save some green

Green

by

Design

Keeping your home's energy demands low shouldn't require sacrifice. In fact, you might even find yourself saving money while you do right by the environment.

BY VIRGINIA WRIGHT

CLOCKWISE FROM TOP LEFT: OAK POINT ASSOCIATES/KIM ROSEBERRY (2); JAMES R. SALOMON 2-4

Architect Richard Renner proved that you don't need to live in the country to have a nature-friendly home when he transformed a ninety-nine-year-old building in Portland's West End into a green exemplar.

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It's hard not to shiver with empathy for the occupants of the farmhouses dotting the frozen fields along Bowdoinham's Abagadusset River. As winds moan and kick up snow, we imagine families bundled in fleece, huddling around woodstoves trying to get warm.

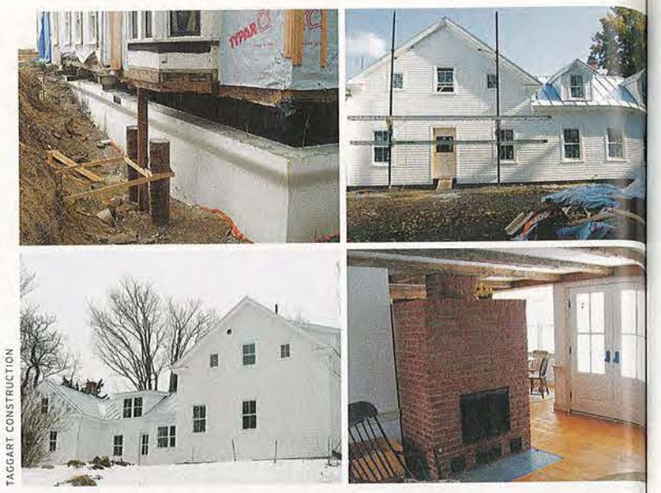
Envy might be a more apt emotion when it comes to our consideration of one unpretentious 169-year-old Cape on Abagadusset Road. The inhabitants have been toasty all season, except when a December ice storm knocked out power for three days and the indoor temperature dropped to — *gasp!* — a balmy fifty degrees.

For that, the owners have Freeport builder Peter Taggart to thank. "People often think that a green renovation means they have to put solar panels on the roof," says Taggart, who used a variety of low-tech, energy-saving techniques throughout his renovation of the farmhouse. "In fact, the best thing may simply be to put insulation in the attic and stop air leaks."

Chairman of the Maine Chapter of the U.S. Green Building Council (USGBC), Taggart was practicing sustainable design and construction long before green became the color du jour. Nudged by volatile home heating oil prices and publicity about "sick buildings," the design and construction market is finally coming around to Taggart's way of doing things.

The interest is especially high in Maine, famous for its long, harsh winters. "The most important thing is to not build any more than you need," advises architect Richard Renner, who established his reputation for sustainable design with the 1993 renovation of Portland's venerable Porteous department store for Maine College of Art. "The smaller you can make something without compromising function, the better. Next, you design the building to keep energy demands as low as possible. I don't see that as a big compromise or sacrifice. Buildings that work with the climate are just better places to be."

Reducing energy consumption, however, is just one of green construction's many aims. As this look at five very different Maine homes reveals, a rigorous green program pays mind to indoor air quality and conserves resources through every phase of the project, from land planning and site development to materials and appliances to recycling surplus and waste.



TAGGART CONSTRUCTION

Renovating an existing home to be more energy efficient is almost always a more sustainable strategy than building a high-performance showplace. Freeport builder Peter Taggart's renovation-in-progress of a farmhouse in Bowdoinham (above) uses dense-pack cellulose insulation, a Russian heater, and radiant floor heating to warm up a formerly chilly structure.

Renovation and Preservation

Abagadusset Road Farmhouse, Bowdoinham

HOMEOWNERS WHO WANT to do the right thing for the environment should not be in a hurry to sell their houses in order to build new high-performance ones, advises builder Peter Taggart (www.tagcon.com). Older homes, like this 1840 farmhouse, represent significant embodied energy, so updating their systems is almost always a more sustainable strategy than building new.

This long-term renovation and addition project has provided many opportunities to make environmentally friendly improvements, beginning with dense-pack cellulose insulation, an excellent air blocker made from recycled newsprint.

The main house, which had been sitting on little more than a rubble-filled trench, was jacked up so a foundation of insulating concrete forms could be built. Low-e, argon gas-filled double-pane windows reflect heat indoors during winter months and outdoors during the summer. "Low-e is probably one of the best things that has happened to glass," Taggart enthuses, "and we were able to find some that suited the historic character of the building."

Taggart hired Albie Barden, of Norridgewock, to build a masonry heater. Sometimes called a Russian heater, this modified fireplace stores heat from a short, hot fire and radiates warmth throughout the day, yet it pollutes far less than other wood- and pellet-burning stoves. "It's a very efficient way to burn wood," Taggart says, "and it's beautiful, too."

Radiant floor heating was achieved through two different approaches. In the old structure, an aluminum plate with snap-in heat tubing was stapled under the wood subfloor. In the three-bedroom addition, the tubing was placed in the concrete slab foundation, the preferred method for new construction. "Radiant heat saves energy because you only need to heat the water to 90 to100 degrees compared to 180 degrees for a forced hot-water system," Taggart says. "Instead of heating the air from the periphery of the structure, it uses the mass of the floor. You're heating everything on the floor, including your body, so you find you're more comfortable at a lower temperature. It's a nice, gentle, uniform heat."

Other Green Design Features: lumber harvested and milled on site ■ environmentally friendly panelized construction in addition ■ fiber cement siding and exterior rain screen ■ durable metal roof high in recycled content ■ Energy Star appliances.

Energy

Morgan House, Cumberland

BUILT FOR A CLIENT who wanted state-of-the-art green technology in a traditional home style, this shingled gambrel-roofed home uses virtually no heating oil or

OAK POINT ASSOCIATES/KIM ROSEBERRY

Talk about sun worshipping! This traditional, gambrel roofed home (below) in Cumberland uses virtually no heating oil or natural gas (its electric meter even runs backward on sunny days), thanks to an array of photovoltaic panels.

GREEN GLOSSARY

Argon Gas, instead of air, between panes of glazing improves the insulation performance of double-paned windows. Krypton gas, another harmless and inert gas, is another fill option.

Embodied Energy is all the energy that was required to construct a building from the extraction of raw materials to assembly of parts to actual construction to disposal of waste and surplus.

Energy Star, a program sponsored by the U.S. Environmental Protection Agency and the Department of Energy, certifies energy-efficient consumer products.

Fiber Cement Siding, composed of cement, sand, and cellulose fibers, is resource efficient because it is extremely durable and holds paint longer than wood.

LEED refers to the U.S. Green Building Council's Leadership in Energy and Environmental Design certification program. It is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

Low- and no-VOC Paints, finishes, and adhesives contain few or no volatile organic compounds. These chemicals, common in many household products, can irritate the nose and throat and cause headaches, nausea, and other illnesses.

Low-e Windows have a thin, transparent metallic oxide coating that reduces heat loss and maximizes solar gain. The "e" stands for "emissivity."

Heat Recovery Ventilation systems reclaim the heat from stale, warm air that is being exhausted from a building and uses it to pre-heat incoming fresh air.

Insulating Concrete Forms are lightweight polystyrene blocks that are filled with concrete at the construction site. They remain in place to insulate concrete foundations and walls.

Photovoltaic (PV) Solar Panels use silicon cells to convert sunlight into energy. Most home systems are typically connected to the local power grid. The power company takes the generated power and offers the homeowner credits, resulting in significantly lower energy bills.

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natural gas and its electric meter runs backward during the day as photovoltaic (PV) panels feed the utility grid, yielding a credit from Central Maine Power.

"The owners didn't want it to look like a hippie house," says architect Glenn Harmon, of Biddeford-based Oak Point Associates (www.oakpoint.com). "They wanted it to look like the other high-end houses in the neighborhood." The rooftop solar panels on the south-facing rear of the house are not visible from the street.

Harmon worked with ReVision Energy of Portland and Liberty, which claims to have provided more than half of all the solar energy systems installed in Maine over the past three years. This PV system generates 6,500 kilowatt hours of electricity annually. An additional solar water heater warms all of the domestic hot water and some of the water needed for radiant heating. The house is equipped with a backup solar-powered battery bank that turns on during power outages and a small, efficient propane-fired boiler, which kicks in when a long stretch of cloudy days deprives the solar collectors. "The house sips fossil fuels only as necessary," Harmon says.

The combined solar systems cost around $75,000. "This is the Cadillac system," Harmon says, though it represents a reasonable 10 percent of this home's construction costs. A solar hot-water heater alone, however, typically costs between $2,500 and $3,500: within the reach of most homeowners. "It's foolish not to have one for hot water," Harmon believes. "I have one in my own home."

The Morgan House's solar power systems are just one piece of a larger energy-conscious package. The three thousand-square-foot house is designed around a compact core, where living room, kitchen, and dining room are warmed by a center fireplace and woodstove. And the building is precisely oriented to take full advantage of solar gain every day of the year. "We calculated the angle of the sun to get as much sunlight as possible," Harmon says, "even on the winter solstice."

Other Green Design Features: radiant floor heating ■ Energy Star appliances ■ low-flow plumbing fixtures ■ local lumber and stone ■ nontoxic, water-based spray foam insulation.

Design

Bradbury Mountain Residence, Pownal

THE ARCHITECT OF MAINE'S first LEED-certified home, Curt Jensch boasts a portfolio full of house designs employing a range of approaches to sustainable construction, including high-tech solar power systems. The modest Bradbury Mountain house, however, proves that good energy performance begins and ends with smart design strategies, not the latest eco-gizmo.

SPRING ISLAND LLC

The first step Chebeague-based designer/builder Curt Jensch took in creating this modest house (above) in Pownal was thinking small. Advanced framing techniques maximized space for insulation without sacrificing breathing room for the owners.

"We were looking to use as many green features as possible in a fairly traditional house that would be affordable to the average homeowner," says Jensch, a co-owner of Spring Island, LLC (www.springisland.biz), a design/build firm on Chebeague Island.

Built on the site of an old farm and surrounded on three sides by state park forest, the Bradbury Mountain residence comprises just 1,800 square feet, so there is not much space to heat. It is oriented for passive solar heating and cooling, with most of the glass on the south side.

Advanced framing techniques eliminated as much as 30 percent of the lumber that would have been required to conventionally frame the house. "It's smart engineering of the lumber," Jensch explains. "For example, instead of sizing window headers based on a rule of thumb for the worst case load, you calculate the size by considering the load on each header. It's a no-cost green strategy because the time spent engineering pays off in the reduction of wood."

Better still, advanced framing techniques make space for more wall and ceiling insulation. Jensch multiplied that benefit by installing insulation whose performance far exceeds state building code requirements. "Adding that extra insulation costs more upfront, but the payback is very short — about three years," Jensch says. "That's much, much shorter than the payback on solar panels."

The house is flexibly outfitted with pocket doors and extra wide openings and hallways, eliminating the need for future renovations should the owners, a retired couple, become disabled. "It makes the home that much more usable into the future, which is a sustainable strategy," Jensch says. "We're thinking ahead for adaptability."

Finally, the metal roof, which is high in recycled content, and the fiber cement siding are expected to last years longer than conventional roofing and siding, thus reducing waste and conserving materials.

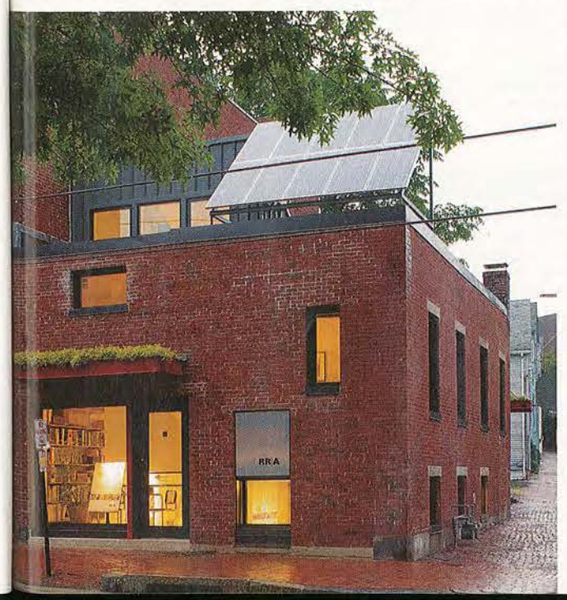
Other Green Design Features: minimized development footprint ■ previously developed site ■ Energy Star appliances ■ radiant floor heat ■ filtered fresh air ■ no-VOC paints and finishes ■ low-flow plumbing fixtures.

Site

Pleasant Street Loft, Portland

LUSH SEDUM GROWS on the roof and evergreens spill over the canopies of Richard Renner's combination office and residence. Not merely aesthetic, the greenery has work to do: absorb and filter rainwater that might otherwise contribute to Portland's occasional sewer system overflows and reduce "heat island effect," the hotter urban microclimate created by concentrations of dark roofs and pavement. One green roof on one small building is not going to have a measurable impact on Portland's cooling demands and water quality, Renner concedes, but the benefits could be significant if other building owners are inspired to plant their roofs.

JAMES R. SALOMON



Richard Renner took a once-bland Portland shoebox and added solar panels, a vegetated roof, low-flow plumbing, and other state-of-the-art design features to earn the Leadership in Energy and Environmental Design's highest level of certification.

Renner hopes they are. He bought the ninety-nine-year-old building on the scruffy fringes of Portland's West End neighborhood in part to demonstrate that "a high level of design and a high level of building efficiency go hand in hand." Indeed, the once-bland brick shoebox has been transformed into a stylish and supremely energy efficient two-bedroom loft for Renner and his wife, graphic designer Janet Friskey, and a sunken first-floor office for his firm, Richard Renner Architects (www.rrennerarchitects.com). The living space is certified LEED CONTINUED ON PAGE 68

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Green by Design

CONTINUED FROM PAGE 49 platinum: the program's highest rating. The office, while not certified, boasts many of the same energy-efficient technologies and healthy construction materials.

Besides absorbing and filtering rainwater, green roofs provide a habitat for insects and birds, as well as some insulation. Not every existing building can be retrofitted for a green roof, however. In Renner's case, the roof had to be strengthened to meet snow-load requirements, so it made economic sense to add a waterproof membrane, soil, and sedum.

The vegetated roof is but one example of the project's sensitivity to its environment. "Simply re-using an existing building is more sustainable than building a new one because it means less energy is used to extract and transport materials and less stuff is going to the landfill," explains Renner, whose many other green designs include the landmark Maine Audubon Environmental Education Center in Falmouth and 10 Cranberry Ridge Road, a LEED platinum home in Freeport. "There is more opportunity to do that in the city, and I think we're beginning to see a trend toward rebuilding cities instead of leveling them. That's very desirable because you're not contributing to sprawl, and you don't need a car, which, of course, reduces the cost and energy of commuting."

Other Green Design Features: high performance building envelope ■ high levels of insulation ■ triple-glazed windows ■ radiant floor heat ■ PV solar panels ■ heat-recovery ventilation ■ energy-efficient lighting ■ locally produced and recycled materials ■ sustainably harvested wood ■ no-VOC paints and finishes ■ low-flow plumbing fixtures.

Materials and Air Quality

Aria House, Cumberland

MAINE-MADE ORIENTED strand board (OSB) sheathes this passive solar home's walls, floors, and roof. The engineered wood product uses a resin binder that, unlike the glue in plywood, emits no urea-formaldehyde gas, a carcinogen.

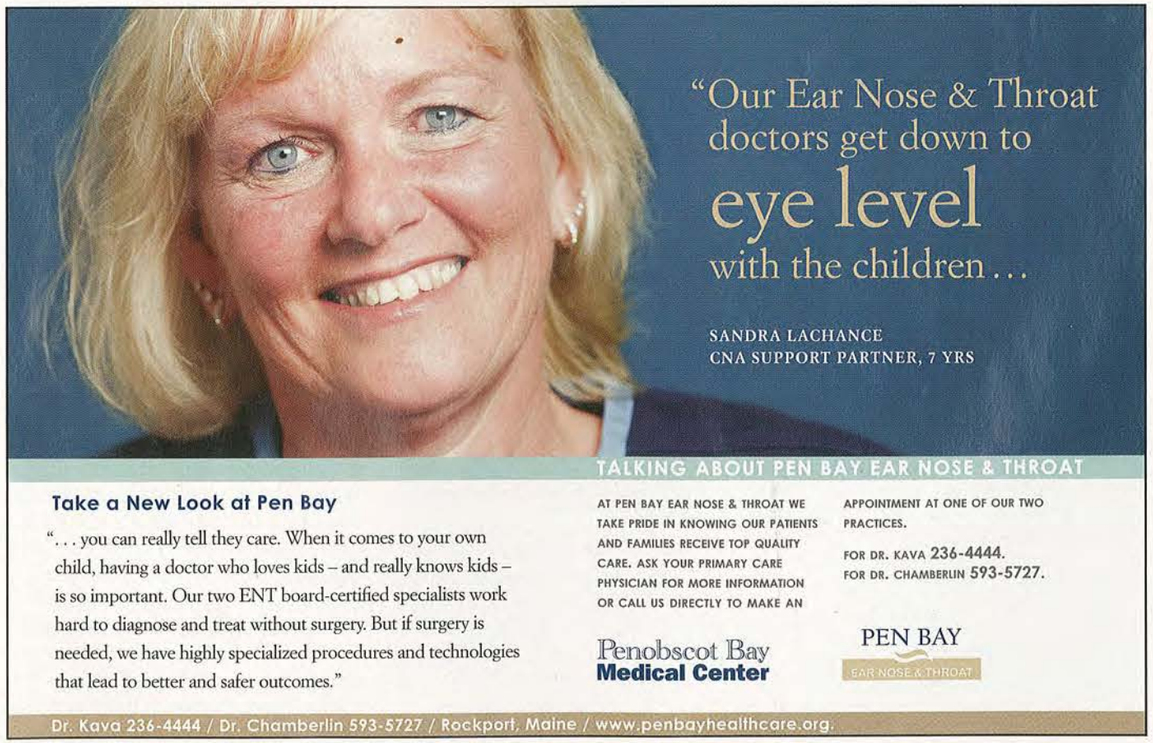
YOUNGNA PARK/SPRIG.COM

Architect Chris Briley of Yarmouth predicts that urea-formaldehyde gas (emitted by the glue in plywood) will be "the next asbestos" – a carcinogen that causes lots of homeowners to rush to renovate their older homes. He used specially engineered oriented strand boards to construct the Aria House (left) in Cumberland for a family who wanted optimal air quality.

Architect Chris Briley, of Green Design Studio (www.architectureforlife.com) in Yarmouth, imagines the day when the many products containing the chemical will be banned from new construction and yanked out of old buildings. "Urea-formaldehyde is the next asbestos," he predicts, citing news stories about high formaldehyde concentrations in FEMA trailers whose inhabitants, victims of Hurricane Katrina, have reported headaches, sinus problems, and asthma.

The OSB that Briley chose for Aria House, which is expected to be LEED-certified, responds to two key elements of green design: it contributes to a healthful indoor environment and it is a locally made product, which means less fuel was required to transport it to the construction site.

Other materials and fixtures were



selected with the same sensitivity. "We shun carpet altogether," Briley says. "They are dust mite factories. They capture a lot of dirt, debris, and bacteria. We favor not having carpet and going with cleanable and beautiful surfaces." Exotic hardwoods, including the cherry floors and cambera mahogany deck, are certified by the Forest Stewardship Council, assuring they were harvested from sustainably managed forests; so even these indulgences come with a green imprimatur.

Briley asked Sherri Cook, of Cook & Cook Cabinetry in Scarborough, to build the kitchen cabinets with PureBond, a formaldehyde-free plywood. "She hopped right on board," Briley says. "She wanted to be part of the green movement, and now she's passing that knowledge along herself."

The kitchen countertops, range surround, and hearth are made from pre-cast concrete pieces, which emit no toxins, though Briley concedes concrete is an

Indoor air quality is a particular concern for tightly built homes.

imperfect green product because its manufacture demands a lot of energy and produces greenhouse gases. Water is conserved with low-flow plumbing fixtures and dual flush toilets.

Indoor air quality is a particular concern for tightly built homes like Aria House. "A healthy house leaks," Briley explains, "and an energy efficient house controls how it leaks." Passive radon control techniques, such as sealing cracks in the foundation, were employed, and all the paints and finishes are nontoxic. An energy recovery ventilator uses exhausted indoor air to preheat incoming fresh air and vice versa, depending on the season. Besides insuring a continual supply of fresh air, the system removes excess humidity that might otherwise promote mold.

Other Green Design Features: passive solar orientation ■ resource-efficient balloon framing ■ high performance building envelope ■ solar hot water system ■ radiant floor heat.

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Growing Minds

CONTINUED FROM PAGE 56 or selling heirloom seeds online or researching the agricultural history of their home towns. On the side, the kids are also responsible for leading tours, presentations, and lessons for visiting students. Last spring alone, more than seven hundred Maine students came to Troy Howard to learn about the garden project — a statistic Tanguay hopes will cultivate interest in school gardens across the state.

"It's beyond hands on," insists Tanguay, who envisions a school-wide environmental studies program incorporating the garden in the future. "We need a new term. People think that we're just playing in the dirt. But [in the garden] the kids' higher-order thinking skills are so much more challenged." The students respond to the challenges by excelling — and behaving. "It's their project, and their garden," explains Tanguay. "Every action has a consequence, and you can't hide from it. We've never had a major discipline issue in eight years."

Avary Lamont, a former student of Tanguay's who is still actively involved in the garden, describes her experience with enthusiasm. "I really liked it in the middle of the year, when you know your stuff," she says. "I did some of the financial work, I helped with composting, and I did photography. I kind of did everything."

Experiential learning is the goal of this award-winning program. "If you integrate something from real life with learning, the kids will be engaged," explains White's successor, current agricultural coordinator Jon Thurston. A tall, gray-bearded man who has been teaching for more than twenty years, Thurston exudes the same childlike enthusiasm for the garden as his students. "How do you learn to cook?" he questions, "From a book? No way!"

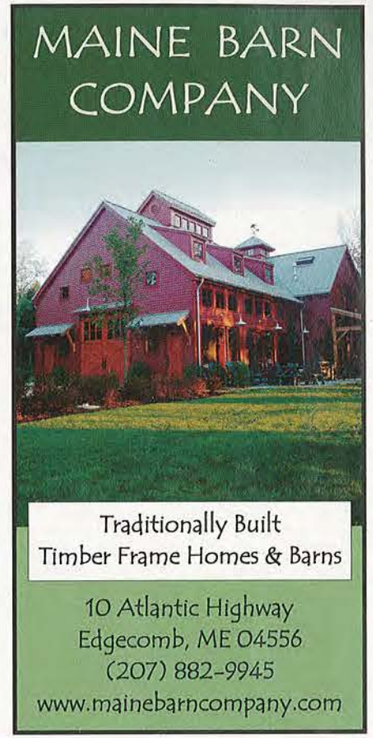
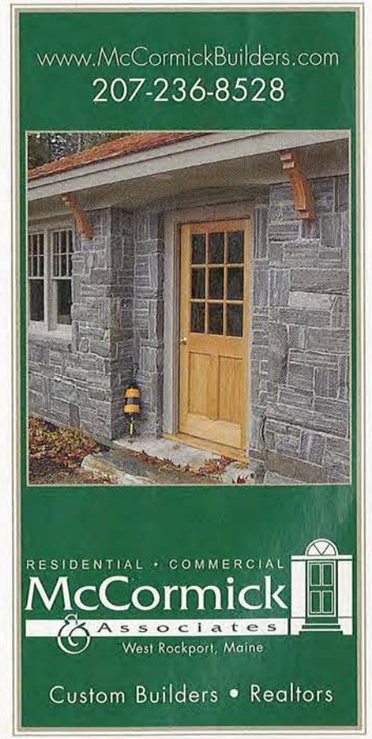
A waft of soft garlic billows out the door of a classroom outfitted with a small kitchen. Inside, a group of about twelve children, ages ten to fourteen, are gathered, their hands covered in flour. They are making pizzas with toppings they picked themselves: garlic scapes, basil, and tomatoes (from the patch of more than eighty varieties just outside the door).

Emma Sturdevant, eleven, makes a calzone with tomato, basil, garlic, and cheese. She says she started liking tomatoes when she was nine. "I like to eat them like apples," she announces.

These children are gathered for a summer camp run by Tanguay and Thurston to maintain the expanding garden. More than one hundred vegetable varieties are now grown on the property. This fall nearly three tons of food were harvested, with a substantial amount going directly to the school lunch program. That relationship helps the garden be financially self-sufficient, except for personnel costs. Part of the program's revenue is also generated by selling vegetables and flowers at their on-site farm stand and to the Belfast Co-op.

"Their vegetables are great," says Chris Grigsby, the produce buyer at the co-op. "They bring the stuff in and we sell out of it in a matter of hours. People in the community come in specifically on the delivery days just looking for their products."

"In the garden, the students' higher-order thinking skills are challenged."

In the garden, the students learn first-hand the value and rewards of hard work and responsibility. They also learn how to grow, harvest, and cook food — no small feat in this era of fast food and frozen convenience. "I had children say they had never eaten a tomato or carrot," recalls program founder White. "They had no clue how you produce those things. That's part of our history that is lost. Now the kids get to see that." The experience can be even more basic for some. "We had kids who would come to school with no breakfast, no food, no nothing," says White. "I would always send them home with food. I'd just put it in their backpacks." From the emotion in White's voice it is obvious that the students aren't the only ones who have been inspired by the garden. "We're meeting some of their basic needs," continues White, "and they are being introduced to vegetables and crops and flowers and having some beauty in their lives."

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