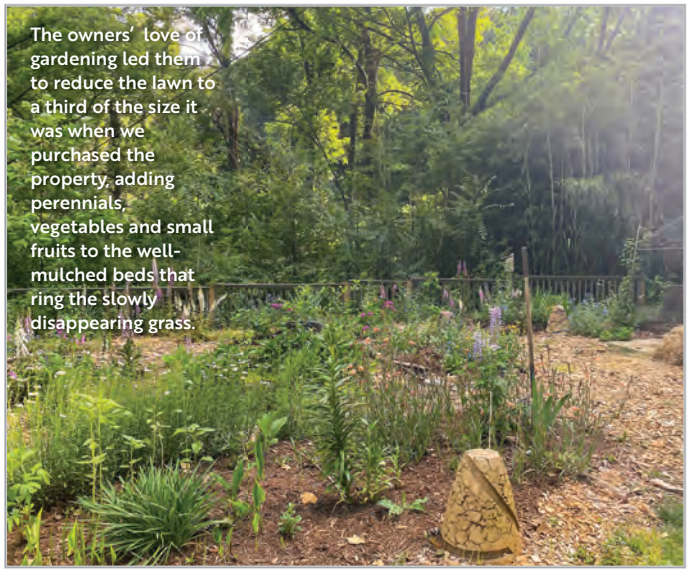
The addition of a new electric lawn mower has not only reduced the noise impact of the mowing chore, but cut the carbon footprint completely. We now mow with solar energy.

It has been a satisfying exercise for our family to work on this home. We have become more aware of the small things we can do to reduce our impact on the planet and welcomed the opportunity to invest in our home as a means of investing in the future.

We were fortunate to have utilized available tax incentives to save a lot on the overall costs of our systems for solar, insulation, the electric vehicle and the geothermal HVAC. But even without those incentives, the value of these installations has been proven to us over time.

Not everyone can afford a new green home, but we can all take the homes we have and improve their performance. We have learned with this old house that even the standard American ranch house can be converted to a high efficiency home.

Robin Cape invests in a brighter future for her grandchildren by committing to use green technologies in her own life. Robin is a broker with the Bold Mountain Team at Nest Realty and chair of Green Built Alliance's Board of Directors. Connect with Robin at boldmountainteam.com.



The owners' love of gardening led them to reduce the lawn to a third of the size it was when we purchased the property, adding perennials, vegetables and small fruits to the well-mulched beds that ring the slowly disappearing grass.

A 3,000-gallon rainwater collection system both to balance the flow of water on our property and to support the irrigation of our gardens.

Overlooking our front gardens, this restful deck space has become a favorite spot for us to entertain, work and relax, rain or shine.

20TH ANNIVERSARY

GREENBUILT ALLIANCE

2001-2021

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Offering programs for the community including:

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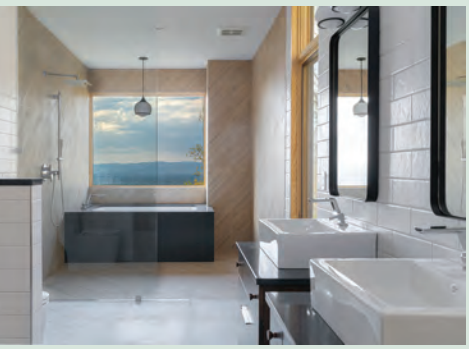

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Growing Green

How Green Built Alliance Changed Our Region During the Past Two Decades

BY MARY LOVE

Green Built Alliance has a special place in my heart. In fact, it was one of the main reasons I moved to Asheville.

Green Built Alliance turns 20 this year. The milestone prompted me to sit down with Boone Guyton and Cindy Meehan-Patton, our concept founders, to reminisce and celebrate our success.

Boone wanted to create a green-building directory and Cindy wanted to establish green-building guidelines for builders. After talking to a small group of friends, they established the nonprofit in 2001 as the Western North Carolina Green Building Council (WNCGBC).

In the first few years, dedicated volunteers and a couple of part-time employees educated the public through a series of forums, field trips and classes. Our hotline, newsletter and oversight of the NC HealthyBuilt Homes program (today known as Green Built Homes) provided valuable information to both contractors who strived to improve their building skills as well as homeowners who wanted to build green.

"I am deeply grateful that the Green Built program has been and continues to be such a major influence in how homes are built in our area and in North Carolina," Cindy said.

After two decades of growth, our organization has expanded to encompass 10 ongoing programs, 10 dedicated employees and many volunteers.

Partnership

Two important factors have led to the continual success of Green Built Alliance: ongoing partnerships with other nonprofits and government officials, along with the long-standing dedication of our core members.

As an organization, we have accomplished so much that it is impossible in this short article to mention all of the people and programs that have been formative in our evolution. It is also important to honor our success over these past 20 years.

"We have become more than I imagined and I am grateful for all the original and continual volunteers, the past and current staff," Boone said with a smile.

It was fun to try to remember the people who were the grassroots volunteers. We couldn't remember everyone. Boone and Cindy did want to give a special thanks to the following: Bobbi Tousey, Duncan McPherson, Ashley Featherstone, Terry Albrecht, John Senechal, Sam Zimmerman, David Tuch, Claudia Cady, Traci Kearns, Isaac Savage, Matt Siegel, Mary Love and Maggie Leslie.

We started with strong partnership and have continued to benefit from these relationships. We are grateful for our ongoing collaboration with community partners including Waste Reduction Partners, North Carolina Solar Center, Mountain Housing Opportunities, Advanced Energy, Asheville Area Habitat for Humanity, Asheville Home Builders Association, Land of the Sky Association of Realtors, Land of Sky Regional Council, the city of Asheville, the town of Black Mountain, Buncombe County, Duke Energy, Community Action Opportunities, On Track, and Green Opportunities.

Programs

Boone, Cindy and I talked about the beginning and the success of our flagship programs — the Green Building Directory, hotline, and green-building certifications — and wanted to give a quick history.

Boone envisioned a directory full of information about green building. He wanted to support the local green-building providers and help homeowners find necessary resources. The only way to pay for the directory was to have businesses place ads. Duncan McPherson did most of the layout and proofing for the first few years. Today, our directory still follows the same format.

Both Cindy and Boone wanted to get as much information as possible to the general public. Thankfully, Terry Albrecht with Waste Reduction Partners helped fund a small grant that allowed Matt Siegel to answer a hotline and help people learn more about green building and our organization.

Cindy's dream of green-building guidelines came true through a joint grant from the State Energy Office with the North Carolina Solar Center, Mountain Housing Opportunities, and Waste Reduction Partners.

Meanwhile, I was hired to oversee the first certification project in the state at Prospect Terrace, which included single-family homes, low-income homes, a six-unit multifamily building and one historical duplex renovation. Part of my job was to educate local builders, Realtors, and homeowners on the advantages of a true green home, which must be certified and overseen by building scientists. I have gone on to make a career of carrying this message to the masses.

The HealthyBuilt Homes program took off in Western North Carolina and, in 2006, Maggie Leslie became full time director of the program. During the recession, the North Carolina Solar Center closed and WNCGBC took over the statewide program, rebranding

A short and condensed history of Green Built Alliance

2001 Nonprofit formed as Western North Carolina Green Building Council

2002 Green Building Hotline established

First Green Building Directory published

2003 Worked with statewide stakeholders to create green-building guidelines

2004 Partnered with North Carolina Solar Center to create HealthyBuilt Homes

Oversaw Prospect Terrace as the state's first HealthyBuilt Homes project

Created ECO certification program for local Realtors and builders

2005 Started work as LEED consultant for four-year-long Ravensford project that provided green schools for the Eastern Band of Cherokee Indians

Launch of Appalachian Offsets

2007 Partnered with City of Asheville and Town of Black Mountain to create incentive to build certified homes

2009 Became provider of LEED for Homes

A ribbon-cutting event in the early 2000s at Prospect Terrace, the first certification project in the state which included single-family homes, low-income homes, a six-unit multifamily building and one historical duplex renovation. Pictured among the crowd are many of the early volunteers and members of Western North Carolina Green Building Council, which became Green Built Alliance. GREEN BUILT ALLIANCE PHOTO

it as Green Built NC and later as Green Built Homes. This year, as Green Built Alliance celebrates its 20-year anniversary, Green Built Homes marks the milestone of 2,000 projects certified.

The Green Built Homes program has been directed by Maggie Leslie for the past 15 years. During this time, Maggie has answered millions of questions and helped certify more than 2,000 homes. She has worked to improve the standards and set a higher bar for all builders. This year, Maggie has decided to move on to new adventures. When you see Maggie Leslie, be sure to say thank you for all the years of dedication and for her contribution to building science and Green Built Alliance.

Onward

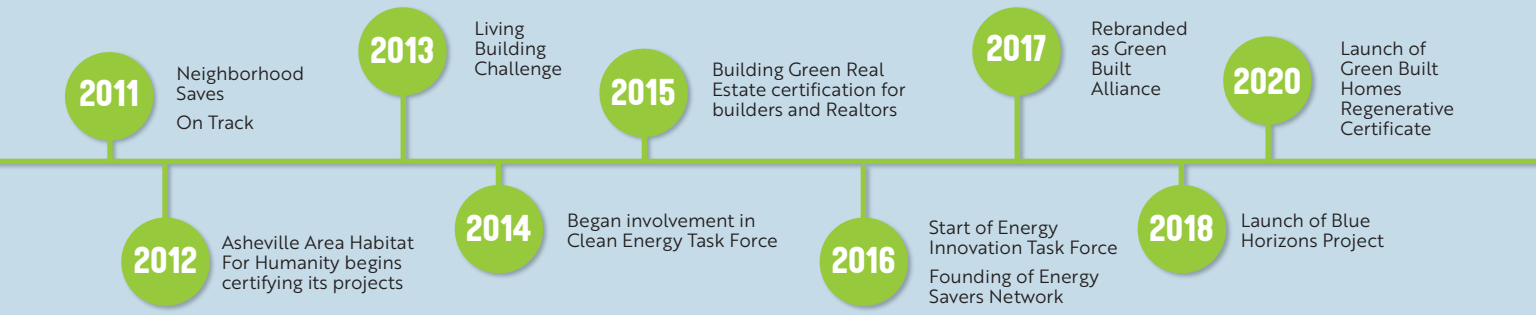
To get a good sense of how much this small nonprofit has accomplished over the past 20 years, you would need to go back and review our past directories. Some of our programs have come and gone, while others have come back around with a different name.

We have touched the lives of countless people in the greater Asheville area, as well across the state of North Carolina and beyond throughout the U.S. We have been leading the way, and the world is finally catching up with our vision.

Through it all, our organization has never stopped evolving. Today, our scope of work includes: certifying new residential construction through Green Built Homes; making energy-efficiency and clean-energy upgrades to local schools and nonprofits through Appalachian Offsets; managing the Blue Horizons Project community clean-energy campaign; weatherizing the homes of our low-income neighbors through Energy Savers Network; and educating the public by hosting sustainability-focused classes throughout the year and distributing our annual Green Building Directory.

I want to personally thank anyone and everyone who has been a part of our work over the past two decades. We made it to 20 years with the loyal support of our members, and we need you to help us continue to thrive and change the world.

Mary Love is the president and broker in charge for Love The Green Real Estate Consulting Firm. A lifetime supporter of Green Built Alliance, Mary currently sits on its Board of Directors and is grateful to be part of this organization that is changing the world for the better. Connect with Mary at lovethegreen.org.



Blueprints for Going Green

Green Built Homes Checklist Clarifies Steps to Better Building

BY KAT MCREYNOLDS

As I sat down to plan my first duplex build as a general contractor, the vague aspiration of "building green in Asheville" became a dizzying stream of questions.

In what neighborhood should I build? What site layout would zoning allow? What are the most durable materials for siding, countertops, flooring? Which paint should I use? What color? What sheen? How many gallons? Have I eaten yet this week?

Every home is the culmination of countless decisions, and building sustainably can add a layer of complexity. While I initially wondered whether the Green Built Homes certification would add hurdles, I eventually found the opposite to be true. If code-built homes are a D-minus, the Green Built Homes checklist provides a detailed study guide for earning an A.

The checklist

Managed by the Green Built Alliance, this voluntary, state-wide program gives builders a framework to track eco-friendly upgrades to both the construction process and the home itself. Participants must meet 16 prerequisites like air sealing to 5 ACH 50 and testing for radon. Beyond that, all checklist items are optional and assigned a point value. Within eight categories like site or building envelope, contractors must earn a minimum number of points, and a cumulative total determines how each home ranks — from simply certified to the highest platinum level.

For newcomers to green building, the level of specificity within the checklist is invaluable. A numerical good-better-best figure is provided for several metrics, like U-values, which measure a window's ability to insulate. An average U-value of 0.32 or less earns one point, while lower (better) U-values of 0.29 and 0.25 earn two and three points respectively. Guideposts like these give instant meaning to specification sheets, allowing builders to more readily compare products.

Perhaps the greatest program benefit, though, is the involvement of a third-party energy rater. Hired by the builder, this person conducts inspections at key times and serves as a consultant on the home's green potential. In my case, speaking to energy raters during blueprint drafting led to an important upgrade from 2x4 to 2x6 exterior walls. I also communicated with the rater during purchasing to ensure that fixtures and finishes were aligned with our goals.

The cost

Cost, of course, is a factor for anyone considering the Green Built Homes program, especially as our community faces serious affordability issues.

Unfortunately, the answer to exactly how much extra certification costs is an obnoxious, "it depends." To start, it depends on what the homeowner would have done in the absence of the program.

Many product lines are already moving toward sustainability by default, like increasingly prevalent

The author's first duplex build as a general contractor was also her first certification experience with the Green Built Homes program. SAGE TURNER PHOTO

The author found the Green Built Homes certification checklist provided a detailed study guide for taking a high-quality and low-footprint approach to her first project. KAT MCREYNOLDS PHOTO

"Remember, class: A home built only to code minimums is a D minus. That's the lowest passing grade."

— Eric Hurley, instructor, Asheville-Buncombe Technical Community College

ENERGY STAR®-certified appliances, light fixtures with LED bulbs, and faucets with modest flow rates. In those cases, little or no marginal cost is incurred for a certified home.

Other costs are subject to fluctuating market conditions. During the framing of our duplex in October 2020, for instance, a 2x6 stud was priced at $5.66, while a 2x4 stud was $6.78. By using 2x6 walls, I actually saved on framing materials but spent a few hundred dollars more on insulating thicker walls. Lumber prices have changed drastically since then and will continue to torment estimators for the foreseeable future.

Fortunately, in my case, rebates from Duke Energy and the City of Asheville are expected to at least cover fees for program enrollment and energy-rater services.

The next steps

In some ways, the Green Built Homes program highlights our community's thriving green-building scene. We have a healthy pool of suppliers and product lines; local subcontractors that are well-versed in their contributions toward sustainability; and free or cheap options for recycling certain building byproducts.

Still, we can and should improve. I had to cringe when I sent a large pile of drywall to the landfill after searching fruitlessly for a regional recycling center. I also discovered the wafer-thin dividing line between sustainability and hoarding, as the crawlspace at my personal residence became a marshalling yard for styrofoam and wood scraps. Asheville GreenWorks accepts styrofoam at its periodic Hard 2 Recycle events, which are wonderful for the community but not a scalable solution for builders.

The inroads to sustainability continue to multiply in the field of construction, and the Green Built Homes checklist serves the important purpose of helping builders to plot their own path.

Here's hoping that more contractors across the state will decide to lean on this resource and to keep building better.

Kat McReynolds is owner of Green Room Builders, which specializes in new construction of compact, green built projects, including small multi-family rental homes. We select materials and finishes for durability, sustainability, low maintenance and a minimalist aesthetic.

Pat Snyder of National Land Realty evaluates opportunities and constraints on a large acreage property in Black Mountain, N.C.
PAT BARCAS PHOTO

Land and Legacy

A Team Approach to Finding Land That Meets Your Stewardship Goals

BY PAT SNYDER

Long a popular destination for people looking to reconnect with nature, the Western North Carolina region is attracting increasing numbers of hopeful landowners seeking an escape from crowded cities and a safe haven from climate change.

By teaming up with Green Built Alliance members, prospective landowners will gain a better understanding of the opportunities and constraints of a specific property, inform their decision making, and enter ownership with executable plans to realize their dreams while mitigating risks and avoiding costly mistakes.

Many local buyers prioritize ecological design, sustainability, conservation, and privacy while balancing the need to build a home or family legacy property in the mountains. It often takes a group of professionals including land brokers, land planners, architects, permaculture consultants, foresters, and land trusts to develop a clear and implementable plan for long-term land stewardship.

Finding the property

The land broker is an experienced local land expert and is generally the person that buyers contact first.

The acquisition process starts with a needs analysis that allows the broker to aid them in identifying properties best suited for their goals.

When a potential property is found, land brokers will act as advisors and project managers who assemble highly experienced teams for detailed due-diligence investigation, site planning, design, and education to advise the buyer on how to best accomplish their goals.

This initial work gets further refined in the more detailed master planning after the property is purchased.

Planning the site

Property analysis and conceptual site design is frequently led by land planning and landscape architecture firms.

These firms offer specialized site visits and analysis to develop plans for the client that minimize disturbances to the land, conform with governmental and private restrictions, and consider factors such as roads, building sites, trails, and conservation-easement planning. These services are key to successful due diligence and help all parties understand land-use ordinances, property features and challenges, environmental concerns, stormwater and erosion risks, and stream and wetland delineations.

Land planners also offer other services like soil analysis or natural resource inventories, which are essential in understanding the conservation potential of a property as well as educating all parties involved about sensitive areas and unique habitats.

Collectively, this information is compiled into an overall master plan that becomes the road map for the new landowner.

"It's so important for a landowner to fully understand any limitations before they make the investment," said David Tuch, owner and landscape architect at Equinox. "We always recommend first exploring the basics such as access into the property, potential building locations and the identification of any obstacles. Then we can focus on developing a plan for the property from permaculture design to creating a resilient homestead or any other goal our client envisions."

Considering conservation

Land trusts help us protect the land and water. The land being

Laura Ruby from YummyYards walks a site with prospective new landowners to evaluate existing resources and educate on permaculture fundamentals. YUMMYYARDS PHOTO

This sample due-diligence conceptual site design blending residential, agricultural, forestry and conservation goals was developed by Equinox with inputs from other subject-matter experts. EQUINOX DIAGRAM

placed in a conservation easement must have some public benefit and must be accepted by the land trust, but the easement does not always require public access. Normally the conservation efforts will be focused on protecting important plant and wildlife habitat, water quality, forest stewardship and preservation, and/or scenic enjoyment.

In most cases, the buyers of these large family legacy properties are willing to donate an easement to protect these resources in perpetuity for federal tax benefits. While it's common for these donations to be made years after the landowner buys the property, it's important to understand up front if the property has the potential to qualify for this use.

There are several local nonprofit land trusts, including Conserving Carolina and Southern Appalachian Highlands Conservancy.

Leveraging the land

Many buyers enjoy working with permaculture consultants in the due-diligence process.

Permaculture-design and landscape-design services help clients understand how to best use areas of the property for their food-production, pollinator-support, and livestock goals. This applies to properties with woodlands, open farmland and meadows, or a mix of features.

Prospective landowners enjoy property walks that enable them to visualize more of what is possible on their land and educate them on how they can apply ecological principles to realize their sustainability and agricultural goals. Other planning can include detailed garden design and plant lists to help them implement self-sufficient and sustainable systems that align with their needs and desires.

"Through the permaculture and sustainability lens, buyers get a clear direction on how to apply ecological principles to realize their sustainability and agricultural goals," said Laura Ruby, owner and landscape designer at YummyYards. "We listen to the client and the land to best align desires with possibilities. Education also plays a large role in this process, empowering the buyer to more deeply connect with the land."

Preserving the forest

In our region, many large properties will also have forest land as a substantial component, so it is important to have a consulting forester involved in due diligence.

These professionals help new owners understand and develop new forest-management plans, enroll in state tax programs, and create long-term strategies to improve the health and growth of forests and wildlife habitat on their property. They're also a key player in evaluating properties for non-native invasive species and helping buyers understand the cost and time necessary to control these so the native species can thrive.

Their analysis, planning, and recommendations also inform the site design, natural resource inventory, and conservation suitability analysis, while educating owners on how to best care for their forests.

"Most forest owners want to be good stewards of their land. We help woodland owners meet their goals by informing their decision making, facilitating forest improvement work, and saving — as well as potentially earning — them money from sustainable and even ecologically beneficial forestry," said Andy Tait, an North Carolina Registered Forester and forestry director at the professional forestry nonprofit EcoForesters. "We can assess forests to identify forest health issues that threaten forests' futures and could be costly to mitigate. We also look for opportunities to enhance all forest benefits: recreation, aesthetics, wildlife habitat, biodiversity, water quality, carbon sequestration, and timber. Finally, we implement this work to restore forests."

Designing the home

Finally, since the ultimate goal for many of these buyers is to create living spaces where they can feel close to and enjoy nature, residences, guest homes, and support buildings are usually part of the plan.

> *"We listen to the client and the land to best align desires with possibilities. Education also plays a large role in this process, empowering the buyer to more deeply connect with the land."*
>
> **— Laura Ruby, owner and landscape designer at YummyYards**

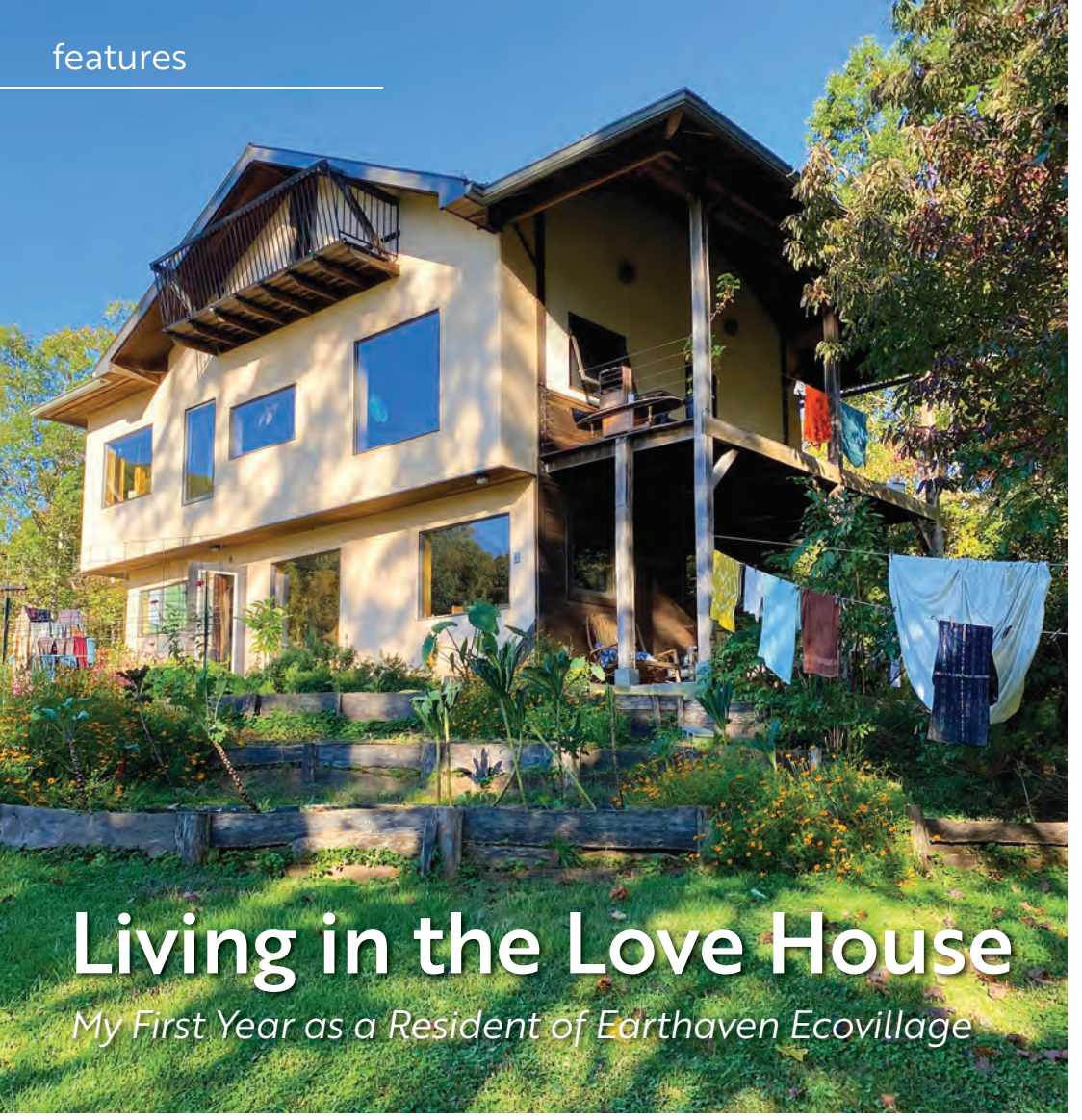
Architects work with the team as part of the initial design and the more detailed master planning processes. They can collaborate on building locations, buildability of a homesite, and shape the features that connect people with the land around them while offering opportunities to showcase nature through the homes they design.

"We love to get involved early in a project so we can help read the land from a construction and end-use perspective," said Duncan McPherson, principal architect at Samsel Architects. "We can help determine ways for the buildings to work with the land, so they feel like they belong there and reflect the natural character of a place."

The process of identifying, evaluating, acquiring, and then developing a property with green, sustainable, and conservation goals can be long and complex.

But by working with members of Green Built Alliance throughout the land-acquisition process, buyers can be confident that they have a team of experienced professionals behind them who also value conserving natural resources and the desire for us to all be good stewards of the land.

Pat Snyder is the managing broker of National Land Realty's Western North Carolina office, a retired military officer, and a Rotarian. National Land Realty supports buyers and sellers across the country with large land tracts (10+ acres) for homestead, conservation, investment, recreation, agricultural, family estate, and residential uses. Connect with Pat at nationalland.com.



Living in the Love House

My First Year as a Resident of Earthaven Ecovillage

The founders of Earthaven shared an environmental ethos and decided early on that they wanted this community to be "a living laboratory for a sustainable human future."

Built in 2008 by Brian Love, the home is powered by the sun, heats water with solar collectors and the wood cookstove, and provides delicious spring water flowing from the taps.
SAM RUARK PHOTOS

BY SAM RUARK

It's a warm spring day full of new and green growing life, and the sun is pumping clean energy into the off-grid house where I live at Earthaven Ecovillage.

Earthaven was founded in 1994 by 12 people seeking a better way of living than the typical urban, suburban or rural modern lifestyles which are often designed in ways that disconnect humans from each other and the natural world.

The founders of Earthaven shared an environmental ethos and decided early on that they wanted this community to be "a living laboratory for a sustainable human future" that would not only teach why sustainability is important, but show how we can live in good relationship with the land, our food, housing, and each other.

Video Tour

Watch a video tour of this home at greenbuilt.org.

There are many types of innovative living situations here. Single-family homes, co-housing units, microhuts, tiny houses, and other light-on-the-land dwellings make up 12 different neighborhoods and a village center.

With vibrant creeks, several springs, a few ponds, and significant rainfall, this is a place with an abundance of water moving through it.

No power lines come into the community of approximately 115 people, so Earthaven has had to figure out how to get much of its electricity, hot water, and heat from the sun, streams and forest. The off-grid community is powered by two micro-hydro systems and a multitude of home and neighborhood-scale photovoltaic (PV) systems.

There is a commitment to intelligently designed and small-space living and village-style density to minimize our footprints and share resources commonly. The average home here is much smaller than the American average, and many residents share kitchens and bath houses.

As the village matures, so does the housing. Innovation guides the builders and renewable-energy specialists who are actively building in the community and have been using Earthaven as a learning opportunity for more than two decades.

In August 2020, I moved with my family to Earthaven into the Love House, which was built in 2008 by Brian Love. My home is powered by the sun, heats water with solar collectors and the wood cookstove, and provides delicious spring water flowing from the taps. The neighborhood microgrid (a 7-kW PV system) powers the barn, our water system, the Love House, and two small cabins.

The feature that I'm most impressed by is the passive-solar design. On a sunny winter day, even if the temperature is in the 30s, we don't need a fire to stay warm. The sun coming in through the massive windows with high Solar Heat Gain Coefficients soaks into the concrete thermal mass floor and countertops during the day, then slowly radiates out at night. So even on a morning when it's 28 degrees outside, it will be 65 degrees inside with no supplemental heat other than the sun.

Passive solar works, people! I've

Through the passive-solar design, the sun coming in through the massive windows with high Solar Heat Gain Coefficients soaks into the concrete thermal mass floor and countertops during the day, then slowly radiates out at night.

been working in the field of green building for more than 20 years, and I learned early on about passive solar. I hadn't had a chance to live in a house with true passive solar until now, and wow, it is great.

Our only supplemental heat is a wood cookstove, and I only burned two-thirds of a cord of wood this past winter. The house where we previously lived in Candler had baseboard heat, resulting in winter electricity bills of $250 a month, and I burned three cords of wood. Passive solar design and good insulation make such a difference.

The element of this house that I'm most excited to show first-time visitors is how all the wood used to build the house came from the land right outside. Where a secondary forest once stood is now a small-scale integrated farm. Those trees were harvested on site, milled and dried at a nearby lumber yard, then returned to build the house.

The wood hero of the house is tulip poplar. It is such a beautiful wood and it makes up the 2x6 walls, cabinets, and ceilings upstairs. In a bioregion with abundant tulip poplar, it's a wise choice for using local materials. Oak and cherry were used for the flooring, and maple and walnut for the banisters.

The layout of the 1,200-square-foot house is conducive for cooking and visiting with friends and family, while the garden right outside the door grows some of our favorite vegetables, flowers and herbs.

Living in an off-grid home has encouraged us to make two minor adjustments.

- To learn more about Earthaven Ecovillage, visit earthaven.org.
- To learn about Earthaven's upcoming workshops and events, visit schoolofintegratedliving.org.

The first is related to access to hot water. In the winter on a cloudy day, the solar hot water collectors don't get warm enough. To get enough hot water, I make a fire in the early morning so that the heat can exchange into the hot water tank to be ready for an evening bath or shower.

The second small inconvenience is not having a clothes dryer, so all the laundry gets dried on a clothesline or rack. Watching the weather for sunshine and choosing laundry day is just another way we live in closer relationship with the sun and seasonal cycles.

The pandemic brought many changes to each of our lives and to society as a whole. I feel lucky and blessed to be living at Earthaven Ecovillage in this super eco-groovy house, and I hope that you too have found ways to feel more at home, to improve your living situation, and grow closer to the cycles of nature.

Sam Ruark is the executive director of Green Built Alliance. He has spent two decades working in the field of sustainability with local governments, small businesses and nonprofits. Connect with Sam at Sam@greenbuilt.org.

Tree Canopy Protection

Asheville's New Ordinance A Step Toward Smart Growth

The urban tree canopy in French Broad River Park in Asheville illustrates multiple benefits of trees including recreation, stormwater mitigation, and shade. AMY SMITH PHOTO

BY AMY SMITH

The benefits of urban forests are immense.

Not only are trees valued for aesthetic beauty and shade, but tree cover in cities also provides benefits to human health and social well-being. Urban forests and greenery are associated with improved mental health and physical wellness.

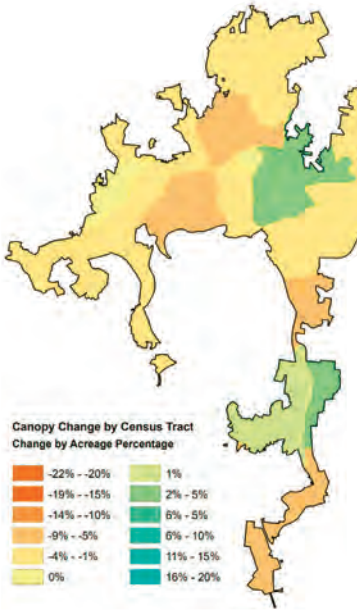
Trees work as a part of the green infrastructure of a city to remove air pollution, mitigate stormwater, reduce flooding, sequester carbon dioxide, provide habitat for wildlife, and improve comfort and cooling for residents by mitigating the urban heat-island effect. Properly placed trees can reduce energy use for homes and businesses, as well as increase property values.

These social, economic, and environmental benefits of the urban forest all contribute to the triple bottom line of long-term sustainability in the City of Asheville.

The data

Like many growing cities, Asheville has struggled to balance the demand for new development with the need for a healthy, mature, and thriving tree canopy. Dedicated citizen groups, nonprofit partners, and city government have all worked together to address the problem of tree canopy loss.

The City of Asheville Urban Forestry Commission (UFC) initiated several key projects in the last few years to collect data and implement new policies for tree canopy protection.



Asheville tree canopy change per census tract from 2008 to 2018. MAP COURTESY OF THE ASHEVILLE URBAN TREE CANOPY STUDY BY DAVEY RESOURCE GROUP

In 2019, the city contracted with Davey Resource Group to study changes in Asheville's tree canopy over the past decade. Data from 2008 was compared to 2018 conditions and found Asheville lost 6.4 percent of the total tree canopy in that time frame. The amount of tree canopy can also be used to calculate ecosystem services including carbon sequestration and stormwater capture.

In 2008, it is estimated that Asheville's urban tree canopy coverage provided $82 million worth of carbon sequestration. Canopy loss in the next 10 years resulted in a loss of $7 million worth of carbon capture benefits. Additionally, from 2008 to 2018, the loss of canopy resulted in an increase in stormwater runoff that cost the city an estimated $1.6 million. Long-term planning to retain and increase canopy cover in the city is a goal that will save money in addition to preserving the legacy of natural beauty in Asheville.

In 2019, the city of Asheville worked with a team from NASA Develop to conduct a study on the urban heat-island effect, which explores the measurable increase in temperatures in a city compared to surrounding areas due to vegetation loss combined with heat capture from the built environment. The study found that census tracts with high vulnerability (high poverty and/or high rate of elderly residents) were often also those with low tree canopy and the highest temperatures.

This inequity in tree canopy distribution and the resulting impacts on human health and cooling costs aligns with recent research on historic redlining practices in Asheville and the impacts on tree canopy. Restoring the tree canopy in historically under-served neighborhoods will help ensure that trees are distributed more equitably in Asheville. Addressing this inequality of tree cover can improve living conditions for all city residents.

The ordinance

From this data, the UFC worked together with city staff to create a new Tree Canopy Protection Ordinance that updated the existing tree-save policies in the Unified Development Ordinance (UDO). The new ordinance uses the data from the canopy study along with a zoning overlay to structure the amount of canopy that must be preserved on a development site.

Asheville City Council voted unanimously to approve the ordinance in September 2020. Leaders cited the ordinance's alignment with the Living Asheville Comprehensive Plan, particularly in creating a healthy and expanding urban tree canopy; protecting land and water assets; making streets more walkable, comfortable, and con-

A red oak tree thrives at Rainbow Community School Playground. SOPHIE MULLINAX PHOTO

Trees are removed during a development project in Asheville
SOPHIE MULLINAX PHOTO

nected; and encouraging naturalized stormwater management techniques.

The Tree Canopy Protection Ordinance applies to most development sites within the city with the exception of single-family residences. Current restrictions to tree removal on steep slopes and within aquatic buffers were unchanged. The new rules take into account the current canopy cover on a development site, along with the location and type of land use. A matrix is used to calculate the amount of trees that will be required on each site, and provides options for meeting these requirements through preservation of existing trees, planting new trees, or paying a fee in lieu of meeting these criteria.

The ordinance puts an emphasis on saving existing trees in the calculation, adding an incentive for preservation. Preserving mature tree canopy is essential to achieve the key benefits of urban forests including climate change mitigation, energy savings, and stormwater management. Large trees are simply better at providing these services in the present rather than waiting decades from planting new trees. The ordinance is also designed to encourage landscape planning on development sites early in the design process. Proper pre-planning and site design for building projects can reduce job costs associated with landscaping and tree removal, in addition to increasing post-construction values.

Implementation of the City of Asheville's Tree Canopy Protection Ordinance is a step in the right direction toward smart growth. Recognizing the value of trees and green infrastructure can help to guide policy and decision making for all stakeholders, from city government to land developers and residents. It pays off in the long run to follow green-building concepts that include site planning to maximize existing trees and vegetation resources. Such practices contribute to the triple bottom line of improving human health, the environment, and the economy.

By passing the new ordinance, the City of Asheville has also taken steps toward improving environmental equity in the city by creating the fee-in-lieu option that will collect funds to be used for various tree canopy enhancement efforts in areas of need.

Reversing the loss of Asheville's tree canopy and eventually increasing tree cover will be a critical piece of climate resilience that will benefit residents and visitors alike.

Amy Smith is a professor of science at Purdue University Global and a REALTOR® with Modern Mountain Real Estate in Asheville. She is LEED AP accredited and holds a Master of Science in Forest Ecology and Management, as well as a Master of Science in Environmental Policy. Amy serves as the chair of the Asheville Urban Forestry Commission and is a volunteer member of the Asheville Tree Protection Taskforce. Connect with Amy at asmithrealtor.com.

Bringing Solar to the People

Solarize Campaign Installs Free Systems for Families in Need

BY SOPHIE MULLINAX

In an effort to increase the region's adoption of and access to affordable solar installations, a diverse coalition of Asheville and Buncombe County community members and mission-aligned organizations came together in 2021 to launch Solarize Asheville-Buncombe.

Solarize campaigns have been gaining popularity across the country with hundreds having taken place in the U.S. since the first one in Portland, Ore. in 2009. As limited-time group-purchase initiatives that strive to streamline and simplify the process of going solar, solarize campaigns are effective in expanding residential and commercial solar installations rapidly in a defined geographical area.

Solarize Asheville-Buncombe was the third solarize campaign Asheville and Buncombe County have seen, with the first two taking place in 2013 and 2015. On the heels of the City of Asheville and Buncombe County's 2018 adoption of resolutions to transition the region to 100 percent renewable energy, the timing was ripe for another solarize campaign.

The Solarize campaign

Solarize Asheville-Buncombe is led by a coalition consisting of Green Built Alliance, Blue Horizons Project, the City of Asheville, Buncombe County, MountainTrue, Hood Huggers International, Solar CrowdSource, Asheville Homestay Network, Sierra Club, Green Opportunities, and Umoja Collective.

This coalition first assembled in late 2020 to plan with a focus on prioritizing environmental justice and incorporating lessons learned from past campaigns. Key to this campaign were the goals of increasing affordability and access to solar for low- and moderate-income families as well as a workforce development program.

The Solarize Asheville-Buncombe campaign brought down the cost of solar for all participants thanks to bulk discounts on solar panels, batteries, and equipment, and reduced installer costs on marketing and lead generation.

The solar installers for residential and commercial installations were pre-selected via a competitive RFP process, and pricing was tiered, meaning that prices per watt installed went down as more participants signed contracts with the installer.

The campaign was wildly successful and surpassed all expectations. Just five weeks after launching in April 2021, the campaign reached its lowest residential pricing tier of $2.45 per watt of solar installed, which realized savings of 10 to 20 percent compared to non-campaign pricing.

By August 2021, Solarize Asheville-Buncombe had more than 700 sign-ups for free evaluations, 120 contracts signed, and more than one megawatt of solar committed to be installed. Once these systems are fully installed, the equivalent of more than 1.75 million pounds of carbon emissions — equal to 875 tons — will have been avoided in Buncombe County. Together, these systems comprise 2,626 solar panels that can produce 1.30 million kWh annually, will save these homeowners $168,275 yearly on their utility bills, and represent $3.05 million in new local clean-energy development.

SOLARIZE
ASHEVILLE-BUNCOMBE

A free solar system is installed on a Swannanoa home thanks to the Neighbor to Neighbor program. SOPHIE MULLINAX PHOTOS

Get involved

As of August 2021, Neighbor to Neighbor had funded solar panel installations on the roofs of nine low- and moderate-income households. The program set a goal of serving 30 households by the end of the campaign, and was in the process of raising the remaining $115,000 needed to fund those systems.

To donate in support of the Neighbor to Neighbor or learn more about the broader Solarize Asheville-Buncombe campaign, visit solarizeabc.com.

The Neighbor to Neighbor initiative

Too often, the economic and environmental benefits of residential solar are out of reach for families of low and moderate incomes. Solarize Asheville-Buncombe's Neighbor to Neighbor program strove to offer solar installations free or deeply-discounted for families making below 100 percent of Buncombe County's area median income (AMI).

Local data shows that Buncombe County's communities of color, low-income families, and households in formerly redlined neighborhoods experience the greatest energy burden, meaning these households pay a disproportionate share of their already limited income on energy costs. Neighbor to Neighbor was designed to help alleviate the energy burden borne by these households and to move toward a more just and equitable clean energy future for Buncombe County.

As of August 2021, Neighbor to

Once these systems are fully installed, the equivalent of more than 1.75 million pounds of carbon emissions — equal to 875 tons — will have been avoided in Buncombe County.

Neighbor had funded solar panel installations on the roofs of nine low- and moderate-income households. Eight of these were fully-funded, and one was partially-funded based on household income. In addition to income requirements, participating homes also had to meet criteria related to sun exposure and roof age.

By permanently reducing their utility costs through the solar installations, these households will have more money for crucial family expenses such as food and medication, and hopefully be less vulnerable to the effects of climate change moving forward.

Funding for these systems was provided by grants from the City of Asheville, Buncombe County, and individual donations. The program set a goal of serving 30 households by the end of the campaign, and was in the process of raising the remaining $115,000 needed to fund those systems as of August 2021.

Regardless of whether they receive solar installations, Neighbor to Neighbor participants are also referred to Energy Savers Network, a free energy-efficiency upgrade program housed at Green Built Alliance under the umbrella of Blue Horizons Project.

The results

The 2021 Solarize Asheville-Buncombe campaign demonstrated that this model does work to bring down the cost of solar for all participants, as it has in more than 350 municipalities in the U.S. in the past 15 years.

The innovative crowdfunding component of the Neighbor to Neighbor campaign raised more than $85,000 to deliver free or deeply-discounted solar to numerous low- and moderate-income households. This is something that had not previously been achieved locally.

Evidenced by the many donations from individuals in support of making solar available to low- and moderate-income families, this campaign energized the broader community around an opportunity to marry climate justice with more solar on more roofs in service of our community renewable energy goals.

"I've thought about solar for a very long time, did my research, but the prices were just out of my price range," said Neighbor to Neighbor recipient Millicent Johnson of Weaverville. "Having solar means more money in my pocket, so I can do other things. ... Words can't even describe how grateful I am for this program."

Sophie Mullinax manages Blue Horizons Project, a community-wide campaign to help residents and businesses of Buncombe County adopt energy efficiency and renewable energy. Before moving home to Asheville in 2018, she spent nine years working in the nonprofit sector while living in Washington, D.C. Connect with Sophie at Sophie@bluehorizonsproject.com.

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This Divided Land

The Way Our Neighborhoods Look Isn't an Accident

BY MADDY ALEWINE

Asheville Area Habitat for Humanity was shocked by the deed to a parcel of land they were developing when they came upon the part that read: this property cannot be sold to "any person of the colored race."

As an organization that condemns structural racism in the housing system, Asheville Habitat did not want to transfer this deed to another owner with this abhorrent language. In addition to seeing what could be done about the racist language in the deed, the nonprofit builder was motivated to learn more about racially restrictive covenants and how they shaped local neighborhoods, and share what was learned with the community.

The first step was a deep dive into learning the history. When discussing race and housing, "redlining" is the concept most familiar to Americans. Another common but less familiar form of de jure segregation — or segregation through laws and policies — can be found in racially restrictive covenants. In the early twentieth century, competition for housing and jobs in American cities led to deadly racial violence. Covenants were a legal tool for property owners and developers to segregate neighborhoods.

"Asheville really leaned into (usage of racial covenants)," Buncombe County Register of Deeds Drew Reisinger said. "I often see them written in documents throughout everything from the 1910s all the way up to the 1970s."

Homeownership is the primary means to building wealth in this country, but federal, state, and local housing policies built on restrictive covenants prevented many Black Americans from owning a home. The effect is obvious in today's disparity in homeownership rates. According to a recent report from Land of Sky Regional Council, only 38 percent of Black households in Buncombe County own homes compared to 74 percent of whites. As a result, the racial wealth gap is as wide today as it was in 1968, when the Fair Housing Act finally outlawed racist deed covenants.

Kel Compton proudly holds up the keys to her new, affordable two-bedroom, two-bath single family home in South Asheville on January 21, 2021, after completing Asheville Area Habitat for Humanity's Homeownership Program. The deed to Compton's home contains a racial covenant, which prompted Asheville Habitat to make a film exploring this history. MADDY ALEWINE PHOTOS

These racist laws and policies shaped the way Asheville looks today.

"Asheville neighborhoods are the way they are because they were designed that way," Asheville Habitat Executive Director Andy Barnett said. "As we learn this history, we realize that the belief that 'deep down people want to live around people that look like them' is just a myth."

Habitat's integrated neighborhoods disprove this myth.

"We just don't see these (Habitat) neighbors resegregating over time," Barnett said. "These neighborhoods continue to be thriving and vibrant places that remain racially integrated."

Next, Asheville Habitat needed

4. No shop, store, hospital or place of business of any kind or character shall be erected or maintained upon said property.

5. No garage, tent or other temporary building shall be used for residential or business purposes on said property.

6. No live stock of any kind shall be housed or kept on said property, but poultry may be kept if properly confined.

7. An easement or right-of-way five feet in width is reserved along the rear end of the property herein described, for the purpose of erecting and maintaining electric light and telephone poles, gas pipes, water mains and suitable equipment for any other utilities.

8. No unlawful or immoral use shall be made of the herein described property nor shall the same nor any part thereof, nor any interest therein, be sold, leased or otherwise conveyed to, or be permitted to be occupied by, any person of the colored race, provided that nothing herein contained shall prevent the keeping and maintaining of servants on the said property for reasonable family use.

9. Any and all frame buildings erected on said property shall be painted at least two coats of paint upon completion and before being occupied and no paper roof shall be erected on any building on said property. All plumbing shall comply with Buncombe County and State of North Carolina requirements.

This conveyance is made subject to taxes for the year 1939 and subsequent years.

TO HAVE AND TO HOLD the same in fee simple forever.

Pictured is a racial covenant highlighted in a piece of South Asheville property that Asheville Area Habitat for Humanity purchased to develop for affordable housing. Racial covenants were a common racist practice in the early 20th century that barred people of color from owning property, and they were widely used at the local level in Asheville and across the county. Although deemed unconstitutional in 1948, these covenants were used up until the 1970s and still remain in deeds today.

DeWayne Barton, owner of Hood Huggers International, seeks to build greater connection and wealth in systemically marginalized neighborhoods like in his own, the Burton Street community. The systemic and legal exclusion of people of color from the U.S. housing system existed at every level of government, and for Barton, the same level of energy and resources need to be used to fix it.

to learn what to do about this specific covenant. They contacted Pisgah Legal Services and the Buncombe County Register of Deeds to learn how to remove this language. While North Carolina does not allow language to be removed from property records, Pisgah Legal was able to draft a termination of the covenant that highlights its historical context and condemns its use.

Habitat filed this termination when they recorded to the new owner the sale of this Green Built Home. Kel Compton, a Black woman, and her young daughter, now call this house home. Compton is excited to be close to her job and her mother. Her housing is stable and she no longer worries about rising rents.

"I think it just opens up opportunities for (my daughter)," Compton said. "For one, it's kind of paving the way for her to eventually own a home one day. If it's not my home, she'll just be motivated because her mom owns a home."

Finally, to share what they learned, Habitat created the film, "This Divided Land," a 19-minute-long documentary that presents the history of racist housing policies by exploring racial covenants and how they set the stage for federal discriminatory policies like redlining.

In the film, local leaders describe the power of homeownership and share solutions.

"There's just a different sense that you have about yourself, your family, your community, when you have homeownership," Shiloh Community Association President Sophie Dixon said.

"When you talk about not being able to get homes ... when you did have a home, you had something to leave behind," Hood Huggers International Owner DeWayne Barton said. "You had resources, you had land to pass down to the next generation and now I think we got to be thinking the same thing. Let's build out these spaces, but not just build them out for now, but build them out and train the people behind us so they know the value of the space."

Overcoming the legacy of housing segregation requires painful, honest discussions and accountability.

"In order to level the playing field, we have got to correct these institutions that we have," County Commissioner Al Whitesides said. "And we can't think about, 'ok, we've closed the achievement gap in the schools, ah, we can sit back and relax.' No, we still have the housing, we still have the criminal justice system, we still have the health disparities."

Asheville Habitat hopes "This Divided Land" furthers the painful, honest discussion. Shining a light on this example of systemic racism will educate the community and encourage people to support Black communities and organizations working to dismantle racist systems.

Maddy Alewine is the communications specialist for Asheville Area Habitat for Humanity. She has worked since 2017 for the local nonprofit, which builds and repairs homes, operates two ReStores, and offers deconstruction services. She shot and produced the 19-minute-long documentary, "This Divided Land," which presents the history of racist housing policies. Connect with Maddy at ashevillehabitat.org.

Video Tour

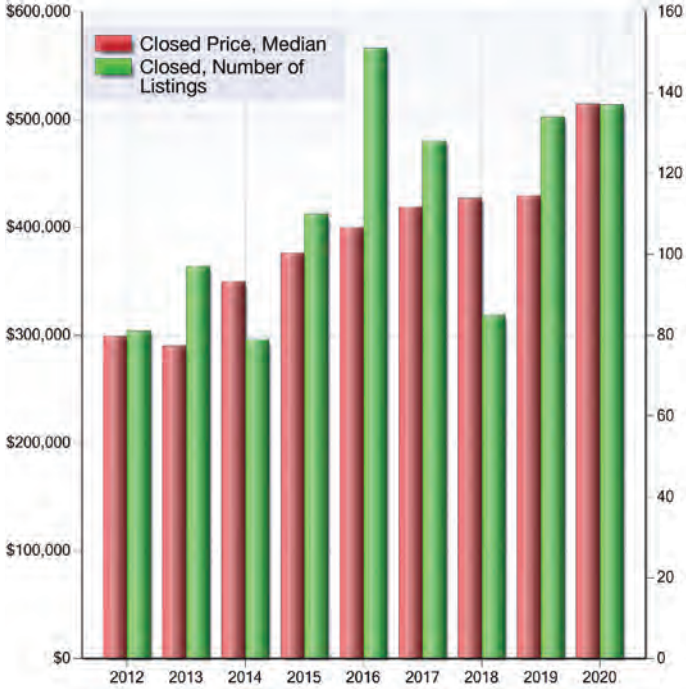
View the film and find resources to learn more, support local organizations, and take action at ashevillehabitat.org/thisdividedland.

"Asheville neighborhoods are the way they are because they were designed that way. As we learn this history, we realize that the belief that 'deep down people want to live around people that look like them' is just a myth."

— Asheville Habitat Executive Director Andy Barnett

Green Home Hunt

Practical Tips for Finding Green Homes on the Market



This chart reflects the median closed price and number of homes sold for green homes in the Asheville Metropolitan Statistical Area during the last decade. CANOPY MLS IMAGE

BY MIKE FIGURA

If you want your next home to be certified by Green Built Homes or ENERGY STAR®, you can either buy an existing home or build a custom one.

When you build a custom home, you dictate where and what you build, but if you buy an existing home, your options are limited to what is available on the market. If you look for green certified homes for sale, you'll discover that the ease of finding one depends on where you are looking and what you are looking for.

The marketplace of green homes has grown over the last 15 years, as more green homes are built and certified each year.

In 2006, the market was tiny. There were only 16 green certified homes that sold in the Asheville Metropolitan Statistical Area (Asheville MSA). The Asheville MSA comprises Buncombe, Haywood, Henderson and Madison counties. With only 16 sales, green certified home sales were only 0.2 percent of the total home sale market in 2006.

Compare that to 2020 when there were 138 green certified homes sold, representing a whopping 763 percent increase over the 15-year period. Green certified homes still comprised a small percentage of the overall market at 1.8 percent of total homes sold, but it is a substantial increase nonetheless.

Green home sales are not evenly distributed though. Out of the 138 green homes that sold in the Asheville MSA in 2020, 91 percent of those sales were in Buncombe County and 65 percent were in Asheville. Haywood, Henderson and Madison counties combined only comprised 9 percent of the green certified home sale market in 2020.

And it gets even more concentrated at a neighborhood level, where 36 percent of the green homes that sold in the Asheville MSA in 2020 were in West Asheville. To put that in perspective, West Asheville had only 8 percent of total home sales in the Asheville MSA but it had more than a third of the green home sales.

By price range, green home sales are a bit more spread out. As you would imagine with the relatively high cost of homes in the Asheville MSA market, there were not many green homes that sold for less than $250,000. Only 6.5 percent of green home sales occurred in a price range lower than $250,000 in 2020. However, 42 percent of green home sales occurred between $250,000 and $500,000 and likewise, 42 percent of green home sales occurred between $500,000 and $750,000. Somewhat surprisingly, only 9.5 percent of green home sales occurred in a price range higher than $750,000.

All home sale data in this article is sourced from Canopy MLS.

If you want to buy an existing home and you want it to be a green home but it doesn't seem likely that you'll find one based on your area or price range, don't despair.

First, start by looking deeper. Not all homes with sustainable features are green certified. Many people who build custom homes are incorporating green-building features while not getting them certified, and many homeowners who own conventional homes are retrofitting to add green features such as solar.

You can also buy an existing home and make improvements that increase efficiency, improve indoor air quality or add energy production through solar, wind or micro-hydro.

And if you are building a custom green home, make sure to follow through with the certifications, which add value and make it easier for buyers who are looking for green homes to find yours when you are ready to sell.

Mike Figura is the owner and broker of Mosaic Community Lifestyle Realty. He has been a Realtor since 2005, founded the Eco Agents committee in 2006 and is a past board member of Green Built Alliance. Connect with Mike at mymosaicrealty.com.

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As members of the Green Built Alliance, we believe that sustainability and diversity strengthen our whole community, making Asheville a better place for both current and future residents. For your real estate needs consider working with the Bold Mountain Team.

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The Green Evolution of Affordable Housing

Green-Certified Affordable Housing is a Win-Win

BY ANNIE MCGEHRIN

The sustainable building sector is often seen as a luxury, but why not as a basic necessity?

Sustainable buildings, also known as green buildings, minimize the use of resources, reduce harmful effects on the environment, and provide healthier environments for people.

Limited-income communities suffer disproportionately from unsustainable buildings and are more likely to be occupants of homes that are unsafe, unhealthy and the least energy efficient.

The value of sustainability is gradually coming into focus within the communities most impacted, thanks in part to the help of programs that incentivize green-building certifications among affordable-housing developments. There are many organizations gleaming as beacons of how we can make shifts so that affordable housing and green building are no longer seen as mutually exclusive.

Shortage of affordable homes

As the nation faces a critical shortage of affordable homes, more than 10 million households are relinquishing more than half of their income towards rent. In Asheville, the need for affordable housing is glaring with more than 500 members of our community facing homelessness and even more people burdened with substandard housing.

With the present and urgent need for affordable housing for millions of families, some argue that the most viable solution is in multifamily developments such as apartments, townhomes, and condos. Not only does multifamily housing accommodate the most people, but it also is one of the most effective ways of building green affordable homes.

A study conducted by Southface Institute and the Virginia Center for Housing Research finds that green multifamily developments outperform non-green developments in terms of construction and development costs, energy and utility costs, and all-around resident satisfaction. When compared to non-green developments, green developments saved nearly $5,000 per year on utility costs. On average, energy bills are 12 percent lower, and the total operations and maintenance costs are 15 percent less expensive.

Overall, green-certified affordable housing is a win, win, win for developers, residents, and the planet.

Local endeavours

Communities and local organizations like Asheville Area Habitat for Humanity and Mountain Housing Opportunities are helping to fit the needs of affordable green housing in Buncombe County. This year, the City of Asheville has plans for more than 870 new affordable housing units and there are a few green-certified treasure troves on the horizon.

The Asheville Area Habitat for Humanity is not a new name in the local green-building world but now it is making waves with its newest and largest construction

This year, the City of Asheville has plans for more than 870 new affordable housing units.

The New Heights development is under construction (left) by Asheville Area Habitat for Humanity. Volunteers put up siding (right) on one of Asheville Area Habitat for Humanity's Aging-in-Place units. ASHEVILLE AREA HABITAT FOR HUMANITY PHOTOS

Maple Crest Apartments at Lee Walker Heights are under construction by Mountain Housing Opportunities. MOUNTAIN HOUSING OPPORTUNITIES PHOTO

Video Tour

Watch a video tour of Asheville Habitat's New Heights development at greenbuilt.org.

project to date. Appropriately dubbed, the New Heights neighborhood is in the works located in West Asheville off of Old Haywood Road. Habitat is building 98 houses to include both multifamily townhomes and single-family homes. It plans to be certified through Green Built Homes and is participating in the SystemVision program which is providing Habitat with the training and technical support needed to design and construct energy-efficient affordable homes ready to be green-certified.

By the same token, Mountain Housing Opportunities (MHO) has been providing hope for community members in need of environmentally sustainable and affordable housing in Western North Carolina since 1988. MHO's newest construction is located in Swannanoa, offering 12 turn-key affordable townhomes, each 1,440 square feet for a cost of about $110 a square foot. Townhomes allow for a third more households on the same allotment which is a substantial factor considering the rising cost of available land as availability shrinks. Construction Supervisor Pat Hunt is overseeing that the townhome project will meet ENERGY STAR® certification requirements. The Swannanoa townhomes will also be participating in the Duke Power Progress program, HERO plus HERS score, which offers up to $6,500 in rebates for meeting a target HERS rating.

Additionally, MHO recently announced in March of 2021 that the Maple Crest Apartments at Lee Walker Heights are now leasing. The apartment complex will meet ENERGY STAR® V2 requirements and utilize Enterprise Green Communities as a reference guide during project planning and design. MHO has worked many green elements into the design including rooftop solar, LED lighting, low-flow plumbing, and a "cool roof" which means happier residents when it comes to their energy bill.

Green building and sustainable standards are the future of affordable housing and best of all, everyone involved benefits in some way. As a basic necessity, people deserve to live in homes that are safe, healthy, and built to last.

Annie McGehrin assists with Green Built Alliance's social media and website updates as a dedicated intern. She is passionate about green affordable housing and has been providing support for the Energy Savers Network program, a community-wide campaign to help low-income households become more energy-efficient. Connect with Annie at intern@greenbuilt.org.

Phelps Clarke, construction manager at Pisgah Energy, felt inspired to volunteer for Energy Savers Network because of his passion for energy efficiency. DANIEL SUBER PHOTOS

Volunteering Empowers the Community

Building Professionals Give Back on Workdays

BY STEFFI RAUSCH

There are many benefits to volunteering: the social aspect of networking and meeting new people, the community aspect of helping others, the mental and physical aspect of learning new skills, and much more.

One aspect that sticks out the most and yet doesn't get mentioned often is the "happiness effect" — the idea that helping others kindles happiness. In fact, research shows that the more people volunteer, the happier they are. When compared with people who never volunteer, those who partake in a volunteer opportunity monthly tend to be 7 percent happier and those who do so weekly are 16 percent happier, according to a study in the Social Science and Medicine journal.

As operations coordinator for Green Built Alliance's Energy Savers Network (ESN) program, I am always impressed when building professionals who do this work full time also volunteer to help with our weatherization efforts in their off time.

"It feels good to give back," said Phelps Clarke, construction manager at Pisgah Energy, who heard about ESN through his work as a member of the Blue Horizons Project Community Council. "You'll be working on older homes and trailers for the most part, and it makes you appreciate how far building science has come over the years. Plus, they don't ask you to go into the attic or the crawlspace, so that is a big plus."

Clarke said he felt inspired to volunteer for ESN because of his passion for energy efficiency.

"I've made my career in installing rooftop solar systems," Clarke said. "We always say energy-efficiency should come first, then

Get involved

VOLUNTEER

If you are a contractor with downtime during your week, come volunteer with us. Energy Savers Network utilizes volunteers to empower people and restore the climate through free home energy-efficiency assessments and upgrades for low-income households. No previous experience is necessary to volunteer, and all tools and training will be provided.

We can accommodate teams of up to 10 people, especially for our latest project with the Housing Authority of Asheville, through which we will be improving 1,000 homes over the next year. Volunteer shifts are four to six hours long, and take place on Tuesday through Friday, and sometimes Saturdays.

You can learn more about volunteer opportunities by visiting energysaversnetwork.org/volunteer, or connect with us by emailing volunteer@energysaversnetwork.org.

SPONSOR

Energy Savers Network offers a sponsorship program to nonprofits or businesses. We are very humbled and grateful for the support of our first sponsors, WENOCA Sierra Club and Sugar Hollow Solar. Their sponsorship funds enable us to provide more extensive home upgrades for our clients in need, and organize events and workshops.

For more information visit energysaversnetwork.org/sponsors.

ABOUT ESN

Energy Savers Network is a program of the nonprofit GreenBuilt Alliance under the umbrella of the Blue Horizons Project, and working in partnership with Buncombe County and the City of Asheville.

The team at SPOKE heard about Energy Savers Network, and saw an opportunity to use their tools and skills to give back to the community.

a good solar system."

With the first two homes Clarke worked on improving, the blower-door test showed a 25 percent reduction in air leakage, which equates to energy bill savings for the residents of 25 percent or more.

"I think especially when working on lower-income homes, utility bills can make up a larger portion of their monthly budget, so the little bit of savings from the work we do can go a long way," said Clarke, who plans to volunteer on a monthly basis. "Alongside the money savings, we are reducing carbon emissions, which is really what motivated me to get into my career in the first place."

Another local business that has established a regular volunteer relationship with ESN is SPOKE LLC. The employee-owned building-arts company decided to do a team volunteer workday in every month that had a fifth Friday in it, totaling five Fridays in 2021.

"(Volunteering) is a nice reminder that we are all part of the same community," SPOKE Project Manager Jason Rector said. "You meet someone new, you share a conversation and a few laughs, and then you are no longer strangers."

The team at SPOKE heard about ESN from United Way of Asheville and Buncombe County, and saw an opportunity to use their tools and skills to give back to the community.

"It felt like the work we did will have obvious benefits to the homeowner for years to come," Rector said. "Homeownership involves work and skills that not everyone possesses. The homeowner we worked for was an amazing woman who had been living in her home for over 60 years. We are grateful for an opportunity to maybe make the next years there a little better."

Rector said the volunteer experience was a testament to the fact that a little can go a long way.

"When there is a better or more efficient way to go about doing something, it's worth exploring," Rector said, "Changes in technology have led to simple steps people can take to save money on utilities, making more of their budget available to meet other needs or wants they may have. Add to that the larger global issues around energy and impacts driven by consumption, it just makes sense to make as many little changes as possible."

Steffi Rausch joined the Energy Savers Network staff in 2021. She brings 23 years of experience as a self-employed web designer and seven years of climate advocacy volunteer work as a chapter leader for Citizens' Climate Lobby. Connect with Steffi at Steffi@energysaversnetwork.org.

Thanks to a community fundraising campaign led by Appalachian Offsets, a 300 kW photovoltaic array was installed on the roof of Isaac Dickson Elementary School in the spring of 2021. SUNDANCE POWER SYSTEMS PHOTOS

Solar for Schools

Isaac Dickson System Installed After Community Fundraising Campaign

BY CARI BARCAS

A moment six years in the making arrived in the spring of 2021 as the much-anticipated solar electric system was installed on the roof of Asheville's Isaac Dickson Elementary School, thanks to a community fundraising campaign led by Green Built Alliance's Appalachian Offsets program.

Appalachian Offsets funds renewable-energy projects and energy-efficiency upgrades in Western North Carolina schools, nonprofits and low-income housing by pooling money contributed by local businesses and individuals through its voluntary carbon-offset program.

Appalachian Offsets finished fundraising for the Isaac Dickson solar project — its largest undertaking to date — in late 2019. Following the approval of the long-awaited interconnection agreement from Duke Energy, the system was installed by Sundance Power Systems on the school's roof over an 11-week period from March to May of 2021.

"Over two years, more than 100 donors contributed directly to make this project happen," Green Built Alliance Executive Director Sam Ruark-Eastes said. "This was a collective effort and we couldn't have done it without the support of our many donors and the large contribution of an anonymous donor who reached deep into their pockets to fund this effort. We are so grateful to live in a place that values clean energy for schools."

Isaac Dickson was designed by Legerton Architecture and Innovative Design as one of the state's first Net Zero Energy schools and has been awaiting the solar system to help it move toward that vision since it was built in 2015. Early that year, Sundance was awarded the contract for the solar project, which lacked the funding from Buncombe County to complete as part of the school's initial construction.

"It was critical to partner with Appalachian Offsets to fundraise for this project," said Dave Hollister, president of Sundance Power Systems. "The whole team at Green Built Alliance rallied to organize the crucial community fundraising for making this project happen."

The school will received a 300 kW photovoltaic array on several roofs with a total investment of $428,000. Appalachian Offsets and Sundance coordinated the fundraising efforts, collecting $305,000 through a variety of community contributions. The project is also being made possible through a $75,000 rebate from Duke Energy as well as Asheville City Schools' allocation of $48,000 in energy-efficiency rebates it re-

What's next?

Appalachian Offsets is currently exploring the potential of several future projects, and plans to announce its next fundraising focus in the near future. Stay tuned to Appalachian Offsets' website or the Green Built Alliance newsletter for the latest.

Appalachian Offsets has historically completed a variety of energy-efficiency and renewable-energy projects over its 15-year history in Western North Carolina, but the program is also open to considering applicants with carbon-sequestration plans. To receive funding, the project must be under the umbrella of a nonprofit, school or coop.

Individuals or businesses interested in supporting the work of Appalachian Offsets can visit cutmycarbon.org to calculate their carbon footprint and offset emissions by paying into the community fund that supports these projects in nonprofits, schools and low-income housing.

Organizations interested in applying for this funding and those with additional questions can email Green Built Alliance Executive Director Sam Ruark at Sam@greenbuilt.org.

A solar electric system is installed at Isaac Dickson Elementary School.

ceived for the energy efficient construction of Isaac Dickson.

The solar array will be a net-metered system, resulting in the school's electric bill being lowered by more than $30,000 per year with a 30-year savings of more than $1.3 million, according to Sundance Power Systems. Through an agreement with Buncombe County, the money saved on Isaac Dickson's electric bills will go back into the school's operating budget.

"The Isaac Dickson project is an expression of the dedication and commitment of this community for taking action against climate change and to leverage this technology to benefit our school system for years to come," Hollister said. "With the leadership of the Green Built Alliance and its Appalachian Offsets program, teachers and concerned citizens were able to raise the money for the project. This is community solar at its best."

In addition to reducing the school's energy bills, Isaac Dickson will leverage the asset as a teaching resource by weaving student involvement in the installation process and data from the on-site solar system into curriculum for students.

"Installing a rooftop solar system will fulfill the architects' vision of using the school building itself as learning tool that can be used to facilitate discussions about our environment and conservation, as well as the impacts of fossil fuel consumption not just on our climate but also on our air and water quality," said Isaac Dickson parent Matt Menne, who played an integral role in fundraising efforts during his time as co-president of the school's PTO. "What better way to help than by reducing the carbon footprint of our schools, which provides the added benefit of saving money on energy costs for the district in the long run."

Cari Barcas is community engagement director at Green Built Alliance. She has more than a decade of experience in communications and nonprofit management, including time reporting on the green building scene in Chicago as a journalist covering residential and commercial real estate. Connect with Cari at Cari@greenbuilt.org.

Caring About Building Air Leakage

The Intersection of Building Science and Cognitive Science

Building science best practices increase the likelihood of getting the most out of our buildings and avoiding the worst. PAT BARCAS PHOTO

BY JONATHAN GACH

You may have heard the concept that "buildings need to breathe" without really understanding what it means. Does this saying hold true to what we expect of modern buildings and what does it mean for your situation?

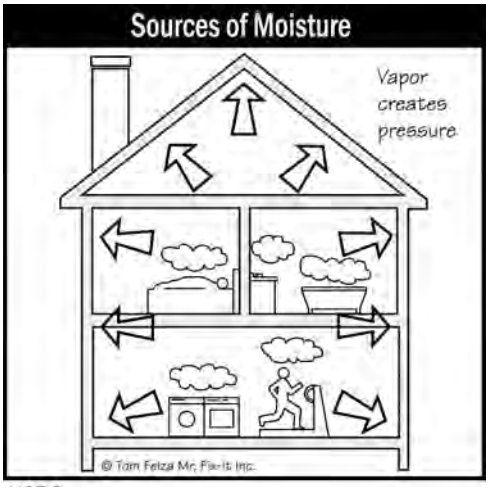
Through cumulative industry experience and an intimate understanding of how heat and moisture movement in buildings affect their performance, today's ideal construction method has evolved to the preferred approach of "seal it tight and ventilate right." Yet, with this knowledge, why are so many buildings leaky and what is the benefit of avoiding air leakage?

Access to information doesn't always lend itself to informed behavior. Consider radon: we know it is unhealthy, but that doesn't mean everyone values the ability to manage radon exposure. To do so requires ongoing accurate radon measurement for informed decision making and mitigation strategies. The reasons for not doing something about radon may be similar to the same reason we accept leaky buildings.

We have a cognitive tendency to make decisions based on one's perception of proximity (when) and magnitude (how big). Without knowing exactly how bad building air leakage is or exactly how much is really worth worrying about, one's perception of proximity and magnitude is a way of making a decision in the present in order to avoid a problem in the future.

The challenge is that we don't know when the consequences of a leaky building might manifest (proximity) or how big of a prob-

With all of the effort that goes into maintaining condition spaces, having a leaky building does nothing but make it harder and more expensive. JONATHAN GACH PHOTO



Ultimately, the desired performance of a building can be dictated by its ability to manage heat and moisture movement.

lem it might be (magnitude). Thus our perception of proximity and magnitude fill in for the imperfect information. Among other factors including building regulations, financial motivations, and the tendency to do things the way they've always been done, we have many buildings that are questionably leaky.

Why is this true and how important is it to "seal it tight and ventilate it right"? Well ... I hesitate to say, but it really depends on the situation.

Since the circumstantial value of air sealing can have to do with how well it was done and what resources one might be giving up to achieve a well-sealed building envelope, let's assume an ideal though potentially unrealistic scenario where resources are unlimited. In this scenario there is abundant access to qualified labor, appropriate materials, and expertise. The buildings that typically have the most to gain from a well-sealed and ventilated envelope are those that attempt to manage an environment most different from the outdoor environment.

For example, the minimum expectation of a barn is to provide shelter from rain or snow. A leaky barn helps ventilate the interior and avoid moisture accumulation. We expect homes to do much more including resisting the elements, avoid pests, and maintain comfortable temperature and humidity levels.

We hope that our homes will be durable and that it will be affordable to operate and maintain them.

The risks associated with air leakage of a home are greater because of the potential for condensation created by artificial temperature differences made possible with modern heating and cooling equipment. Managing this risk is all about limiting the exchange of conditioned air with unconditioned air. The increased risk for unmanaged condensation that results from conditioned spaces may occur in the organic building materials concealed from view, such as inside walls. The combination of moisture and organic materials invites life, but not the kind of life you want hidden in a wall, such as biological growth and wood destroying organisms.

The advantages of managing a building's air leakage goes beyond limiting the potential for condensation. Air movement induced by heating and cooling equipment from mechanically forced air, rising warm air and falling cool air create zones of pressure differential in buildings. When areas like the floor and ceiling that are connected to unconditioned spaces like a basement or attic are leaky we lose the ability to control where a building's fresh air comes from, because these zonal pressure differences force out conditioned air from interior spaces and replace it with unconditioned air from exterior spaces.

It turns out leaky buildings that are said to have the benefit of being able to "breathe" aren't bringing in clean air from adjacent spaces that is desirable for a healthy indoor environment. With uncontrolled air movement, the potential for excessive moisture, pests, noise, air contamination, and risk of fire spread are increased.

Heating and cooling are very energy-intensive processes. The greater the temperature difference between the inside and outside, the more heat has to be put in a building or removed and the quicker it has to be done to maintain desirable indoor conditions. At the same time, the occurrence of zonal pressure differences are increased as a direct result of forced air movement and the stack effect (rising warm air and falling cool air). Without discussion of conductive and radiant heat transfer, it is already possible to get an idea of how complex and sophisticated our endeavors are to maintain conditioned spaces.

With all of the effort that goes into maintaining condition spaces, having a leaky building does nothing but make it harder and more expensive. Think about a building like a bucket. Keeping it full of comfortable conditioned air is easier when there aren't elusive holes allowing the expense of conditioned air to leak out. When the openings for fresh air to enter a building are conspicuous, we can decide how much stale conditioned air we want to exchange with fresh unconditioned air from the outside. That is why we "seal it tight and ventilate it right."

Ultimately, the desired performance of a building can be dictated by its ability to manage heat and moisture movement. When a high-performance building is desired, the best way to go about managing heat and moisture movement is to seal it tight and ventilate it right. When this is done with consideration for the building's systems and their interconnectedness, the benefits are layered and compounding.

The benefits of doing it correctly and the consequences of doing it incorrectly can have an impact whose proximity and magnitude is unknown. Building science best practices increase the likelihood of getting the most out of our buildings and avoiding the worst.

Jonathan Gach is self-employed with Energy Home Inspection as a real-estate inspector and building diagnostician for residential and light commercial properties. He is a person who will enthusiastically take you up on an invitation to investigate a crawl space. Connect with Jonathan at energyhome inspection.com.

Healthy From the Ground Up

Home Healthiness Starts in the Design-Build Process

The design stage is the most advantageous time to set the conditions for environmental healthiness performance. ANTHONY SHKRABA PHOTO

BY RICK BAYLESS

In recent decades, our increased focus on sustainability has led to the creation of advanced house and commercial designs that are indeed very energy efficient, thanks in part to organizations such as Green Built Alliance, U.S. Green Building Council and their related certification programs leading the way.

But, outdoor weather patterns, house tightness, and occupant health needs are at a point now where our indoor environments can slip into sickness, also known as "Sick House Syndrome." Though most people assume this is something found only in older homes, it is a real concern especially for environmentally sensitive individuals.

As a board-certified Indoor Environmental Consultant, I've been called in often to examine recently built homes where the new owners are having adverse health symptoms within less than a year of moving into the home. By understanding what could be causing people to develop health issues in new homes, we can adjust our building practices to deliver a sustainable balance between energy efficiency and healthiness.

The house as an organism

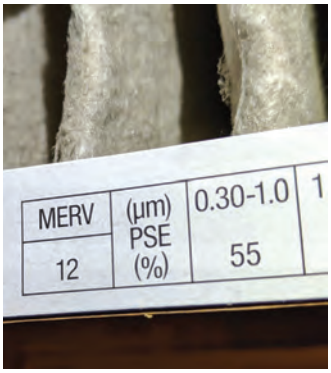
Think of a house as a living thing.

No, not like something out of a horror movie where we keep yelling at the screen, "Don't go into the basement!" but as a functioning system.

There's a brain in the home's energy systems; a central nervous system made up of components, cables and wiring; a respiratory system inhaling and exhaling via the HVAC/AC/furnace; the metabolic system found in the plumbing, pipes and sewer; and the kitchen, of course, is the heart, but I digress.

The point is, the home is a system that can be operating at its maximum healthiness or one that could be sick.

Great strides have been made with programs such as Green Gauge, a building science-based analysis of an existing home's energy characteristics and efficiency. Along with the priority of increasing a home's energy efficiency, more consideration needs to be given to improving a home's healthiness.



Air filter showing MERV. SCOTT PARKER PHOTO

The design stage is the most advantageous time to set the conditions for environmental healthiness performance, taking a holistic approach to control issues such as wetness, dampness, temperature regulation, air particulate control and exchange capabilities.

Common areas of concern

Just as individuals are informed on certain symptoms to watch for within their physical wellbeing, so too can homeowners benefit from education on common systemic sources of home healthiness concerns.

For example, a homeowner turns off the ventilating system (energy recovery ventilator, or ERV), thinking they can save money or energy. Carbon dioxide levels increase, which leads to healthiness issues. Dust levels go up, odors go up, chemical pollutants go nowhere.

However, using the ERV could increase humidity levels. So, what should the homeowner do? First, they should monitor indoor humidity with hygrometers in living areas and the basement where mold can be an issue. Then, if there are dampness issues, either install a whole-house dehumidifier or purchase a free-standing dehumidifier if they have a limited budget. And, turn off a whole-house humidifier if one exists.

Another simple thing that often causes issues is related to MERV, or the Minimum Efficiency Reporting Value developed by the American Society of Heating, Refrigeration and Air Conditioner Engineers. A higher MERV value denotes a filter that is more efficient at trapping airborne particles.

Green building in process. PIXELBAY PHOTO

Millions of folks get sick from being inside their tight, enclosed homes because they haven't been educated about MVOCs, otherwise known as microbial volatile organic compounds created by fungi and bacteria.

However, it is imperative to help homeowners understand the maximum filter that can be used with the system installed. People will often say "higher is better," when we know from the field that the wrong size filter can do just as much harm as a dirty one.

Millions of folks get sick from being inside their tight, enclosed homes because they haven't been educated about MVOCs, otherwise known as microbial volatile organic compounds created by fungi and bacteria. That musty smell may be the result of MVOCs, which can be dangerous and even toxic.

People often need to be reminded that although they have invested in a green house, they still need to maintain home health with ongoing measures like controlling humidity at 45 percent and scheduling a professional HVAC system and air duct cleaning to ensure they'll be breathing easy for years to come.

A home-health punch list

The green-building industry recognizes many components of healthier home environments as they are part of the EPA's Indoor airPLUS program. The EPA's protocol is getting there, but leaves room for improvement.

Just as selecting finishes for countertops and stainless-steel appliances are part of the design-build stage, there should also be a punch list for environmental healthy home performance. It is prudent to strengthen these systems early in the design process, or to at least make adjustments that allow for easier implementation of healthiness measures by the building owner through the coming seasons.

These considerations are becoming a matter of necessity to those with chronic conditions who are more vulnerable to downturns in health as adverse environmental conditions intensify along with the impacts of climate change.

As the costs of new-home construction continue to creep higher, it's worth acknowledging that these components and adjustments will impact the homeowner's budget. But, this commitment to keeping the home "alive and healthy" from the beginning will pay off in the long run.

When the design-build team is not actively involved in the conversation on healthy-home performance from the ground floor, it can create the conditions in which issues are more difficult to address and often ignored by the homeowner moving forward.

It can be much more satisfying for the contractors and homeowners alike if the build team as the experts sets the stage for healthiness protocols with everyone from the beginning, on the same blueprint.

Rick Bayless is founder and owner of A Healthier Home LLC. Board-certified as an indoor environmental consultant (Indoor Air Quality Association) and as a Healthy Homes Specialist (National Environmental Health Association), Rick offers expert, unbiased evaluations and services regarding a home's environmental and wellness status including Sick House Syndrome. Connect with Rick at ahealthierhomenc.com.

For the past two decades,

GREENBUILT ALLIANCE

Green Built Alliance has been working to advance sustainability in the built environment, and we would not have been able to make such an impact without the support of the many individuals who energize our mission by engaging with our programs. Thanks to all those who have supported our work by building green projects, donating to improve the homes of our neighbors in need, and offsetting their carbon footprints in the past year.

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Individuals and businesses who donated to support home-efficiency improvements for neighbors in need through Energy Savers Network

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Individuals and businesses who offset their carbon footprint and support clean-energy projects in local schools and nonprofits through Appalachian Offsets

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These maps show the impact of redlining on New York Boroughs. MAPPING INEQUALITY PROJECT IMAGE

Centering Equity in Green Buildings

Marginalized Benefits Are Not Sustainable Benefits

BY VALERIE J. AMOR

The word benefits, for most people, is usually defined by their personal association to the word, for example through Social Security benefits or medical benefits. By merely inserting the word benefits in any sentence, it immediately seems to imply something good and positive.

When the word co-benefits is used, it is usually invoked in the context of providing synergistic benefits, an important concept in sustainability and resiliency in responding to a climate-change challenged world. A common example of co-benefits can be seen in green roofs' ability to provide stormwater management, reduce the heat-island effect, increase a roof's life, reduce energy use in the building, and offer a potential green space to enjoy.

These are all positives and should be part of a healthy, regenerative environment. But what if some or all these benefits are not shared equally or equitably, or access is limited? Are the benefits still as beneficial and for whom?

Recent research on tree canopies has shown that there was a calculated unequal investment in where trees were planted within American cities, following the patterns of redlining, disinvestment, and racial segregation over the past century.

The research shows that not only did lower-income areas have less tree canopy but the trees that were planted were smaller than those planted in wealthier neighborhoods. One could say that a benefit of increasing the tree canopy was provided to all the residents of a given city. However, the benefit was unequally and unfairly provided.

Take another example of a report released in February 2021 by the City of Orlando in the Orlando Energy Burden Report as part of the American Cities Climate Challenge. Even though citywide there is a decrease in energy burden, conditions are worsening in some of the highest burdened neighborhoods. According to the report, "while the average burden has been improving across the city, some of the most burdened areas are not sharing in these benefits."

The report summary explains that spending a high percentage of household income on energy costs is connected squarely to equity issues like healthcare and race, an historic continuation of systemic bundling and discarding groups of people based on race, class, and income.

Affordable housing

By selecting sites with less than ideal conditions, developers can drive down their land-acquisition costs while maximizing their return on investment, and in turn, are then rewarded by collecting valuable tax credits. The result is a repetition of the cycle of placing frontline communities back on the front line, in unhealthy environments for low-income communities.

Consider my family's quest to obtain an apartment through the affordable housing lottery in New York City. Too many times, when we visit the project, it is in a marginalized area in proximity to major transportation arteries, in flood zones or near heavy industrial areas. Within the project itself, affordable units are selected based on market rentability, designating the least desirable units as affordable. This usually equates to compromised views, coughing proximity to subways and highways, and smaller floor plans; closets seem to be considered a luxury.

One could argue that the building is new, providing up-to-date appliances with perhaps some shared amenities. But there is a missing requirement in exchange for developer tax credits awarded for including affordable housing units in the project: a criterion that needs to be met for quality of life. Too often, the very conditions that the tenant is trying to move away from comes back full circle. The tenant is looking for a healthier, safe environment in which to live. It could be argued that being offered a bright and shiny brand-new building with new appliances is all that is required and isn't that

Green roofs, with far-reaching environmental, social, and economic benefits, can be instrumental in addressing systemic issues for Black, Indigenous and people of color, as well as low-income populations.
LIVING ROOFS, INC. PHOTO

enough?

Is it enough? No, it is not. The message we hear is that because of our lower income, we only deserve the smaller-size units with maybe closets in the bedrooms, access to a laundry room not an in-unit washer and dryer, with affordable units that were pre-selected during the design process to be located in the least desirable locations within the building.

This is a market-driven approach that reinforces the entitlement of those with greater means and marginalizes those who occupy the affordable units. It is a positive feedback loop in the most negative way possible. The benefit ultimately only benefits the developer, not the prospective tenant; it is stolen wealth over the generations perpetuated by the complicity of government and developers.

Should the developer be held to a higher standard of delivery for housing services? Damn straight. Equal access to benefits, the equitable distribution of these benefits and ultimately, the elimination of institutionalized discrimination are all directly linked. Based on the level of need, tenants of low-income housing should be entitled to proportionally more benefits and amenities.

So how can this be realized? So far, we have looked at some of the existing inequities in providing benefits and the continued, systemic marginalization of an already marginalized population. But are there co-benefits that have not been fully realized? Consider the role of the building itself.

Green roofs

Local Law 92/94 in NYC became effective in November 2019. It essentially requires that all new buildings and alterations of existing buildings, provide a sustainable roofing zone covering 100 percent of the roof which must include either a solar photovoltaic system and/or a green roof system.

Green roofs, with far-reaching environmental, social, and economic benefits, can be instrumental in addressing systemic issues for Black, Indigenous and people of color (BIPOC), as well as low-income populations; too often one in the same.

When the greenery on a roof elevates to being productive, a chain of reactions can drive home the point that the cost of installing and maintaining a rooftop garden or farm begins to diminish relative to the co-benefits it can provide: entrepreneurship, job training, educational opportunities, community building, access to local food, support for shelter-in-place and greater resilience amidst extreme heat and disruptions to the food system.

This begins to address health issues as well as providing cleaner, cooler air. Since the Department of Housing and Urban Development still has not repositioned itself on considering air conditioning a luxury rather than a necessity (a long-standing position), this is an important benefit.

Shelter in place

Building on the opportunities afforded by a green roof creates opportunities for the residents to become self-sustaining and resilient in the face of disasters.

This was a major problem after Hurricane Sandy, especially in affordable and NYCHA housing. With too many elderly living on top floors in tall buildings without working elevators, they were not able to traverse the stairs, creating many difficulties for rescue crews trying to provide emergency supplies.

Underscoring the importance of equipping residents to shelter-in-place rather than be forced to leave during or after an emergency event, by integrating on the upper floors a kitchen, emergency-only medical station and at least one week's storage of foodstuffs (supplemented by the rooftop farm), realigns the concept of resilience. It becomes its own circular form of self-reliance by being able to provide emergency supplies, from the top down as well as from the bottom up.

"We know that public housing is a sleeping giant. We are the most impacted by anything that comes to the city, whether it be COVID, registering to vote, filling out the census," says Lynn Spivey, president of the New York City Housing Authority (NYCHA) Branch of the NAACP. "(I am) proud to advocate for people with NYCHA after growing up in public housing in the Bronx."

Spivey serves as a HomeFree Champion, part of a Community of Practice and an advisory board for the national HomeFree initiative of the Healthy Building Network, supporting affordable housing leaders who are improving human health by using less toxic building materials.

Co-benefits are enhanced benefits that speak directly to quality of life. We all love to walk down tree-lined streets, especially in the summer, as they provide shade and cooling, filling our lungs with sweet, restorative air. This should not be a luxury enjoyed by those who happen to buy in the right real-estate market.

Quality of life is an environmental justice necessity. Co-benefits need to be provided equitably and fairly without distinction or prejudice. If we are all to survive the impacts of escalating climate change, we must rethink regenerative resiliency; otherwise, we will all pay the cost.

Valerie J. Amor is a member of the NAACP's Centering Equity in the Sustainable Building Sector initiative, which is working to ensure a just transition to sustainable buildings for communities of color and low-income communities who disproportionately feel the burden of unhealthy, energy-inefficient, and disaster-vulnerable buildings.

Sustainable Stone

Lowering the Environmental Impact of Your Hardscaping Project

Because natural stone comes in so many sizes, it's easier to work around pre-existing living plants and shrubbery.
STEVE AMBROSE PHOTOS

BY STEVE AMBROSE

From a patio or walkway to a custom fireplace, designing your backyard's features with natural stone has become more popular in recent years for its beauty and durability.

To be an educated consumer and build your outdoor oasis with the environment in mind, it's important to understand the impacts of the stone you choose and how you can make better choices to ensure your design is eco-friendly.

Shop local, buy natural

After the year that was 2020, we all want to get outside more. True nature-lovers may fear that digging up your backyard or altering it in any way could hurt the environment. But there are environmentally friendly hardscaping practices that can allow you to design the backyard of your dreams and still do what's right for the planet.

Before shopping for materials for any outdoor renovations, it's essential to understand how your choices could affect Mother Nature.

First, consider where you'll shop. While searching for stone for your outdoor patio or fireplace, if you decide to shop at the local big-box hardware chain, you might end up selecting stone that traveled a long distance, using gallons and gallons of fossil fuel while they made their way to you.

Transporting natural stone a far distance ranks as the most significant environmental hazard of choosing this medium. Think of the large planes or boats exporting and importing natural stone from a developing country. Then, a truck transporting the stone barrels down the highway with gas billowing out of its exhaust pipe.

But shopping locally is easy because quarries exist across the United States, including in and near Western North Carolina. The trick to maintaining a low environmental cost is to choose a natural stone from a local, nearby quarry. Selecting local stone also helps ensure it will hold up in your region's climate. Picking natural stone native to your area means less maintenance, price, and carbon emissions for you.

Next, ensure you're actually choosing a natural stone. Some products you might purchase look like stone but are really made of concrete, which presents many environmental issues.

The costs of concrete

Homeowners looking to design an inexpensive outdoor patio may seek out materials like concrete to create a functional and afford-

able outdoor space for entertaining. However, concrete is manmade which means there's a high environmental cost.

To pour concrete, the truck needs to be on at all times to spin its drum. This prevents the concrete from hardening before it's been laid. The truck idling in front of your home means it is emitting carbon dioxide while the contractor can spend hours completing your hardscapes.

Concrete also doesn't absorb rainwater, so as it builds up, the rain runs off into a nearby storm drain. The runoff can pollute the local natural streams, hurting the water supply and local animals.

When selecting a natural stone, the layout allows the water to soak into the dirt below it and drain back into the soil, the way Mother Nature intended.

In general, natural stone has a low impact on the environment because it requires little fabrication and no harmful chemicals. This is unlike other options you could select, such as wood, brick, ceramic, glass, and concrete, which require natural resources and energy to create.

Manufactured stone is created for its tolerance and consistency. It is an excellent choice for commercial projects where uniformity and strength is a premium, but it requires enormous sophisticated machinery to create the pressures and temperatures necessary. Naturally you won't find manufactured stone factories near most of the U.S. population because of their size. They are huge distribution hubs serving many states at a time. The travel distances are far greater than even concrete.

The impacts on environment

The good news is that stone is not a limited natural resource and comes from the Earth. When designing any part of your outdoor property, choosing Earth-friendly materials that renew themselves helps the environment because you're not depleting a natural resource.

No manmade materials are used to create natural stone, making it an extremely environmentally friendly choice. Choosing materials such as soapstone, limestone, and travertine help you design an eco-home.

Since natural stone comes from the Earth, each one is different due to geological shifts, mineral composition, and the weather. All of these things mean you can choose from diverse types of stone to achieve the rustic or romantic look you envisioned for your unique home and project.

Homeowners may seek out materials like concrete to create an affordable outdoor space. However, concrete is manmade which means there's a high environmental cost.

When designing natural stone hardscapes in your back or front yard, consider trees or flowers. Because natural stone comes in so many sizes, it's easier to work around pre-existing living plants and shrubbery. Leaving the greenery intact helps keep the environment in balance as well.

The benefits in maintenance

In terms of maintenance, most sealers used for stone are natural and water based. Natural sealers emit fewer chemicals into the air, helping lower pollution.

Since natural stone comes from the Earth, it is tolerant of the elements, such as rain, snow, or sun. Stone doesn't show much dirt, which reduces the need to clean and minimizes the use of energy, water and chemical cleaners in the process.

On the contrary, decks built out of wood require yearly treatments as well as monitoring for rotting and bugs. Within several years, a wood deck may need an upgrade, repair, or replacement, whereas natural stone patios are free of these issues.

Stone projects stand the test of time, lasting anywhere from 50 to 100 years. Stone's durability means once installed, you won't have to redo the project in a few years with new materials. And that results in less overall waste generated from your home.

Steve Ambrose is an expert hardscaper who has been working with natural stone for more than 25 years. Steve owns Ambrose Landscapes, a full-service landscaping company in Asheville. Steve works with three generations of landscapers, all of whom put responsible building at the core of what they do. Connect with Steve at ambroselandscapes.com.

While searching for stone for your outdoor patio or fireplace (left), shopping locally is easy because quarries exist across the United States, including in and near Western North Carolina. Stone's durability means once installed (right), you won't have to redo the project in a few years with new materials.

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We are a green home building company working in the greater Asheville area. It is our passion to build beautiful and creative homes that add value and comfort to the lives of our owners and community. In each home we strive to articulate modern green building practices.

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DUKE ENERGY'S HOME ENERGY HOUSE CALL program offers eligible homeowners a free home-energy assessment to help you learn how your home uses energy, including where you can improve comfort and maybe even save money. You'll also get a free Energy Efficiency Starter Kit. Learn more at bluehorizonsproject.com.

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You dream it, we build it! Appalachian Builders Collective is a worker-owned construction company based in Asheville, NC.

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Beach Hensley Homes provides sensibly crafted, fixed-priced homes that are affordable, responsibly built designs with a focus on efficiency and urban infill building. To us, it's bigger than home building - we want to foster the growth of the community while simultaneously preserving the integrity of our Appalachian ecology.

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A green home is healthier to live in and healthier for our planet. It is our mission to build green homes that bring together the features of an environmentally-friendly structure, while maintaining the function and design of a custom built, upscale home - our unique hybrid of green and luxury.

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We are a leading green building company committed to the highest standards in construction quality and sustainable, healthy living.

Equinox Woodworks
Todd Kindberg
Burnsville • 828.284.6552
todd@equinoxwoodworks.com
equinoxwoodworks.com
Building custom, high performance, finely-crafted homes in Yancey and Mitchell County, plus design services, renovations, custom furniture, and timber frame.

Evergreen Construct Inc.
Darren Henegar
Leicester • 828.779.4077
evergreenconstructinc@gmail.com
evergreenconstruct.com
Evergreen Construct specializes in custom-built homes and renovations, using your inspiration to create mindfully crafted structures through a collaborative process.

Falcon Construction and Development
David Ross
Asheville • 828.274.3055
tanya@falconbuilt.com
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

Familia Enterprises LLC
Konstantinos Katsigiannis
Asheville • 828.712.0300
builtbygus@gmail.com

Forward Construction Inc.
Jim Forward
Asheville • 828.298.9532
JTFBuilder@gmail.com

Going Green Builders LLC
Ryan Jacques
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goingreenbuilders@gmail.com
goinggreenbuilders.info

Grammatico Signature Homes
Brooke Geiger
Biltmore Lake • 734.945.1565
grammaticohomes@gmail.com
grammaticohomes.com
Grammatico Signature Homes is an Asheville-based full-service building company offering complete home building, remodeling, consulting, and real estate.

Green Earth Developments
James Boren
Asheville • 386.690.0886
JamesnBoren@yahoo.com
loveyournewgreenhome.com
Our business involves developing responsible homes on a site where the trees are considered very important assets to this planet. Love your new green home!

Green Light Home Builders LLC
Jon Sloop
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jon@greenlightcustomhomes.com
greenlightcustomhomes.com

Green Room Builders
Kat McReynolds
Asheville • 910.389.7373
kat.mcreynolds@gmail.com

Greencraft, Inc.
James & LeAnn Bound
Fairview • 828.713.2316
greencraft.lb@gmail.com
ashevillegreenbuilder.com
We are committed to serving Asheville as a sustainable builder. Our focus is super energy-efficient, high-quality and environmentally sound home-building.

High Country Timberframe & Gallery Woodworking Co.
Tom Owens
Boone • 828.264.8971
tomo@highcountrytimberframe.com
We specialize in design/construction of high-performance homes that meet Green Built Homes and NC Energy Star 3 standards.

HomeSource Real Estate & Construction, Inc.
Tim Alexander
Asheville • 828.252.1022
tim@homesourcebuilders.com
homesourcebuilders.com
Fully licensed and insured custom home builder and remodeling contractor, providing expertise and commitment in construction. Offering turnkey service, including home design, kitchen and bath design, and product selection under one roof. Current and past projects include more than 100 custom homes and hundreds of remodels from large to small.

Howard Building Science, Inc.
Rob Howard
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rob@howardbuildingscience.com

Jade Mountain Builders & Co. Inc
Hans Doellgast
Fairview • 828.216.3948
hans@jademountainbuilders.com
jademountainbuilders.com
Jade Mountain Builders is a team of 39 craftsmen who pride themselves on taking an ecologically sensitive approach to building homes.

JAG & Assoc. Construction, Inc.
Jody Guokas
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jody@jaggreen.com
jaggreen.com
JAG Construction is a small company specializing in in-town urban spec construction. Our goal is to make healthy, creative, long-lasting houses more available to the general public. We're examining new ways to reduce the impact of construction on the environment around us and preparing for a future of alternative energy.

Kaizen Homes
Jonathan Landry
Candler • 828.450.1317
jlandry@khbuilt.com
khbuilt.com

Kogi Group LLC
Alfonso Socarras
Arden • 828.775.5901
alfonsosocarras@hotmail.com

Living Stone Design+Build
Molly Sullivan Reeves
Black Mountain • 855.720.2435
molly@livingstoneconstruction.com
livingstoneconstruction.com
Living Stone Design+Build crafts award-winning custom homes that exceed clients' expectations. For over 20 years, our proven process and strategic partnerships with architects, designers and realtors has delivered dream-worthy homes at the best value to hundreds of families and couples seeking a happier, healthier life in the mountains.

LMT Homes
Lauren Tamayo
Asheville • 828.318.3740
lauren@lmthomes.com
lmthomes.com
LMT Homes is a modern builder taking a unique approach. Our form and design follow the functionality in a home.

M.C. Kern Contracting, Inc.
Matt Kern
Asheville • 828.231.1252
cazkern@aol.com

McHugh Designs
Bobby McHugh
Asheville • 828.712.8451
rebaloo@bellsouth.net
mchugh-designs.com
We strive to make art that you live in. Custom woodwork, in-house design, and attention to detail sets us apart.

McMaster Construction Company
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Asheville • 828.676.4775
wncpropertysolutions@gmail.com

Meinch Construction inc
Jesse Meinch
Asheville • 828.243.2997
jesse@meinchconstruction.com
meinchconstruction.com

Milestone Contracting
Dustin Penland
Fairview • 828.342.8211
dustin@milestonebuilding.com
milestonecontracting.net

Milo General Contractor, LLC
Andy Stowe
Asheville • 828.702.2735
andy@milogeneralcontractor.com
milogeneralcontractor.com

Mountain Sun Building & Design
Emily Boyd
Asheville • 828.713.0549
emily@mountainsunbuilding.com
mountainsunbuilding.com
A small design/build firm focused on site-specific design and zero energy homes, we can work with clients from finding the perfect lot through move in and landscaping. Our passion is creating finely crafted, light filled homes that connect interior spaces with their natural surroundings.

Mystic Builders
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cwilson@mystic-builders.com

Nemec Construction, LLC
Chris Nemec
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chrisnemec@gmail.com
nemecconstruction.com

New Pointe Builders
Jim Ayers
Hendersonville • 828.329.8024
jamesgayers@yahoo.com
newpointebuilders.com

Nicholson and Sun LLC
Donald Nicholson
Asheville • 828.620.3000
nicholsonandsun@gmail.com
nicholsonandsun.com
Using a foundation of science, aptness for innovation, and passion for arresting climate change, we build unique true green™ homes.™™

Old North State Building Company
James Dose
Black Mountain • 828.623.0009
office@onsbc.net
oldnorthstatebuildingcompany.com

Osada Construction
Matt Osada
Asheville • 828.606.7890
info@osadaconstruction.com
osadaconstruction.com

DURING SUMMER MONTHS, gardens and landscaping can account for 50 to 70 percent of a home's water usage. Installing a rainwater-harvesting barrel could take care of your watering needs for the summer.

Pioneer Construction and Development Inc.
Duane Liming
Asheville • 828.242.5101
duane@pioneerasheville.com
pioneerasheville.com
With over thirty years of experience, Pioneer consistently blends innovative ideas with time honored quality. We work until your project or new home is true to your vision. To learn more call us at 828.768.8771.

Preish Construction, Inc.
Mallory Fuller
Asheville • 828.776.4444
homes@preish.com
preish.com

Rare Earth Builders, Inc.
Mark Bondurant
Canton • 828.492.0534
rareearthbldrs@bellsouth.net
rareearthbuilders.com
We build high-performing, exceptionally beautiful custom homes while minimizing negative environmental impacts with attention to construction details and client comfort.

RCJ Building Inc.
Robert Jacobelly
Asheville • 828.216.4433
rcjbuilding@yahoo.com
RCJ Building Inc.'s custom homebuilding professionals have the knowledge and expertise that you'll need when you have the opportunity to build the house you've always wanted. We understand what goes into the building process, and more importantly, what goes through the minds of future homeowners during the build.

Robert Roepnack
Robert Roepnack
Asheville • 828.545.5363
Bob@roepnack.com
jcrdesigns.net

RS Motley Construction
Rob Motley
Asheville • 828.776.7470
rsmotleyconstruction@gmail.com
robmotleybuilder.com
We distinguish ourselves through communication, honesty, transparency, attention to detail, and building each home as if it were our own.

Ruckle Construction and Realty Inc.
Skip Ruckle
Leicester • 828.776.3532
skipruckle@gmail.com

Sage Builders
Doug Keefer
Asheville • 828.713.7208
info@thesagebuilders.com
thesagebuilders.com
SAGE uses Sustainable, Appropriate, Green and Efficient building techniques to create beautifully hand-crafted homes with passive and active solar amenities.

Scroggs Construction Services LLC
Nicholas Scroggs
Swannanoa • 828.552.3222
Nick@scroggsconstruction.com
ScroggsConstruction.com

Sineath Construction Company
Allyson Sineath
Weaverville • 828.645.8518
asineath@sineathconstruction.com
SineathConstruction.com
We're committed to offering you a place constructed with care; using quality, sustainable materials with enduring value and timeless appeal.

Solid Rock Builders LLC
Travis Meinch
Asheville • 828.712.3280
travis@solidrockbuilders.com
solidrockbuilders.com
We focus on providing our customers with a wonderful building experience, and a beautiful efficient custom home.

SouthLight Builders
Jamie Shelton
Asheville • 828.775.8665
southlightbuilders@gmail.com
southlightbuilders.com
We are a green building and design firm constructing the areas most energy efficient homes since 1977. We were pioneers of the green building movement long before it had a name. Our turn-key approach to building allows us to keep construction costs low and maintain the highest quality.

Standing Stone Builders, Inc.
David Ulrichs
Asheville • 828.713.2771
daveulrichs@gmail.com
standingstonebuilders.com

Steel Root Builders
Bob Koplos
Asheville • 830.832.7610
bob@steelrootbuilders.com
steelrootbuilders.com
We specialize in modern luxury homes, complete renovations and commercial upfits.

Stillwell Carpentry
Nick Stillwell
Black Mountain • 828.273.6425
nickstillwell@gmail.com

Sulaski & Company
Robert Sulaski
Asheville • 828.273.4458
robert@sulaskico.com
sulaskico.com
We are a builder and developer of well-planned homes and communities.

Sundog Homes
Joel Sowers
Asheville • 828.774.5720
info@sundoghomes.com
sundoghomes.com
Sundog Homes is a division of Sundog Development Company LLC, an unlimited general contractor with projects in NC and SC

Sure Foot Builders Inc.
Raymond Thompson
Asheville • 828.242.0925
surefootbuilders@gmail.com
surefootbuilders.com
We are a green home building company working in the greater Asheville area. It is our passion to build beautiful and creative homes that add value and comfort to the lives of our owners and community. In each home we strive to articulate modern green building practices.

The Brigman Group
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thebrigmangroup.com

The William Baxter Co.
William Baxter
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thewmbaxterco@aol.com

THINK BUILD + design
Travis McKay
Asheville • 828.209.8855
think.build.design@gmail.com
thinkbuilddesign.com
Eco-friendly design-build and remodeling firm focused on providing superior quality and workmanship for aesthetically pleasing construction of modern homes.

Timberframe Horizons, LLC
Tom Rouse
Fairview • 828.222.2555
tom@timberframehorizons.com
timberframehorizons.com
We are a design build firm that specializes in creating energy-efficient custom artisan homes utilizing timber frame construction.

Timberline Custom Homes, LLC
Mark Montini
Asheville • 828.776.1511
timberlinehomes@att.net
timberlinecustoms.com

Town Mountain Builders LLC
Kirk Johnson
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townmountainbuilders@gmail.com
townmountainbuilders.com

Tyner Construction
Marc Tyner
Burnsville • 828.682.7421
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Virant Design Inc.
Tom Virant
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virantdesign.com

Wells Construction Group
David Wells
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dfwells@bellsouth.net

Wheelhouse
Chris Faulkner
Brevard • 828.577.5493
chris@wheelhousebuilders.com
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WSM Craft
Smith McAulay
Asheville • 828.337.1957
smcaulay@wsmcraft.com
wsmcraft.com

Cleaning

Clean Environments
Nina Young
Asheville • 828.239.0040
nina@cleanasheville.com
cleanasheville.com

Commercial Builders

Buchanan Construction, LLC
Rick Buchanan
Asheville • 828.650.6565
rick@buchananconstruction.com
buchananconstruction.com
A green home is healthier to live in and healthier for our planet. It is our mission to build green homes that bring together the features of an environmentally-friendly structure, while maintaining the function and design of a custom built, upscale home - our unique hybrid of green and luxury.

Consultants

Love The Green Team
Mary Love
Asheville • 828.279.6723
mary@lovethegreen.org
lovethegreen.org
Love The Green Team is a women/veteran-owned full-service real estate company. Our mission is to create a sustainable world, one home at a time. We provide services to buyers and sellers, and property management services. We are your matchmaker for the home that you love which fits your budget.

Developers & Communities

Asheville Housing Authority
David Nash
Asheville • 828.258.1222
dnash@haca.org
haca.org

ASHEVILLE GREENWORKS OFFERS "Hard 2 Recycle" days throughout the year to recycle items that cannot be included in your curbside pickup and to avoid the landfill.

"To waste, to destroy our natural resources, to skin and exhaust the land instead of using it so as to increase its usefulness, will result in undermining in the days of our children the very prosperity which we ought by right to hand down to them amplified and developed."

— Theodore Roosevelt

Building for Life, L.L.C.
Stuart Zitin
Asheville • 828.230.1424
stuartzitin@gmail.com
buildingforlifeasheville.com
We have completed many renovations, additions, and a few new homes in Asheville since 1996. Now we have begun developing 4 south-facing acres in Oakley, a mile from Biltmore Village. All homes are Energy Star/Green Built Certified—some with breathtaking mountain views and some affordable, including a Cottage Development.

East West Capital
Brian Nelson
Asheville • 828.490.1156
bnelson@eastwestcapitalgroup.com
eastwestcapitalgroup.com
East West Capital is a private-equity investment firm with a focus on acquiring, repositioning and managing value-add projects. We focus on driving successful residential and commercial projects in urban areas and in the path of development. Sources of capital include the principals and funding from Asia and the U.S.

Green Earth Developments
James Boren
Asheville • 386.690.0886
JamesnBoren@yahoo.com
loveyournewgreenhome.com
Our business involves developing responsible homes on a site where the trees are considered very important assets to this planet. Love your new green home!

Hickory Nut Forest Eco Community
Jane Lawson
Gerton • 828.625.4780
laughingwaterscontact@gmail.com
hickorynutforest.com
Hickory Nut Forest Eco-Community in Gerton 17 miles from Asheville, sits on over 100 acres with waterfalls, wildflowers, and mountain vistas. 20 home sites with green, solar homes surrounded by forever-wild land, organic orchard/gardens, hiking trails, and Laughing Waters Retreat Center, which utilizes hydropower generated from Hickory Nut Creek.

Homeward Bound of Western North Carolina
Santiago Cely
Asheville • 828.767.0423
santiago@homewardboundwnc.org
homewardboundwnc.org

JAG & Assoc. Construction, Inc.
Jody Guokas
Asheville • 828.216.0914
jody@jaggreen.com
jaggreen.com
JAG Construction is a small company specializing in in-town urban spec construction. Our goal is to make healthy, creative, long-lasting houses more available to the general public. We're examining new ways to reduce the impact of construction on the environment around us and preparing for a future of alternative energy.

Mountain Housing Opportunities
Geoffrey Barton
Asheville • 828.254.4030 ext. 130
geoffrey@mtnhousing.org
mtnhousing.org

Mountain Meadows on Crooked Creek
Bernie Byrne
Mars Hill • 828.230.0755
bernie@ashevillemountainlots.com
ashevillemountainmeadows.com

Olivette Riverside Community and Farm
Allison Smith
Alexander • 828.407.0040
allison@olivettenc.com
olivettenc.com
Olivette is a 346-acre planned community and historic farm on the French Broad River, just 6.7 miles from downtown Asheville.

Sure Foot Builders Inc.
Raymond Thompson
Asheville • 828.242.0925
surefootbuilders@gmail.com
surefootbuilders.com
We are a green home building company working in the greater Asheville area. It is our passion to build beautiful and creative homes that add value and comfort to the lives of our owners and community. In each home we strive to articulate modern green building practices.

Education

AB Tech
Heath Moody
Asheville • 828.254.1921
hmoody@abtech.edu
abtech.edu
Our programs focus on a variety of teaching techniques, including live projects. Students acquire skills in energy efficiency, renewable-energy technologies, and construction materials and methods associated with high-performance buildings. We are Asheville's training center for renewable energy, advanced framing methods, green building, energy-auditing techniques, and software associated with building-energy analysis.

Asheville Home Builders Association
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ashevillehba.com

Christmount
Rob Morris
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christmount.org

Green Opportunities
Eric Howell
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eric@greenopportunities.org
greenopportunities.org
Green Opportunities (GO)'s mission is to train, support, and connect people from marginalized communities to sustainable employment pathways. In addition to technical training in construction and culinary arts, GO's holistic programs include wrap-around support services, high school equivalency classes, life skills training, counseling, and job placement assistance.

Lenoir-Rhyne University Asheville
Michael Dempsey
Asheville • 828.407.4269
michael.dempsey@lr.edu
lr.edu/asheville
Pursue a master's degree in Sustainability Studies or MBA in Social Entrepreneurship, with tuition discounts for Green Built Alliance members.

Mtn STEM Solutions
Hayden Fink
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mtnstemsolutions.com

NC Sustainable Energy Association
Raleigh • 919.832.7601
info@energync.org
energync.org
The leading nonprofit dedicated to creating clean energy jobs, economic opportunities and affordable energy to benefit all of North Carolina.

North Carolina Building Performance Association
Ryan Miller
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buildingnc.org

Organic Growers School
Brandon Greenstein
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Energy Efficiency & Automation

Conservation Pros
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LV Energy Systems LLC
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Vandemusser Design
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amy@vandemusser.com
vandemusser.com
We provide technical consulting and certification services for green residential construction to builders, architects, developers, and homeowners in Western North Carolina and beyond. Our company is run by an architect and engineer with extensive experience in the industry. We are here to assist with all technical aspects of green building.

Engineers

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Blue Earth Planning, Engineering & Design, PC
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ECS Southeast, LLP
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ECS is the premier local provider of geotechnical engineering and environmental consulting services. We specialize in steep slope properties, retaining walls, landslides, specialty foundations, contamination assessments, and asbestos/lead/mold testing.

Geothermal Design Center Inc.
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geothermaldesigncenter.com
We work with all kinds of geothermal systems - residential, commercial, wells, slinky, pond, hybrid, isolated, and distributed. We specialize in low-impact geothermal installation

IONCON
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Boone • 828.264.8500
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goioncon.com
Sustainability-in-Engineering: Commercial and Residential structural engineering and design, occupancy/code analysis, specialty sustainability services for renewable energy, mechanical and shipping containers.

Medlock & Associates Engineering, PA
Edward Medlock
Asheville • 828.232.4448
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medlockengr.com
Medlock & Associates is a full-service structural engineering firm with 20+ years of success providing practical yet innovative design solutions.

Vandemusser Design
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amy@vandemusser.com
vandemusser.com
We provide technical consulting and certification services for green residential construction to builders, architects, developers, and homeowners in Western North Carolina and beyond. Our company is run by an architect and engineer with extensive experience in the industry. We are here to assist with all technical aspects of green building.

Equipment & Supply

Gemaire
Tyler King
Arden • 757.778.2708
Tyler.King@gemaire.com
gemaire.com

General Equipment Rental
Erika Conrad
Weaverville • 828.658.2334
erikaconrad@generalrents.com
generalrents.com
Look to General Equipment Rental for your equipment needs. From construction to landscaping, earth moving to grounds care and more, we are your one-stop rental solution. We proudly sell Honda and Husqvarna outdoor power equipment, and we service everything that we rent or sell, in-house, with minimal turnaround time.

Finishes - Exterior

Best Buy Metals, LLC
Mason Burchette
Asheville • 828.667.8555
mason@bestbuymetals.com
bestbuymetalroofing.com
Metal roofing manufacturer. Serving residential, agricultural, and commercial industries with next day service, on-site manufacturing, and custom trim work. Stocking all metal roofing trim and accessories.

Finishes - Interior

HomeSource Design Center
Kayleigh Sedlack
Asheville • 828.712.6860
kayleigh@the-homesource.com
the-homesource.com
One convenient location providing home improvement, new construction and remodeling products; kitchen and bath design; and all your construction needs. Specializing in cabinets, countertops, hardwood flooring, tile, closet systems, stone, cabinet and bath hardware, and window treatments. Visit our showroom to view samples, make selections or speak with a designer.

RockStar Marble & Granite
George Douglas
Fletcher • 828.505.2137
george@rockstarmarble.com
rockstarmarble.com
RockStar Marble and Granite is a leading countertop supplier of hand-finished natural stone, quartz and recycled products. Opened in 2006, we have built our customer base by providing top quality products at a fair price and a reasonable time frame.

Sherwin-Williams
Chad Horton
Asheville • 828.280.0981
chad.s.horton@sherwin.com
sherwin-williams.com

Square Peg Construction Inc.
Leslie Humphrey
Asheville • 828.277.5164
info@squarepeginc.net
squarepeginc.net

The Arch Architectural Finishes, Flooring and More
Catherine Silver
Asheville • 828.253.5455
cmsilver@thearchnc.com
thearchnc.com
The Arch is your source for American Clay Earth Plaster, Forno Bravo Wood fired ovens, Vermont Natural Coatings for interior and exterior wood, and healthy flooring options including Kahrs, Tesoro Woods and APC Cork. We are a stocking American Clay dealer offering sales and application services as well as sales and installation services for Forno Bravo wood fired ovens. Please visit our website or call for current hours.

Flooring

EnnisArt Decorative Concrete
Daniel de Wit
Weaverville • 423.306.1705
Daniel@ennisart.net
ennisart.net

HomeSource Design Center
Kayleigh Sedlack
Asheville • 828.712.6860
kayleigh@the-homesource.com
the-homesource.com
One convenient location providing home improvement, new construction and remodeling products; kitchen and bath design; and all your construction needs. Specializing in cabinets, countertops, hardwood flooring, tile, closet systems, stone, cabinet and bath hardware, and window treatments. Visit our showroom to view samples, make selections or speak with a designer.

The Arch Architectural Finishes, Flooring and More
Catherine Silver
Asheville • 828.253.5455
cmsilver@thearchnc.com
thearchnc.com
The Arch is your source for American Clay Earth Plaster, Forno Bravo Wood fired ovens, Vermont Natural Coatings for interior and exterior wood, and healthy flooring options including Kahrs, Tesoro Woods and APC Cork. We are a stocking American Clay dealer offering sales and application services as well as sales and installation services for Forno Bravo wood fired ovens. Please visit our website or call for current hours.

Whole Log Reclaimed
Jon Gleman
Zirconia • 828.697.0357
jon@wholelogreclaimed.com
wholelogreclaimed.com
Suppliers of Rustic & Refined Reclaimed Wood Products since 1984. Character Floors, Mantels & innovative Box Beams are our specialties.

Furnishings

Atelier Maison & Co.
Sean Sullivan
Asheville • 828.277.7202
sean@ateliermaisonco.com
ateliermaisonco.com
Atelier Maison & Co. is dedicated to providing design-forward, unparalleled home furnishings. We are committed to educating our community on the importance of sustainable, well-crafted, environmentally friendly and healthy furnishings that contribute to good indoor air quality.

Rest Right Mattress
Jesse Crow
Texas • 469.314.4051
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Home Energy Raters

Eco-Sense
Hunter Dendy
Asheville • 828.505.3853
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Certifying single family and multi-family projects for Green Built Homes, Energy Star for Homes and Duke/Progress rebates.

Residential Energy Diagnostics
Elliott Nailen
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Vandemusser Design
Amy Musser
Asheville • 828.348.4723
amy@vandemusser.com
vandemusser.com
We provide technical consulting and certification services for green residential construction to builders, architects, developers, and homeowners in Western North Carolina and beyond. Our company is run by an architect and engineer with extensive experience in the industry. We are here to assist with all technical aspects of green building.

Home Inspectors

Energy Home Inspection
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energyhomeinspection.com
A building performance consultant providing diagnostic services and real estate inspections for residential and light commercial properties throughout WNC, specializing in historic and high-performance green-built homes.

HVAC

Air Craftsman Heating & Cooling, Inc.
George Willis
Asheville • 828.299.1809
office@aircraftsmanheating.com
aircraftsmanheating.com
Our ultra high-efficiency equipment uses the new environmentally friendly refrigerant and reduces the emissions released into the environment.

Bullman Heating & Air, Inc.
Branson Bullman
Asheville • 828.658.2468
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bullmanheating.com

Gentry Heating Inc.
Mike Young
Swannanoa • 828.581.4045
myoung@gentryservice.com
gentryservice.com

Morris Heating & Cooling LLC
William Morris
Marion • 828.659.2400
wmorris@morrisheatingandcooling.com
morrisheatingandcooling.com
We are proud to be 2020 Mitsubishi Top Sales for North Carolina. Using ductless efficient mini-splits we can help your home be more energy efficient. We specialize in custom home new construction system design. With over 30 employees, we offer Precision Tune up plans that best fit your needs.

Sustainable Air Inc.
Tyler Healy
Asheville • 828.691.9221
info@sustainable-air.com

Indoor Air Quality & Health

A Healthier Home, LLC
Rick Bayless
Asheville • 828.243.5192
rickbayless@ahealthierhomenc.com
ahealthierhomenc.com

Atelier Maison & Co.
Sean Sullivan
Asheville • 828.277.7202
sean@ateliermaisonco.com
ateliermaisonco.com
Atelier Maison & Co. is dedicated to providing design-forward, unparalleled home furnishings. We are committed to educating our community on the importance of sustainable, well-crafted, environmentally friendly and healthy furnishings that contribute to good indoor air quality.

Blue Ridge Radon Solutions
Tucker Wilson
Asheville • 828.252.2212
tucker@blueridgeradonsolutions.com
blueridgeradonsolutions.com
Blue Ridge Radon Solutions provides radon testing and mitigation, including passive radon systems and consultation during construction. Serving all of WNC.

Green R, Inc.
Ron Pariseau
Mars Hill • 828.680.9615
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.

Living Stone Design+Build
Molly Sullivan Reeves
Black Mountain • 855.720.2435
molly@livingstoneconstruction.com
livingstoneconstruction.com
Living Stone Design+Build crafts award-winning custom homes that exceed clients' expectations. For over 20 years, our proven process and strategic partnerships with architects, designers and realtors has delivered dream-worthy homes at the best value to hundreds of families and couples seeking a happier, healthier life in the mountains.

"For most of history, man has had to fight nature to survive; in this century he is beginning to realize that, in order to survive, he must protect it."

— Jacques Cousteau

Morris Heating & Cooling LLC
William Morris
Marion • 828.659.2400
wmorris@morrisheatingandcooling.com
morrisheatingandcooling.com
We are proud to be 2020 Mitsubishi Top Sales for North Carolina. Using ductless efficient mini-splits we can help your home be more energy efficient. We specialize in custom home new construction system design. With over 30 employees, we offer Precision Tune up plans that best fit your needs.

Mueller Environmental & Sustainability Solutions, Inc.
John Mueller
Candler • 828.667.8578
johnmueller.pe@gmail.com
ashevillemoldguy.com

Insulation

Best Buy Metals, LLC
Mason Burchette
Asheville • 828.667.8555
mason@bestbuymetals.com
bestbuymetalroofing.com
Metal roofing manufacturer. Serving residential, agricultural, and commercial industries with next day service, on-site manufacturing, and customer trim work. Stocking all metal roofing trim and accessories.

EnergySmith Home Performance
Mike Fowler
Asheville • 828.277.5668
mike.f@energysmithus.com
energysmithus.com

Insurance

Hummingbird Insurance
Geoffrey Ferland
Asheville • 828.372.0101
hummingbirdagency@gmail.com
hummingbirdins.com
Hummingbird Insurance is the #1-rated agency in Asheville and WNC. Health, Life, Business, Builders, Rentals, everything.

Interior Designers

Alchemy Design Studio
Traci Kearns
Asheville • 828.255.5110
traci@alchemy-interiors.com
alchemy-interiors.com

Allard & Roberts Interior Design,Inc
Talli Roberts
Asheville • 828.271.4350
talli@allardandroberts.com
allardandroberts.com

Griffin Architects PA
Robert Griffin
Asheville • 828.274.5979
inquiries@GriffinArchitectsPA.com
GriffinArchitectsPA.com
Griffin Architects provide years of experience and interpretations of specific information relative to the clients needs, the site and its orientation, and the neighborhood's relationship to the community. We offer 3-D Energy Modeling/Virtual imaging services of custom residential designs and additions, commercial developments, environmental design, community planning, and historic preservation.

ID.ology Interiors & Design
Laura Sullivan
Asheville • 828.252.4403
Laura@idologyasheville.com
idologyasheville.com

Interior Finishers

Deltec Building Company
Tildon Whiteside
Asheville • 828.257.4907
twhiteside@deltecbuilding.com
deltechomes.com

RockStar Marble & Granite
George Douglas
Fletcher • 828.505.2137
george@rockstarmarble.com
rockstarmarble.com
RockStar Marble and Granite is a leading countertop supplier of hand-finished natural stone, quartz and recycled products. Opened in 2006, we have built our customer base by providing top quality products at a fair price and a reasonable time frame.

Land Planning

Equinox
David Tuch
Asheville • 828.253.6856
David@equinoxenvironmental.com
equinoxenvironmental.com
Providing specialized design services inspired by nature for site design, planting design, drainage and stormwater to create beautiful and functional spaces.

Fusco Land Planning & Design, PLLC
Matthew Fusco
Asheville • 828.243.6604
matt@fuscola.com
fuscola.com

Otter & Arrow Land Planning
Kevin Tate
Roswell, GA • 828.551.1414
kevin@otterandarrow.com
otterandarrow.com

V & V Land Management and Resource Recovery LLC
Carrie Vogler
Weaverville • 828.777.6637
carrie@voglerllc.com
voglerllc.com
Planning and execution of sustainable property improvements including forestry, mulching, driveway building and repair, boulder walls and dry-stacked masonry tree service, consulting and mapping.

Landscape Architects

BareRoot Designs, PLLC
Jennifer Verprauskus
Weaverville • 980.500.9931
barerootdesignsAVL@gmail.com
barerootdesigns.com

Equinox
David Tuch
Asheville • 828.253.6856
David@equinoxenvironmental.com
equinoxenvironmental.com
Providing specialized design services inspired by nature for site design, planting design, drainage and stormwater to create beautiful and functional spaces.

Fusco Land Planning & Design, PLLC
Matthew Fusco
Asheville • 828.243.6604
matt@fuscola.com
fuscola.com

Nicholas Anthony Tropeano, PLLC
Nicholas Tropeano
Denver • 704.910.9220
nick@tropeanolanddesigns.com
tropeanolanddesigns.com

Osgood Landscape Architects
Joel Osgood
Asheville • 828.337.7496
jo@osgoodla.com
osgoodla.com

Landscapers

Ambrose Landscapes
Steve Ambrose
Asheville • 828.768.1861
dave@reliableacorn.com
landscapingasheville.com

Asheville Drainage + Rain Harvesting
Benjamin Portwood
Asheville • 828.222.3720
Benjamin@ashevilledrainage.com
ashevilledrainage.com
Landscaping with water in mind, resolving drainage issues, capturing rain water, design and installation of both residential and commercial projects.

B. H. Graning Landscapes, Inc
Casey Kirkman
Sylva • 828.586.8303
casey.kirkman@bhglandscapes.com
bhglandscapes.com

Ecology By Design
Teresa Rogerson
Alexander • 510.227.7804
tallresa@gmail.com
houzz.com/pro/tree

Mountain Meadow Landscaping
Kyle Guie
Marshall • 828.200.2379
kyle@mountainmeadowllc.com
mountainmeadowllc.com

Thorpe Landscapes, LLC
Daniel Thorpe
Black Mountain • 717.752.6496
dsthorpelandscapes@gmail.com
thorpelandscapes.com
Professional Landscaping Installation and Maintenance Company. Specializing in environmentally friendly hardscapes, new construction installations, and storm water management solutions.

YummyYards
Laura Ruby
Weaverville • 828.785.8624
laura@yummyyards.com
yummyyards.com
YummyYards offers full-service landscape consulting and design. We blend form and function to make your landscape and garden the reality of your dreams. We offer a number of services ranging from perennial and annual landscape design to veggie garden installs and designing mini food forests and children's' play spaces.

Landscaping Supply

Southeastern Native Plant Nursery
Brad Martin
Candler • 828.670.8330
brad@southeasternnatives.com
southeasternnatives.com
We are a wholesale nursery providing native trees and shrubs to landscapers, garden centers, state and federal agencies in WNC.

Lenders

GoPrime Mortgage
Zachery Adam
Asheville • 828.348.1907
zachery@goprime.com
goprimenc.com
GoPrime Mortgage will provide complete, inclusive mortgage solutions that are educational, transparent, honest, and sincere.

Mold & Moisture

A Healthier Home, LLC
Rick Bayless
Asheville • 828.243.5192
rickbayless@ahealthierhomenc.com
ahealthierhomenc.com
Immune-system challenges, overall body health and wellness can be connected to your home environment. Board-certified indoor environmental consultant; home-health investigator.

Precision Restoration Services
Anne Bellizio
Weaverville • 828.645.4546
anne@restorewnc.com
prs2restore.com

Pest Control

Economy Services
Wilson Jones
Asheville • 828.254.0691
jones.wilsond@gmail.com
economy-services.com
ESI uses reduced risk pest control products in our exterminating services to protect your home, family, pets, and the environment.

Plumbers

Blue Planet Plumbing LLC
George Efird
Asheville • 828.423.6289
katti@blueplanetplumbing.com
blueplanetplumbing.com
Blue Planet specializes in premium water filtration (so you can stop paying for bottled water), main line replacements, energy efficient water heater options (hybrid & tankless), well work, inspections, etc. Offering Industry leading warranties!

Goodman Plumbing LLC
Jacob Goodman
Asheville • 828.774.7076
info@goodmanforthejob.com
goodmanforthejob.com

Realtors

Amanda Boren at Nest Realty
Amanda Boren
Asheville • 828.713.7049
afboren@yahoo.com
nestrealty.com/amandaboren

Amy Smith at Modern Mountain Real Estate
Amy Smith
Asheville • 828.333.3235
amy@asmithrealtor.com
asmithrealtor.com

Beth Zabriskie at Nest Realty
Beth Zabriskie
Asheville • 828.273.6724
callbethz@gmail.com
nestrealty.com/bethzabriskie

Bobbi Holland at Nest Realty
Bobbi Holland
Asheville • 828.275.6170
bobbi.holland@nestrealty.com
nestrealty.com/bobbiholland

Bold Mountain Team at Nest Realty
Robin Cape
Asheville • 828.220.4440
boldmountainteam@nestrealty.com
boldmountainteam.com

Jackie Rocks Green at Dawn Wilson Realty
Jackie Tatelman
Black Mountain • 828.713.5193
jackie@dawnwilsonrealty.com
dawnwilsonrealty.com
A eco-certified realtor who is customer-focused and knows how to navigate the complexities of real-estate transactions, Jackie lives in a gold-certified green home that has solar PV and thermal. She has built two green homes. Jackie works with buyers and sellers in the Asheville area including Black Mountain and Marshall.

Joseph Ruiz at Mosaic Community Lifestyle Realty
Joseph Ruiz
Asheville • 828.231.3475
joseph@mymosaicrealty.com
mymosaicrealty.com

Kathleen Cook at Mosaic Community Lifestyle Realty
Kathleen Cook
Asheville • 828.280.6839
kathleen@mymosaicrealty.com
mymosaicrealty.com/realestate/agent/kathleen-cook
A Building Green Real Estate cerified agent helping residents buy, build, and sell their Green Built Asheville homes.

Keller Williams Professionals Realty
John Senechal
Asheville • 828.230.4021
johnsenechal.kw@gmail.com
johnsenechal.kwrealty.com

Lauren Dahl at Mosaic Community Lifestyle Realty
Lauren Dahl
Asheville • 828.279.4700
lauren@mymosaicrealty.com
laurendahl.com

Love The Green Team
Mary Love
Asheville • 828.279.6723
mary@lovethegreen.org
lovethegreen.org
Love The Green Team is a women/veteran-owned full-service real estate company. Our mission is to create a sustainable world, one home at a time. We provide services to buyers and sellers, and property management services. We are your matchmaker for the home that you love which fits your budget.

SUPPORTING farmers markets, community-supported agriculture, and buying local greatly reduces carbon emissions needed for transportation of food and other goods.

MOSAIC Community Lifestyle Realty
Mike Figura
Asheville • 828.707.9556
Mike@mymosaicrealty.com
mymosaicrealty.com
We specialize in green real estate and in-town properties. Our approach is to advance the interests of our clients by being attentive to their needs and to negotiate aggressively on their behalf. Real estate is our job and passion. Call or email for a free consultation over coffee or tea.

National Land Realty
Pat Snyder
Fairview • 828.772.5899
psnyder@nationalland.com
nationalland.com
National Land Realty supports clients looking to buy or sell large land tracts (10+ acres) for homestead, conservation, investment, recreation, agricultural, family estate, and residential purposes. Our team leverages best-in-class technology and partners with local experts who focus on sustainable forestry and ecological design to protect our natural resources.

New Earth AVL Realty at Keller Williams
Jason Martini
Asheville • 828.515.1771
jmartini@kw.com
newearthavl.com
Full-service visionary real estate company committed to turning dreams into reality with integrity, gratitude, and commUnity.

Recycling

Asheville Area Habitat for Humanity ReStore
Asheville • 828.254.6706
ashevillehabitat.org
The Asheville Habitat ReStore sells donated items to the general public with proceeds supporting Habitat's building programs. Find building supplies, appliances, furniture and much more. The removal of usable materials from structures is available throughout their Deconstruction service.

Waste Pro
Teri Reedy
Arden • 828.620.0302
treedy@wasteprousa.com
wasteprousa.com

Renewable Energy

Asheville Solar Company
Nate Pembleton
Fletcher • 828.808.4153
nate@ashevillesolarcompany.com
ashevillesolarcompany.com
Asheville Solar Company is a small, family-run business that places honesty and customer benefit before profit.

Geothermal Design Center Inc.
Rick Clemenzi, PE, CGD
Asheville • 828.712.6786
rclemenzi@geothermaldesigncenter.com
geothermaldesigncenter.com
We work with all kinds of geothermal systems - residential, commercial, wells, slinky, pond, hybrid, isolated, and distributed. We specialize in low-impact geothermal installation

MB HAYNES Corporation
Chris Pennington
Asheville • 828.254.6141
cpennington@mbhaynes.com
mbhaynes.com
Save energy and slash power bills with solar energy systems. Free analysis and financing, and help with tax incentives.

Pisgah Energy
Evan Becka
Asheville • 828.206.4780
evan.becka@pisgahenergy.com
pisgahenergy.com
Providing comprehensive solar and energy storage design and development services for commercial, municipal and institutional clients across the Southeast.

Renu Energy Solutions LLC
Matthew Culley
Charlotte • 704.999.4469
mculley@renuenergysolutions.com

Solar Crowdsource
Don Moreland
Decatur, GA • 770.548.2714
don@solarcrowdsource.com
solarcrowdsource.com

Solfarm Solar Co.
Torey Heinz
Asheville • 828.332.3003
office@solfarm.com
solfarm.com

Sugar Hollow Solar, Inc.
Phelps Clarke
Fairview • 828.776.9161
info@sugarhollowsolar.com
sugarhollowsolar.com
We are a locally owned, full-service renewable energy company focused on great design, installation and maintenance of solar arrays, electric vehicle (EV) charging stations, and battery backup systems.

Sundance Power Systems, Inc.
Dave Hollister
Weaverville • 828.645.2080
info@sundancepower.com
sundancepower.com
Sundance Power Systems has been setting the standard for renewable energy in the region since 1995. We are committed to empowering homeowners, businesses and organizations with solar power and supporting a clean energy future through our Community Benefits Program. Our technical expertise includes off-grid and battery back-up energy solutions. We are also the local leader in radiant heating systems as well.

Renovators & Remodelers

A & B Construction and Development, Inc.
Jeremy Bonner
Asheville • 828.258.2000
jeremybonner@a-b-construction.com
a-b-construction.com
Committed to quality since 1981, A&B builds with great care and efficient use of the resources needed. Your design or ours, residential or commercial, A&B is the right choice.

Appalachian Builders Collective
Jonathan Platt
Asheville • 828.793.0143
abcollective.info@gmail.com
appalachianbuilderscollective.com
You dream it, we build it! Appalachian Builders Collective is a worker-owned construction company based in Asheville.

Best Built Inc.
Adrienne Buck
Clyde • 828.280.0415
bestbuiltinc@outlook.com
bestbuiltcustoms.com
Veteran Green Built Contractor located in Haywood County. Design-built custom homes tailored to fit your lot or one of ours. Lots or Home/Land packages available.

Continuous Improvement Construction LLC
Duane Honeycutt
Black Mountain • 828.551.7573
ciclic.duane@gmail.com
cic-llc.squarespace.com

Corner Rock Building Co.
Zachariah Banks
Weaverville • 828.348.1004
zach@cornerrockbuilding.com
cornerrockbuilding.com

Evergreen Construct Inc.
Darren Henegar
Leicester • 828.779.4077
evergreenconstructinc@gmail.com
evergreenconstruct.com
Evergreen Construct specializes in custom-built homes and renovations, using your inspiration to create mindfully crafted structures through a collaborative process.

Falcon Construction and Development
David Ross
Asheville • 828.274.3055
tanya@falconbuilt.com
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

HomeSource Design Center
Kayleigh Sedlack
Asheville • 828.712.6860
kayleigh@the-homesource.com
the-homesource.com
One convenient location providing home improvement, new construction and remodeling products; kitchen and bath design; and all your construction needs. Specializing in cabinets, countertops, hardwood flooring, tile, closet systems, stone, cabinet and bath hardware, and window treatments. Visit our showroom to view samples, make selections or speak with a designer.

HomeSource Real Estate & Construction, Inc.
Tim Alexander
Asheville • 828.252.1022
tim@homesourcebuilders.com
homesourcebuilders.com
Fully licensed and insured custom home builder and remodeling contractor, providing expertise and commitment in construction. Offering turnkey service, including home design, kitchen and bath design, and product selection under one roof. Current and past projects include more than 100 custom homes and hundreds of remodels from large to small.

Jade Mountain Builders & Co. Inc
Hans Doellgast
Fairview • 828.216.3948
hans@jademountainbuilders.com
jademountainbuilders.com
Jade Mountain Builders is a team of 39 craftsmen who pride themselves on taking an ecologically sensitive approach to building homes.

JAG & Assoc. Construction, Inc.
Jody Guokas
Asheville • 828.216.0914
jody@jaggreen.com
jaggreen.com
JAG Construction is a small company specializing in in-town urban spec construction. Our goal is to make healthy, creative, long-lasting houses more available to the general public. We're examining new ways to reduce the impact of construction on the environment around us and preparing for a future of alternative energy.

Pioneer Construction and Development Inc.
Duane Liming
Asheville • 828.242.5101
duane@pioneerasheville.com
pioneerasheville.com
With over thirty years of experience, Pioneer consistently blends innovative ideas with time honored quality. We work until your project or new home is true to your vision. To learn more call us at 828.768.8771.

Rare Earth Builders, Inc.
Mark Bondurant
Canton • 828.492.0534
rareearthbldrs@bellsouth.net
RareEarthBuilders.com
We build high-performing, exceptionally beautiful custom homes while minimizing negative environmental impacts with attention to construction details and client comfort.

RCJ Building Inc.
Robert Jacobelly
Asheville • 828.216.4433
rcjbuilding@yahoo.com
RCJ Building Inc.'s custom homebuilding professionals have the knowledge and expertise that you'll need when you have the opportunity to build the house you've always wanted. We understand what goes into the building process, and more importantly, what goes through the minds of future homeowners during the build.

River Birch Builders
Pierce Harmon & Griff Gamble
Asheville • 828.423.9813
riverbirchbuilders@gmail.com
riverbirchbuildersnc.com
We offer quality and craftsmanship in the building of green and energy-efficient homes. We offer design and build services for fully customized homes, and experience with a range of architectural styles and sizes. From start to finish, we'll work closely with you to make your dream home become a reality.

RockStar Marble & Granite
George Douglas
Fletcher • 828.505.2137
george@rockstarmarble.com
rockstarmarble.com
RockStar Marble and Granite is a leading countertop supplier of hand-finished natural stone, quartz and recycled products. Opened in 2006, we have built our customer base by providing top quality products at a fair price and a reasonable time frame.

Stewart Builders Inc.
Mary Stewart
Canton • 828.421.1939
marestew@gmail.com
stewartbuilders.net

The Hands of Sean Perry
Sean Perry
Asheville • 828.258.7272
hosp@seanperryinc.com
seanperryinc.com

VTAC General Contractor
Vitaliano Duran
Bladensburg, MD • 301.277.6700
vtacgeneral@yahoo.com
vtacinc.com

Residential Designer

HomeSource Real Estate & Construction, Inc.
Tim Alexander
Asheville • 828.252.1022
tim@homesourcebuilders.com
homesourcebuilders.com
Fully licensed and insured custom home builder and remodeling contractor, providing expertise and commitment in construction. Offering turnkey service, including home design, kitchen and bath design, and product selection under one roof. Current and past projects include more than 100 custom homes and hundreds of remodels from large to small.

IONCON
Patrick Beville
Boone • 828.264.8500
info@goioncon.com
goioncon.com
Sustainability-in-Engineering: Commercial and residential structural engineering and design, occupancy/code analysis, specialty sustainability services for renewable energy, mechanical and shipping containers.

Mountain Sun Building & Design
Emily Boyd
Asheville • 828.713.0549
emily@mountainsunbuilding.com
mountainsunbuilding.com
A small design/build firm focused on site-specific design and zero energy homes, we can work with clients from finding the perfect lot through move in and landscaping. Our passion is creating finely crafted, light filled homes that connect interior spaces with their natural surroundings.

Timberframe Horizons, LLC
Tom Rouse
Fairview • 828.222.2555
tom@timberframehorizons.com
timberframehorizons.com
We are a design build firm that specializes in creating energy-efficient custom artisan homes utilizing timber frame construction.

Responsible Investing

Earth Equity Advisors
Leesa Sluder
Asheville • 877.235.3684
leesa@earthequityadvisors.com
earthequityadvisors.com
Based in Asheville, Earth Equity Advisors, four-time Best for the World Certified B Corporation, manages diversified investment portfolios for clients across the country. Our focus is sustainable, responsible and impact investing.

National Land Realty
Pat Snyder
Fairview • 828.772.5899
psnyder@nationalland.com
nationalland.com
National Land Realty supports clients looking to buy or sell large land tracts (10+ acres) for homestead, conservation, investment, recreation, agricultural, family estate, and residential purposes. Our team leverages best-in-class technology and partners with local experts who focus on sustainable forestry and ecological design to protect our natural resources.

Reuse Retail

Asheville Area Habitat for Humanity ReStore
Asheville • 828.254.6706
ashevillehabitat.org
The Asheville Habitat ReStore sells donated items to the general public with proceeds supporting Habitat's building programs. Find building supplies, appliances, furniture and much more. The removal of usable materials from structures is available throughout their Deconstruction service.

APPALACHIAN OFFSETS is a voluntary carbon-offset program from Green Built Alliance that offers businesses, organizations, and individuals the option to easily reduce or offset their carbon footprint. Supporters offset their emissions by paying into a community fund that helps make energy-efficiency improvements within local nonprofits, schools and low-income housing. Learn more and donate at cutmycarbon.org.

Roofers

Best Buy Metals, LLC
Mason Burchette
Asheville • 828.667.8555
mason@bestbuymetals.com
bestbuymetalroofing.com
Metal roofing manufacturer. Serving residential, agricultural, and commercial industries with next day service, on-site manufacturing, and customer trim work. Stocking all metal roofing trim and accessories.

Living Roofs, Inc.
Emilio Ancaya
Asheville • 828.252.4449
emilio@livingroofsinc.com
livingroofsinc.com
Green roofs and living walls :: design and installation

RCJ Building Inc.
Robert Jacobelly
Asheville • 828.216.4433
rcjbuilding@yahoo.com
RCJ Building Inc.'s custom homebuilding professionals have the knowledge and expertise that you'll need when you have the opportunity to build the house you've always wanted. We understand what goes into the building process, and more importantly, what goes through the minds of future homeowners during the build.

Salvage

Asheville Area Habitat for Humanity ReStore
Asheville • 828.254.6706
ashevillehabitat.org
The Asheville Habitat ReStore sells donated items to the general public with proceeds supporting Habitat's building programs. Find building supplies, appliances, furniture and much more. The removal of usable materials from structures is available throughout their Deconstruction service.

Whole Log Reclaimed
Jon Gleman
Zirconia • 828.697.0357
jon@wholelogreclaimed.com
wholelogreclaimed.com
Suppliers of Rustic & Refined Reclaimed Wood Products since 1984. Character Floors, Mantels & innovative Box Beams are our specialties.

Site Work

Rare Earth Builders, Inc.
Mark Bondurant
Canton • 828.492.0534
rareearthbldrs@bellsouth.net
rareearthbuilders.com
We build high-performing, exceptionally beautiful custom homes while minimizing negative environmental impacts with attention to construction details and client comfort.

V & V Land Management and Resource Recovery LLC
Carrie Vogler
Weaverville • 828.777.6637
carrie@voglerllc.com
voglerllc.com
Planning and execution of sustainable property improvements including forestry, mulching, driveway building and repair, boulder walls and dry-stacked masonry tree service, consulting and mapping.

Supporting Members

Asheville Downtown Association
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Asheville • 828.251.9973
meghan@ashevilledowntown.org
ashevilledowntown.org

Cady/Guyton Construction
Boone Guyton & Claudia Cady
Alexander • 828.683.3688
boone.guyton@gmail.com

CompostNow
Stefano Rivera
Raleigh • 516.996.0073
stefano@compostnow.org
compostnow.org
CompostNow is a doorstep collection service in Asheville and the Triangle that makes composting easy for households and businesses. They provide a weekly collection of compostables, turn it into nutrient-dense compost and gives it back to members and local community gardens.

Duke Energy
Marc Faircloth
Sumter, SC • 803.934.2535
marc.faircloth@duke-energy.com
duke-energy.com/newhomes
The Residential New Construction Program helps homebuyers find the best, most energy-efficient and comfortable new homes on the market. Homes are verified by independent, nationally accredited Home Energy Rating System Raters to meet stringent standards. Find participating builders at duke-energy.com/mynewhomewnc. For details on our builder program, visit duke-energy.com/newhomes.

Integritive
Joy Kirk
Asheville • 828.250.0970
joy@integritive.com
integritive.com
At Integritive, you can expect the proven results of a large firm with the flexibility of a small creative enterprise. You can expect the professionalism of seasoned experts with the fresh ideas of an avid entrepreneur. You can expect the technical muscle of talented programmers who understand your needs.

Rockbrook Camp for Girls
Jeff Carter
Brevard • 828.884.6145
jeff@rockbrookcamp.com
rockbrookcamp.com

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urbanforestalliance@gmail.com

Surveyors

Blackrock Surveying and Land Design PC
Jamie Brady
Asheville • 828.225.4341
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Our services include topographic surveying, construction staking, boundary determination and relocation, subdivision designs, elevation certification and consultation on property use.

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Brad Kee
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Sustainable Wood Products

Architectural Woodcraft
Craig Weis
Asheville • 828.258.9977
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architecturalwoodcraft.com
Locally made cabinets, doors and energy star windows. Implementing green finishes and bamboo sustainable and reclaimed woods. Restoration specialists.

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Timberframe Horizons, LLC
Tom Rouse
Fairview • 828.222.2555
tom@timberframehorizons.com
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We are a design build firm that specializes in creating energy-efficient custom artisan homes utilizing timber frame construction.

Tiny & Small Homes

Green Source Construction Management, Inc
Josh Scala
Black Mountain • 828.337.0284
greensourcebuilder@gmail.com
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Training

Green Opportunities
Eric Howell
Asheville • 828.398.4158
eric@greenopportunities.org
greenopportunities.org
Green Opportunities (GO)'s mission is to train, support, and connect people from marginalized communities to sustainable employment pathways. In addition to technical training in construction and culinary arts, GO's holistic programs include wrap-around support services, high school equivalency classes, life skills training, counseling, and job placement assistance.

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EcoForesters
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Asheville • 828.484.6842
info@ecoforesters.org
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Asheville • 828.712.6860
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Ironwood Studios LLC
Thomas Gibson
Asheville • 978.501.6954
tom@ironwoodstudios.org
ironwoodcustomcabinetry.com
Ironwood Studio provides innovative and artistic solutions to spacial needs, specializing in custom cabinetry, built-ins and finely crafted furniture.

Narwhal Design Build, PLLC
Joe Archibald
Asheville • 828.273.9509
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