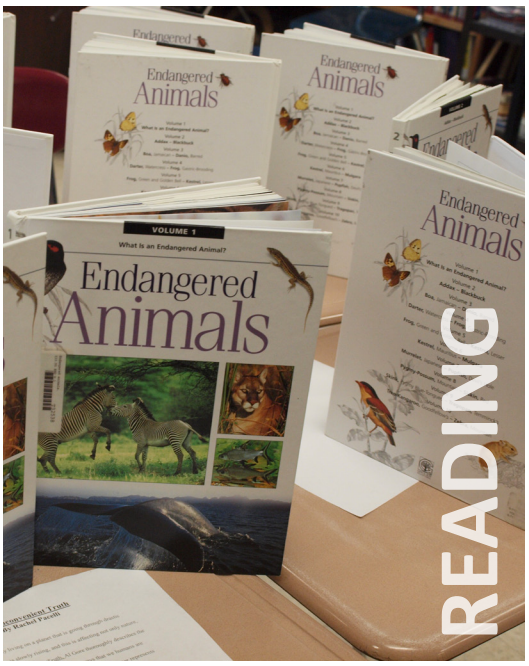
SCHOOLS
LEADING THE WAY IN SUSTAINABILITY



Land-of-Sky Regional Council
Buncombe • Henderson • Madison • Transylvania Counties NC

READING
RIDING
RETROFIT

Introduction

Schools help students learn the basic skills they will use for the rest of their lives and enable them to be contributing and responsible citizens in their communities. Schools can also offer students first-hand experiences with proven practices and technologies that will help sustain the future of the planet. Reading, Riding and Retrofit was designed to support schools in Buncombe County, NC to become models of sustainability practices. The project, a collaboration between community leaders and the two school systems, demonstrated immediate operational cost savings through retrofits of school facilities as well as educational activities that encouraged students and the broader community to adopt practices that will conserve and sustain our natural resources over the long term.

Reading, Riding and Retrofit (RRR) evolved from the combined vision of the Asheville HUB, a county-wide economic development alliance, and the Asheville-Buncombe Sustainable Community Initiative (ABSCI). The original idea was to "show" the value of sustainability initiatives. They recognized an opportunity to fund the project when they discovered a similar mission in the U.S. Environmental Protection Agency's Climate Showcase Communities Grants Program. The Climate Showcase awards were designed to fund innovative community-based projects around the nation that would demonstrate community level opportunities for reducing greenhouse gas emissions, a key contributor to global warming.

In 2009, RRR partnered with the Land-of-Sky Regional Council to design a proposal that would help Asheville City Schools, Buncombe County Schools, and the county's three charter schools make investments in energy-saving improvements to their facilities and establish school "green teams." In March, 2010, the EPA awarded the Council a $499,500 grant, one of only 25 across the nation. That grant allowed the community to test the value of engaging schools in saving energy and building a green awareness within their campuses. This effort has been deemed a great success and has built the foundation for the school systems' on-going work in promoting energy efficiency and sustainability. The project yielded an annual environmental impact reduction of 1,315 tons of greenhouse gases and school utility cost savings of more than $241,000.

Students at Asheville High School

The Project

Land-of-Sky apportioned $330,000 of the grant funds between the Buncombe County School System, the Asheville City School System, and three charter schools, according to their respective sizes and needs. A total of $310,000 was allocated for energy retrofits in the schools and $20,000 was allocated for micro-grants to be used for student and teacher projects. A total of 41 schools conducted facility retrofits and 18 initiated Green Teams. For various reasons, funds were not used to address transportation issues. Notably, buses in the Buncombe County School System had recently been retrofitted to use clean diesel emission systems; charter schools do not have buses.

Climate Showcase Communities
Local Climate and Energy Program

ASHEVILLE CITY SCHOOLS ESTABLISHED 1887

BUNCOMBE COUNTY SCHOOLS
ELEVATING YOUNG MINDS

EPA Climate Showcase Community Grant Funds – Allocations to Schools

	BCS	ACS	Charters	Total Sub-award
No. of schools in system	41	10	3	
Green Team micro-grants	$12,000	$5,000	$3,000	$20,000
Energy retrofit upgrades	$175,000	$105,000	$30,000	$310,000

BCS = Buncombe County Schools; ACS = Asheville City Schools

Partners

Fundamental to the success of RRR have been the collaborative partnerships among local, State and Federal governments, the two school systems, individual schools, the local utility company and non-profit agencies. Project success and continued efforts hinge on a network of funding and technical assistance. ABSCI partnered with Land-of-Sky Regional Council to secure funding from the EPA under the Climate Showcase Communities program. Those funds leveraged Federal Energy Conservation Block Grant Funds and rebates from Progress Energy, the local electric utility, to gain even larger savings. For Buncombe County Schools, the $175,000 in EPA funding leveraged another $360,000 in other grants and rebates. The NC Department of Environment and Natural Resources supported Waste Reduction Partners, a team of retired engineers, to provide the schools with technical assistance, as did the NC State Energy Office and Progress Energy's staff.

Educational partners, including Asheville-Buncombe Technical Community College, the North Carolina Arboretum, the University of North Carolina at Asheville, and the North Carolina Department of Public Instruction, engaged in the program, adding dollars, interns and support to maximize RRR's efforts.

The Global Institute for Sustainable Technologies (GIST) at the Asheville Buncombe Technical Community College brought additional resources from a US Department of Energy grant that had specific objectives of increasing energy education in K-12 Schools. Jon Snover, Director of GIST remarked, "when you have various organizations trying to achieve similar goals, it's important that you leverage each other's resources. I think we did a good job of that with Reading, Riding, and Retrofit."

"When you have various organizations trying to achieve similar goals, it's important that you leverage each other's resources. We did a good job of that with Reading, Riding, and Retrofit."

Jon Snover, Director, AB Tech's Global Institute for Sustainable Technologies

Administrative Support

The involvement of two school systems with forty-four individual schools in the RRR program did not happen automatically. Rather, it resulted from an overall vision that was consistent with the project's goals and with the cooperation of administrators, teachers and staff. The RRR project aligned with the public school systems' goals to advance environmental literacy in the classroom and enhance community collaboration, and offered new opportunities to achieve utility cost savings during tight budget years. RRR founder, Robin Cape, cultivated these school/community partners early in the RRR project development phase, garnering support, commitments, and excitement about the potential for accomplishments on various levels.

"Projects like Reading, Riding, and Retrofit help students prepare for colleges and careers in the 21st century."

Tony Baldwin, Superintendent of Buncombe County Schools

Key school leaders promoted sustainability strategies through staff leadership, educator mentoring and personal energy and passion. "I believe projects like Reading, Riding, and Retrofit help students prepare for colleges and careers in the 21st century," said Tony Baldwin, Superintendent of Buncombe County Schools. "We received $12,000 in classroom grants, which allowed students to do hands-on projects using green technologies. We also received a $175,000 grant to do energy retrofits in 31 schools. That has led to a significant reduction in energy costs. As a result of this [participation in RRR], Buncombe County Schools has launched its own Green Schools Awards program."

"As a result of RRR, students have an increased awareness of the importance of the environment and how each of them can make a difference."

Kay McLeod, Buncombe County Science Curriculum Coordinator

Kay McLeod is a former science teacher and now Science Curriculum Coordinator for the Buncombe County Schools. "As a result of RRR, students have an increased awareness of the importance of the environment and how each of them can make a difference," McLeod said. "The students then go home and talk to their parents, so there is a multiplier effect." McLeod said the Buncombe County Schools would not be nearly so far along in the Green Schools program and with facilities improvements if not for RRR. "It's carrying us further in the direction we were already going," she said.

BCS recently constructed two LEED (Leadership in Energy and Environmental Design) certified intermediate schools. The LEED program was developed by the U.S. Green Building Council (USGBC). It credits points to LEED schools based on sustainable site practices, water efficiency, energy efficiency, materials and resources, indoor environmental quality, and innovation in design. One feature of the new BCS schools are their Energy Efficiency Education Dashboards (EEED) – interactive learning labs with continuous coverage of the building's environmental conditions, energy usage, carbon offsets, and water usage. Some of the sites' features include solar thermal panels, day-lighting monitors in the classrooms, cool roof membranes, an outdoor classroom with amphitheater, rainwater cisterns, gardens, green screen trellises, storm water filtration systems, and LED site lighting.

Tim Fierle, architect with the Buncombe County Schools, said the energy audits and facility improvements conducted under RRR made the school administrators and teachers more comfortable in pursuing LEED standards. "RRR made us more aware of the hierarchy of options that yield the best return on investment," Fierle said. "It gave us a roadmap to make good decisions in the LEED process."

Asheville City Schools also expressed high praise for Reading, Riding, and Retrofit. "This project fit well into our overall goal of energy conservation," said Alan Johnson, Superintendent of the Asheville City Schools. "We used some of the resources to retrofit our school facilities. More importantly, it helped us establish Green Teams where students and teachers work together to identify ways to recycle and reduce energy costs. The Green Teams are continuing beyond the life of the project."

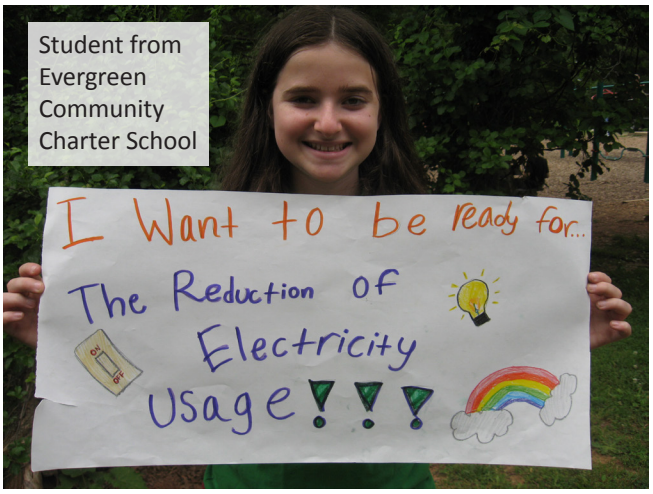
RRR "helped us establish Green Teams where students and teachers work together to identify ways to recycle and reduce energy costs. The Green Teams are continuing beyond the life of the project."

Alan Johnson, Superintendent, Asheville City Schools

Energy Efficiency Retrofits

The bulk of RRR grant money, $310,000, was designated for energy retrofits in 36 schools. These offered immediate financial savings and a reduction of greenhouse gases through decreased electrical usage. A significant portion of electrical generation in western North Carolina is provided by coal-fired power plants, a major source of carbon dioxide, so these efforts also supported cleaner air and a reduction in fossil fuel consumption.

Waste Reduction Partners, a state partnership with Land-of-Sky Regional Council staffed by retired engineers, identified energy efficiency improvements and offered grant-supported energy audits of the facilities. These audits pointed out the "low-hanging fruit"—retrofits that offered the quickest payback. The most common of these was the installation of high-bay linear fluorescent lighting systems in the school gymnasiums, an option taken by all 31 participating schools in Buncombe County Schools



Student from Evergreen Community Charter School

System. These retrofits led to annual energy savings of 815,000 kWh and a reduction of 422 metric tons of CO_2. Here are some details of the program's energy savings across all the K-12 schools in Buncombe County:

School Energy Efficiency Upgrades and Savings - Summary

RRR Project Description	Percent Energy Reduction, %	Annual Energy Savings, kWh	Annual Utility Cost Saving, $	Annual GHG Reduction, Metric Tons CO_2e
Buncombe County Schools RRR Energy retrofits savings	24%	815,000	$91,500	421
Asheville City Schools RRR Energy retrofit savings	7.5 - 36%	1,589,000	141,600	858
Charter School - Francine Delany, lighting and hot water upgraded	16%	11,401	2,304	5.89
Charter School – Evergreen Community Charter School, lighting and insulation	5%	11,679	2,000	10
Charter School – ArtSpace lighting upgrades	14%	48,342	4,031	24.7
Total		2,477,000	$241,444	1,315
Proposed Goal				1,026

BCS Fairview Elementary Gym - New lighting fixtures included self-contained occupancy sensors for additional savings.

Buncombe County Schools (BCS):

RRR grant funds were used to retrofit the lighting in 31 county school gyms, including elementary schools and high school auxiliary gyms. The work started in April, 2011 and was completed in September 2011 at a cost of $175,000. Facility staff saw immediate savings in utility costs. Many gyms were deficient in the quality of their lighting. With the retrofits, the gyms are now meeting the NC Department of Public Instruction lighting standards and are substantially more efficient.

Seth McLamb, the energy specialist with BCS, said the new lighting has yielded the energy savings that were predicted in the audits. The retrofits improved lighting levels, uniformity, and visual quality for the gyms' many diverse uses. An unforeseen problem arose when students at some gyms began to spin the fixtures around by hitting them with basketballs. This issue was resolved by using a crisscrossed chain arrangement that stabilized the fixtures.

Preliminary estimates of the energy savings from four gyms with dedicated electrical meters show an approximate savings of 24 percent. Further verification is currently underway to measure the on/off time of gym lamps and the lighting circuit amperage. This post-project measurement and verification will more accurately account for actual gym lighting electrical savings as well as cost savings and greenhouse gas reductions.

Buncombe County Schools - Energy Upgrade Performance Matrix

RRR Project Description	Percent Energy Reduction, %*	Annual Energy Savings, kWh	Annual Utility Cost Saving, $	Annual GHG Reduction, Metric Tons CO_2e
EPA–funded Gym lighting & occupancy sensors - 31 gyms	24%	160,000	$16,000	82.8
Locally Funded Competitive Gym Lighting - 15 gyms		155,000	15,500	80.2
Other RRR lighting upgrades including gym and classroom lighting – 17,200 fixtures	Varied	600,000	60,000	310.6
Total		815,000	$91,500	421.9

Asheville City Schools:

In late 2009 Asheville City School (ACS) officials launched an energy efficiency program that began with energy assessments performed by Waste Reduction Partners at all ten of their campuses. WRP engineers identified and categorized 121 potential energy saving projects which were projected to yield just over $500,000 in annual utility cost (avoidance) savings, or twenty percent in energy savings. The ACS Board quickly approved an Energy Mission Statement and the ACS District Energy Committee was formed to pursue the implementation, policies and procedures that could support these projects. Many of these projects could be achieved with simple no or low cost solutions. In 2010 ACS Facilities management was able to secure American Recovery and Reinvestment Act (ARRA) funding to add to the funding from the EPA Climate Showcase Grant.

This ARRA funding and matching utility rebates helped ASC upgrade much of its classroom lighting to high performance T-8 fluorescent systems. ASC specifically used the RRR funding to make long–awaited lighting system improvements at Asheville High School's competition gym. They upgraded existing High Pressure Sodium (HPS) lighting with T5HO High Bay fluorescent lighting and installed a new 3-level centralized computer control system that helps monitor and track energy usage.

ACS also upgraded electronic interfaces for the remaining 8 schools using the Novar Building Control System allowing improved control of the existing systems and added load-shaving capabilities.

RRR funding supported Asheville City School's first solar photovoltaic demonstration project. This project introduced students to solar energy and provided a tool studying, analyzing and exploring solar energy. ASC school officials elected not to pursue a 3rd party solar purchase agreement for the system but instead to pay for and own it themselves. In June 2012 ACS negotiated and entered into a contract with Sundance Solar of Asheville to design and install a 5 kW photovoltaic solar demonstration project on the high school campus. Sundance Solar also installed a monitoring system that could be used as an educational tool accessible from all of their campuses.

Asheville City Schools - Energy Upgrade Performance Matrix

RRR Project Description	Percent Energy Reduction, %*	Annual Energy Savings, kWh	Annual Utility Cost Saving, $	Annual GHG Reduction, Metric Tons CO_2e
Project #1: Competitive Gym lighting upgrades	36	35,228	$3,139	18
Project #2 Upgrade Novar Building Control System	7.5	581,250	$51,789	295
Project #3 Renewable Energy Demonstration Project	(.08)	6,300	$561	3
SEO – ARRR funding classroom lighting upgrades 14,060 lamps	12.4	966,544	$86,119	490
Total		1,589,322	$141,609	858

Notes: ACS RRR project are in operation for the 2012-23 school years. Savings are projected estimates. Total savings based on 7.775 Million kWh/yr usage system –wide.

Asheville City School
Chronology of Strategic Energy Management

August 2009	ACS conducts system-wide energy audits with Waste Reduction Partners.
October 2009	Energy Management Plan drafted.
December 2009	ACS Board adopts Energy Mission Statement and creates Energy Steering committee.
February 2010	ACS receives lighting upgrade grant from State Energy Office.
May 2010	Board Adopts Strategic Energy Management Plan Mission Statement.
October 2010	Reading, Riding Retrofit efforts support Green Teams and micro grant programs.
May 2011	ASC receives grant for lighting upgrades from Land-of-Sky Regional Council, RRR project.
June 2011	ACS completes comprehensive lighting retrofit – supported by State Energy Office.
August 2011	Energy Management Policy 9201 adopted.
October 2011	Competitive gym lighting retrofit complete with funding support by RRR-LOSRC
June 2012	5 KW photovoltaic renewable energy array – Demonstration project
December 2012	Energy Management System upgrade complete.

Evergreen Community Charter School

Evergreen Community Charter School is a learning community committed to holistic education, excellence and environmental stewardship. It is also one of two schools in North Carolina and one of 78 schools nationwide to receive the inaugural U.S. Department of Education's Green Ribbon Schools award. At the beginning of the RRR project, many environmental programs and projects were already completed or underway.

Evergreen implemented a two-part energy-saving retrofit project which included installing T-8 lighting upgrades to the elementary school wing and adding additional insulation to the middle school building. These improvement projects support the school's goals of reducing greenhouse gas emissions and reducing school utility costs.

The T-12 to T-8 lighting conversion in the elementary wing entailed replacing electronic ballasts and installing the T8 bulbs. The school's dedication to whole systems management of their campus involved the intentional recycling of the T-12 bulbs and non-PCB ballasts and the proper disposal of the non-recyclable PCB containing ballasts. The school was also able to install new light lenses, replacing those that were missing or damaged. Progress Energy provided rebates for the lighting improvements. Total cost was $6,310.

The middle school ceiling insulation project entailed adding blown-in R-30 Propink insulation on top of the existing insulation. The cost for this was $3690. Grand total for both projects was $10,000

Evergreen saved 2960 kWh in the first year, with a net reduction of 5% and a cost savings of $799. Total energy savings for the upgrade are estimated to be 75.9 million Btu per year. Greenhouse gas emission reductions are estimated to be 4.5 tons year of CO_2 .

Along with the energy savings, school officials say there is an increased quality and uniformity to the new lighting. The new light covers also provide increased safety for students.

New Retrofitted T-8 lighting in the elementary wing of Evergreen Community Charter School

Francine Delany New School for Children

Francine Delany New School for Children is a local charter school that practices experience-based learning and hands-on projects and programs, with an emphasis on critical thinking skills, creativity, respect and social justice. Their campus is made up of converted older residential buildings and some newer accessory buildings.

Francine Delany replaced 107 T-12 fluorescent lighting fixtures with higher efficiency T-8 lamps and installed occupancy sensors in their hallways and bathrooms. The total cost of these upgrades was $5,317. The school also installed 32 tankless water heaters (replacing 9 tank hot water heaters) at a cost of an additional $4,800.

School officials report the upgrade in the lighting was impressive and was noticed immediately by staff, students and parents. "Many students and visitors asked if the room had been painted because of the brighter, smoother quality of light," said Executive Director, Buffy Fowler.

Energy usage dropped from an average of $1,197.07 per month to $1,004.63 per month, a monthly savings of $192. The tankless water heaters had not been installed long enough to reflect in this calculation and total energy saving for the upgrade is estimated to be 11,401 kWh per year. Greenhouse gas emission reductions are estimated to be 8.7 tons year in CO_2.

"Participating in this project also made the entire staff more aware of our energy use and encouraged students to look for ways to conserve energy," Fowler said.

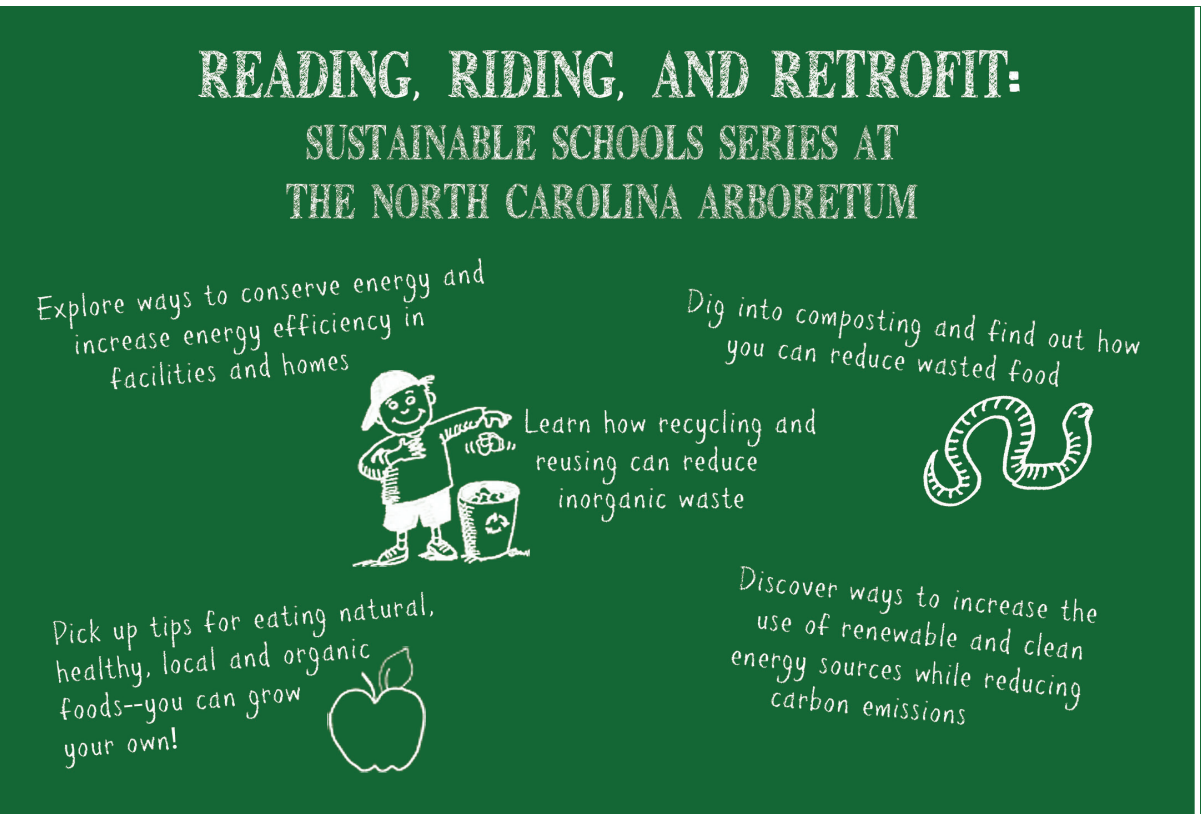
Schools officials say the lighting upgrade and switches were fairly easy to install with their own staff. The tankless water heaters on the other hand required more labor than they had anticipated and involved the help of professional contractors.

ArtSpace Charter School

ArtSpace Charter School offers an integrated curriculum centered around visual and performing arts, with an experiential approach. The school building was built in the late 1970s and it was renovated to house the school in 2001.

ArtSpace Charter School replaced 418 T-12 fluorescent lighting with T-8 systems, and added occupancy sensors in several locations. They removed 12 exit sign lights and replaced them with LED fixtures. Finally, they removed 21 incandescent lamps and replaced those with compact fluorescent lamps of appropriate wattage.

First year savings totaled 33,280 kWh worth $4,349. This is the equivalent of 115 million BTU's.



NC Arboretum Partnership

The NC Arboretum provided instruction to almost 300 fifth and seventh graders on air quality and related issues through its Atmosphere and Climate training sessions. It also hosted and helped promote a series of community outreach events, called Sustainable Schools.

Green Teams

School green teams are defined as groups of students, staff, and teachers who meet regularly to examine the sustainability of school practices and create innovative solutions. When RRR began, several schools within the county had already established green teams or had piloted student-based sustainability projects:

- Asheville City Schools formed a District-wide Green Team - composed of teachers, facilities, and administrative staff to address energy-related policies and opportunities that meets quarterly.
- Evergreen Charter School had undertaken a number of teacher- and student-led "green" projects, then formed a green team under RRR.
- SILSA (School of Inquiry and Life Sciences at Asheville) incorporated science-related project competitions into its curriculum.

During the two-year RRR project, micro-grants of $500-$1000 were offered to teachers at the beginning of the fall and spring semesters. Teachers proposed projects that would complement the efforts of their facilities staff and/or help reduce GHG emission reductions. Students were required to share what they learned with the wider community. Land-of-Sky staff oversaw the grant review and approval process and administered the program. A total of 18 micro-grants were awarded; nine to Asheville City Schools teachers, seven to Buncombe County Schools teachers, and two to the charter schools.

Projects included the following:

- A campaign to "Turn it off" (turn off lights) at Hall Fletcher Elementary School
- Teaching about energy use and weatherization that included student-led home energy audits at North Buncombe High School and SILSA
- Performing weekly energy audits of classrooms and creating an inter school competition to win the Green Cup Award at Evergreen charter school
- A food waste assessment and waste recovery plan at Erwin High School
- A waste assessment and the creation of a folk art garden using "waste" materials at Francine Delaney New School for Children
- Building curriculum and a garden around the benefits of composting and gardening at Candler Elementary
- Developing a composting program at Asheville Middle School
- Installing reforestation and native plant educational signs along an existing school nature trail at Jones Elementary

The Evergreen Team

Evergreen Charter School started their Green Team by identifying the grade level (5th grade) that was not engaged in a lot of other after school activities. A dozen students signed up for the Green Team, which came up with the idea of finding "energy vampires;" items that were left plugged in when not in use. The goal was to end up with as few of these vampires sucking energy from their schools as possible.

The Green Team presented their project to the public at the North Carolina Arboretum during the Sustainable School Series. "It was pretty cool for the kids to present their findings to a roomful of adults," said Susan Gottfried, Evergreen Executive Director.

Gottfried said the project has resulted in the students adopting a more responsible behavior toward energy usage. "They remind their teachers and their peers that the computer and the power strip need to be turned off."

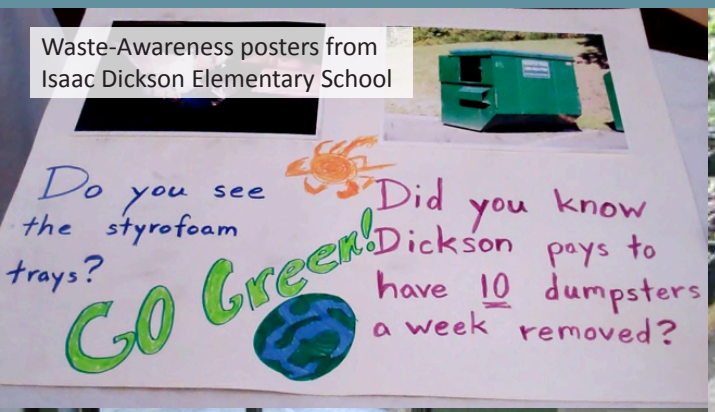
The Circle of Life

To fire up their Green Team about composting, Hall Fletcher Middle School brought in Danny's Dumpsters, a local, commercial composting company. Danny explained that virtually everything on the students' lunch trays could be composted, as well as many other items that were currently being thrown into the school's trash bins. The school then posted a volunteer student beside each trash bin advising other students about what could or couldn't be composted.

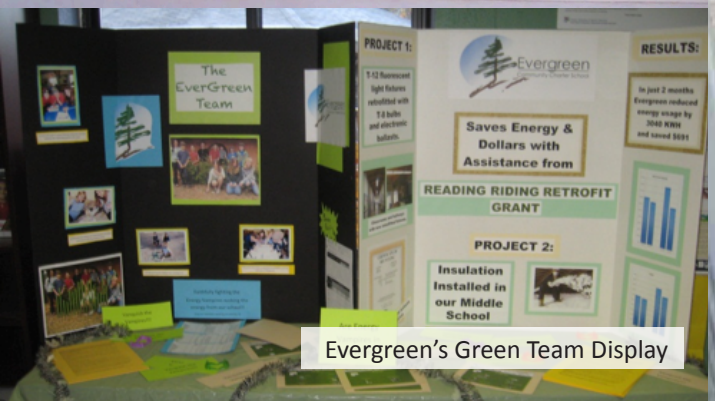
"We went from about 8 trash bags a day to almost nothing," said Michelle Corral, project leader and a teacher at Hall Fletcher.

Danny's Dumpsters collected the refuse and added it to their composting operation, where microbes set to work breaking the material down into usable soil. "The temperatures get so high—over 100 degrees--they will even break down bones," Corral said.

The resulting compost was then sold back to the school for use in their garden, closing the loop and illustrating nature's circle of life.



Waste-Awareness posters from Isaac Dickson Elementary School



Evergreen's Green Team Display

Greenhouse and gardeners at Oakley Elementary School

Evolution

The momentum gained with RRR has led to the adoption of additional energy and sustainability related projects, multiplying the effect of these initial efforts. In the summer of 2011, RRR staff began working with others to develop a Green Schools Program specifically designed to support North Carolina schools. The National Green Schools Network, NC Office of Environmental Education, NC Department of Public Instruction, NC Department of Environment and Natural Resources and the US Green Building Council NC Affiliates partnered with RRR staff to develop a statewide program. Staff combined a successful model of green schools recognition from Palm Beach County , with the pillars of the US Department of Education's Green Ribbon Schools Program to create a comprehensive program that encourages, supports and recognizes the sustainability efforts of North Carolina's K-12 schools.

RRR: NC Green Schools provides a framework for supporting energy efficient, healthy learning spaces where resources are managed wisely and a sense of conservation becomes an integral part of the school culture. Additionally, the program offers tools and resources to engage students with the world around them through interdisciplinary, hands-on experiences that blend curriculum and service learning. The program is still adding partners and honing the rubric with the intent of officially launching in the spring of 2013. For more information go to www.ncgreenschools.org.

Buncombe County Schools' maintenance staff worked with Waste Reduction Partners to produce engineering reviews that validated key energy and building performance data for the Energy Star Certification Program. They have since had 36 of their 44 schools designated as Energy Star Schools. This designation earns them a cost reduction of five cents per therm from PSNC, their natural gas provider, which is equivalent to a discount of $40,000 annually off their gas bill. The recognition provided by Energy Star certifications has also raised more interest and participation among staff, students, and parents in achieving further operational and behavioral improvements.

Conclusion

Reading, Riding and Retrofit illustrates the value and success of organizations working together to increase collaboration and leverage resources. Project staff learned valuable lessons about communicating issues of sustainability, working with school administrators and teachers, and the strength and support within the community for energy savings and sustainability projects. The EPA Climate Showcase Communities Grant leveraged far more resources than the grant itself provided, and helped the schools in Buncombe County become visible advocates for energy saving technologies.

Partner Organizations:

This publication was produced by Land-of-Sky Regional Council in December, 2012. Land-of-Sky is a multi-county, local government planning and development organization in western North Carolina. See www.landofsky.org for more details on the organization and its work, and see www.reading-riding-retrofit.org for more on Reading, Riding and Retrofit and the NC Green Schools Program.

This publication was developed under Assistance Agreement No. AF-83454101 awarded by the U.S. Environmental Protection Agency. It has not been formally reviewed by EPA. The views expressed in this document are solely those of the Land-of-Sky Regional Council and EPA does not endorse any products or commercial services mentioned in this publication.