turning wheaton GREEN

City of Wheaton Sustainability Report

City of Wheaton • Published August 2012

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CITY OF WHEATON

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DISCLAIMER

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{ACRONYMS}

BAU	Business as Usual
BMP	Best Management Practices
CFL	Compact Fluorescent Light
CFM	Cubic Feet per Minute
CMAP	Chicago Metropolitan Agency for Planning
CMAQ	Congestion Mitigation and Air Quality
CNG	Compressed Natural Gas
CNT	Center for Neighborhood Technology
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DCEO	Illinois Department of Commerce and Economic Opportunity
EECBG	Energy Efficiency and Conservation Block Grant
EPA	U.S. Environmental Protection Agency
ESAC	Environmental Stewardship Advisory Council
ESCO	Energy Service Company
GHG	Greenhouse Gas
GWH	Gigawatt hour
GWP	Global Warming Potential
IDOT	Illinois Department of Transportation
KWH	Kilowatt hour
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
MT CO_2E	Metric Tons carbon dioxide equivalent
MSC	Memorial Student Center
USGBC	U.S. Green Building Council
VMT	Vehicle Miles Travelled

EXECUTIVE SUMMARY

Over the last decade, the City of Wheaton and its residents have become **fully engaged** in the **sustainability movement,** the idea that reductions in energy and resource consumption can result in financial and environmental benefits immediately and over the long term.

The objective of this inaugural report is to document our achievements to date and set a course for the next generation of projects and programs that will strengthen Wheaton's position as a vibrant community. Turning Wheaton Green is an effort that works best with participation from all corners of our community, from individual households to the business community, from municipal departments to other local governments and nonprofits. This report highlights endeavors from our entire community, demonstrating that sustainability is truly a uniting principle.

This report is focused on activities that impact greenhouse gas (GHG) emissions, such as building energy use, transportation fuels and waste management. The City has set a goal of aligning with Illinois' GHG reduction goal, which is a two-phase effort: (1) achieving 1990 levels by 2020 and (2) GHG emissions 60% below 1990 levels by 2050. Wheaton's current emissions rate is close to 713,000 metric tons carbon dioxide equivalent (MT CO_2e), or

13 MT CO_2e per resident. If the annual emissions rate per resident increases at the current pace, the "business as usual" (BAU) forecast will result in a 2.5% increase in GHG emissions by 2020 and 5% by 2050, which would be a 64% increase over 1990 levels. To align with the Illinois goals, Wheaton will need to achieve a 6% reduction from the current GHG rate to meet the 2020 goal and a 43% reduction from the current rate to achieve the 2050 goal.

To date, the City has scored significant accomplishments in its effort to "turn Wheaton green." Most notably, the projects funded by the 2009 Energy Efficiency and Conservation Block Grant (EECBG) provided the City with a long-range bicycle network plan and multiple building retrofits with an average return on investment in less than three years, and provided more than $200,000 in energy-saving projects to homeowners and businesses. Building on top of an already solid foundation of environmental performance, Wheaton is well-positioned to battle the impacts of global climate change and to continue prospering as a vibrant community.

As detailed in this report, the City has established the following initial GHG reduction goals:

- **Reduce building energy by 36% (82,000 MT CO_2e)**
- **Reduce waste-related emissions by 15% (4,100 MT CO_2e)**
- **Reduce water-related emissions by 10% (480 MT CO_2e, 162M gallons/year)**
- **Reduce transportation emissions by 3% (6,800 MT CO_2e)**

Achieving these reductions would equal roughly 30% of the City's ultimate 2050 goal. This report is being produced in 2012, leaving just less than 40 years to that end date. With a steady focus on the GHG emissions reduction targets, Wheaton will be able to achieve its goals.

The majority of GHG reductions could be achieved by retrofitting residential buildings and local businesses, the funding for which is almost entirely reliant on grants. Wheaton will focus on supporting efforts to reduce building energy consumption for the residential and commercial markets, primarily by promoting use of programs such as ComEd's Smart Ideas for Your Business and, where possible, securing grant funds similar to the 2009 EECBG program.

{introduction}

Wheaton is a comfortable place to call home.

This is a close-knit community of just over 53,000 residents who take pride in their top-ranked schools, picturesque downtown, historic neighborhoods and dynamic community.

For more than a decade, the City of Wheaton and its residents have become fully engaged in the sustainability movement, the idea that reductions in energy and resource consumption can have financial and environmental benefits immediately and over the long term. The objective of this inaugural report is to document the City's achievements to date and set a course for the next generation of projects and programs that will strengthen Wheaton's position as a vibrant community.

Turning Wheaton Green is an effort that works best with participation from all corners of the community, from individual households to the business community, from municipal departments to other local governments and nonprofits. This report highlights endeavors from the entire community, demonstrating that sustainability is truly a principle that unites the city.

success story

Community Unit School District 200 eliminated paper flyers by launching the E-School Bag, an online informational service. Every ton of avoided paper, around 40 boxes, saves 24 trees ![i]

{report methodology}

In the fall of 2009, Wheaton received an Energy Efficiency and Conservation Block Grant (EECBG) from the U.S. Department of Energy, funded by the American Recovery and Reinvestment Act (ARRA). As part of the ARRA program, the City solicited bids for a consultant to assist in developing the City's EECBG strategy and selected AECOM.

As the strategy developed and projects were implemented, it became clear that a formal sustainability report would be a fitting capstone to the effort. Through the EECBG program, the City amassed a significant amount of information about not only its own operations, but also about the energy efficiency and conservation efforts of residents, the business community and other government agencies. The City also learned about projects that would be appropriate in the future, when more funding is available or when technological advances reduce the costs.

The first crucial component was to determine the City's current GHG emissions rate and its 1990 baseline. A complete explanation of the GHG calculation methodology is provided in Appendix A, but to summarize, AECOM utilized a collection of data sets provided by Wheaton and from a report by the Center for Neighborhood Technology (CNT). The report, Wheaton Energy and Emissions Profile (CNT report), provided data from 2007 on the consumption rates of electricity and natural gas, as well as vehicle miles travelled (VMT), which provides data on vehicle fuel use. Combining the data sets from CNT and the City, as well as U.S. Census data, AECOM determined Wheaton's 1990 GHG emissions baseline, the Business as Usual (BAU) forecast, and the 2020 and 2050 reduction goals. Data citations are provided in Appendix A.

success story

The Wher Family switched from sponges to dish rags, from disposables to cloth diapers and wipes, and from paper napkins to cloth (reusing cloth napkins emits half the GHGs as paper).[ii]

{greenhouse gas emissions inventory}

The first step in setting Wheaton's GHG reduction goal was to determine the current rate of greenhouse gas (GHG) emissions. Using the data described in Appendix A, AECOM was able to provide a detailed analysis of the GHG impact by sectors.

As shown in Figure 1, the majority of GHG emissions in Wheaton are generated by the operation of buildings, both residential and commercial (which includes education and government facilities), close to 64% of the total. Transportation is the second significant category (32%), with emissions from solid waste and water management generating a minor share of the City's emissions (4% and less than 1%, respectively).

Once the current GHG rate was determined, the 1990 baseline was estimated in order to align with the State of Illinois' GHG reduction goals. In 2007, Illinois committed to a two-phased GHG reduction goal of (1) achieving 1990 levels by 2020 and (2) 60% below 1990 levels by 2050.[iii] To do this, the current per person GHG rate was applied to the City's population as recorded by the 1990 Census. Wheaton's residential, commercial and industrial base did not change significantly between 1990 and 2007 (the baseline year), and facilities were operating at similar efficiencies (assuming energy efficiency measures had not been widely adopted before 2007). Based on this examination, this simple calculation was deemed to be adequate.

The current emissions rate is close to 713,000 MT CO_2e, or 13 MT CO_2e per resident. If the annual emissions rate increases at the current pace, the BAU forecast will result in a 2.5% increase in GHG emissions by 2020 and 5% by 2050, which would actually be a 64% increase over 1990 levels. For Wheaton to achieve the two-phased goal of 1990 levels by 2020 requires a 6% reduction from the current GHG rate and a 43% reduction from the current rate to achieve the 2050 goal of 60% below 1990 levels.

FIGURE 1: WHEATON GHG EMISSIONS BY SECTOR

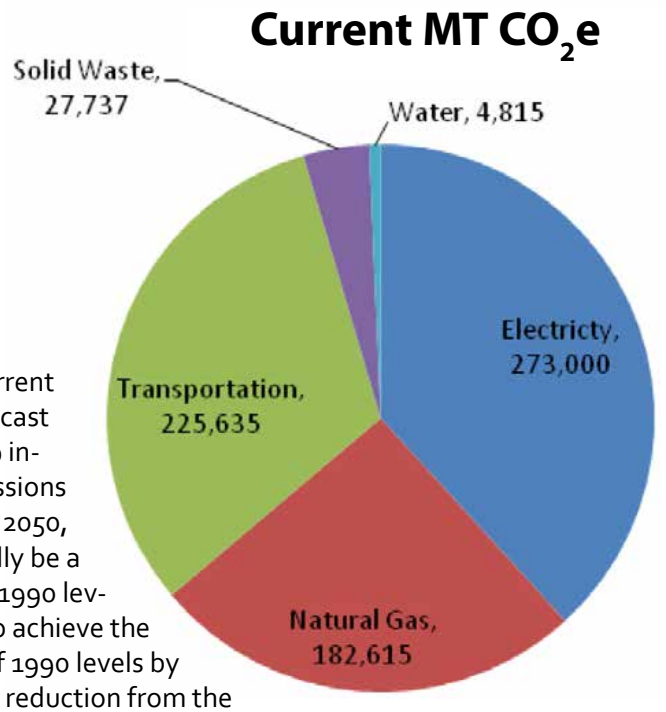
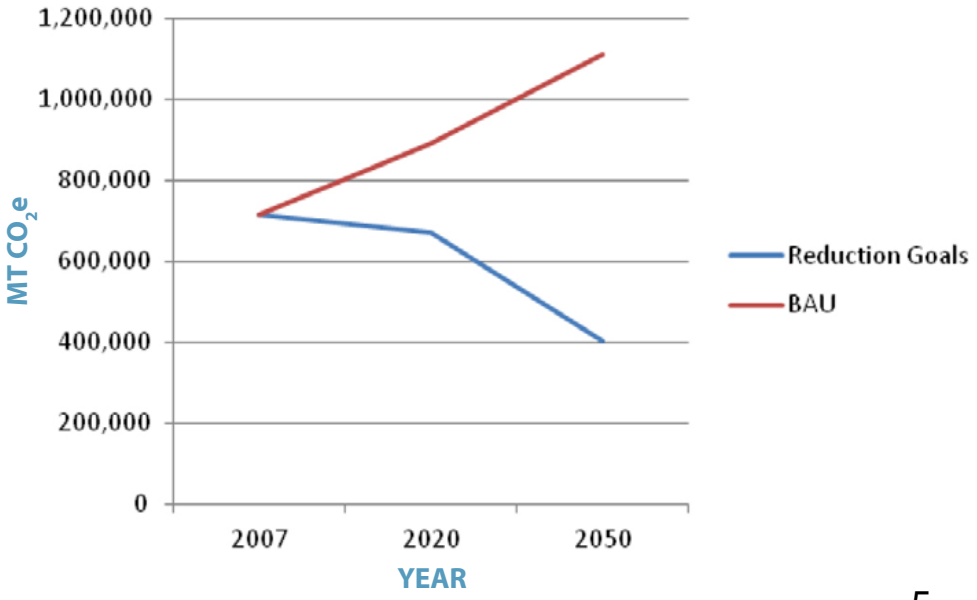


FIGURE 2: WHEATON GHG REDUCTION GOAL



{sustainability 101}

Sustainability, climate change, energy efficiency and **green** are terms commonly heard in discussions about reducing costs and protecting the environment. In this report, we define the terms as follows:

Sustainable is a holistic term used to describe a place or a process in its entirety. A product can be sustainable if its raw materials are continually available and its waste can be re-used or re-purposed, and a system can be sustainable if it can regenerate without assistance, for example, a classic Illinois prairie.

Green is a descriptive term that refers to a product's environmental qualities or the environmental benefits of an action. For example, using a refillable bottle for drinking water is a green action; if the refillable bottle is made from recycled steel, the bottle itself is a green product.

Climate change is a term to describe the long-term trend in the condition of the Earth's natural systems. Short-term fluctuations are described as "the weather" while change over the long term is described as "the climate." Weather can be quite different from one year to the next (e.g. cold and dry one year, wet and warm the next). Climate change is revealed by the long-term trend after accounting for the year-to-year variability. The term "Global Warming" is not as accurate a description as "Climate Change," since "warming" implies that the only effect is increased temperatures.

Energy efficiency describes a strategy that leads to sustainability and helps reduce the human impact on climate change. Products can be energy efficient, such as compact fluorescent light bulbs and Energy Star appliances, and whole systems can use less energy, such as buildings that are well-insulated, feature updated lighting systems and double-pane, low-E windows.

Greenhouse gas (GHG): There are six categories of gasses defined as having a greenhouse effect on the planet, meaning that their presence in the atmosphere traps heat, which changes the climate. Each of the six has an assigned Global Warming Potential (GWP) figure. Carbon dioxide (CO_2) has a GWP of 1, and all GHGs are measured relative to it as carbon dioxide equivalents, or CO_2e. The complete list is shown in the table to the left.[iv] With a GWP of 25, methane (the primary GHG emitted by natural gas) has 25 times as great an impact on climate change as carbon dioxide.

GREENHOUSE GAS CATEGORIES

GAS	GLOBAL WARMING POTENTIAL
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous oxide (NO_2)	298
Sulfur hexafluoride (SF_6)	22,800
Hydrochlorofluorocarbons Hydrofluorocarbons (HCFCs and HFCs)	77-14,800
Perfluorocarbons (PFCs)	7,390-12,200

{why emissions matter}

Carbon dioxide (CO_2) is a natural element present in the Earth's atmosphere at all times, and for most of the Earth's existence, the atmosphere has maintained a balanced share among all elements. Since the dawn of the Industrial Age, the volume of CO_2 has increased to the point where natural systems are affected, such as the rising of ocean temperatures that, in turn, create unusual weather patterns across the globe. The increased presence of CO_2 has caused a rise in atmospheric temperatures, and even if all human sources of emissions were to cease at once, this temperature increase would continue due to the higher-than-natural volume of CO_2. There is a need to reduce the sources of CO_2 emissions, which can be controlled by human behavior, and the result will eventually allow the atmosphere to again reach equilibrium where CO_2 levels no longer alter natural systems on the planet.

Humans can control their contribution to emissions through a variety of lifestyle changes, but like all change, the effort will be most successful if it is accessible and has little to no negative impact on our quality of life. It's all about choice – can a fuel-efficient car do the job, and can we drive our vehicles less? Will our homes be more comfortable and easier to maintain if we insulate them or use healthy indoor materials? Do we benefit by voting with our consumer dollars to choose goods manufactured in a process that has less impact on the environment?

GLOBAL EFFECTS OF CLIMATE CHANGE [v]

Observations from around the world show that global average air and ocean temperatures have steadily increased over the past 100 years. Between 1995 and 2006, all but one of the years ranked as the warmest year on record. In addition to increased temperatures, other evidence indicates that our planet's climate is warming. Rapid levels of glacial melt, decreases in the extent of Northern Hemisphere sea ice, shorter freezing seasons and decreasing snowpacks are a few of the changes. Increasing temperatures in particular threaten the world's ecological, social and economic systems.

Between 1995 and 2006, **all but one** of the years ranked as the **warmest year on record**.

Flash flooding has serious impacts on public health and can result in **severe property damage.**

NOTABLE EXAMPLES OF POTENTIAL EFFECTS INCLUDE:

- More frequent and intense extreme weather events (i.e. hurricanes)
- Increased stress on water resources
- Coastal areas at greater risk from sea-level rise and storm surges
- Reduced food security
- Increased threats to human health (i.e., mosquito-borne diseases)
- Ecosystem loss or degradation
- Economic and geopolitical disruption

EFFECTS OF CLIMATE CHANGE IN WHEATON

To date, the effects of climate change have primarily been examined at global and regional scales. Due to the scale of current models, it is difficult to identify the specific effects that climate change may have on an individual city or community.

The few studies that have been conducted indicate that many communities will become hotter, with an increase in the number of heat wave days and the number of days with poor air quality and high concentrations of ground level ozone (smog). Hotter, smoggier days mean more stress on electricity and water supplies, more heat-related injuries, and additional strain on people with respiratory and cardiovascular diseases. Two issues[vi] that may be significant for Wheaton's future are:

FLASH FLOODING

Flash flooding has serious impacts on public health, transportation infrastructure, and power service and can result in severe property damage. Even small flooding events have been known to cause public transportation disruptions. Power outages due to storm damage can

compound transport delays and put populations dependent on electricity for health needs at risk. Major stormwater events also are a cause of toxin infiltration.

HEAT WAVES

The most significant risk of heat waves is the likely increased levels of heat stress and death caused by extreme temperatures. This is of particular concern for the elderly and infirm, as well as those with heart or respiratory problems and perhaps mental health issues. The percentage of Wheaton residents over the age of 65 is around 11% [vii] and as the population ages, this percentage is likely to increase.

With the prevalence of air conditioner use during heat waves, demand for power may outstrip supply and cause a power blackout. This risk is compounded during a heat wave, particularly for those managing their heat stress with air conditioning. If the outage is sufficient to disrupt public transportation, mass stranding of passengers also may occur.

While the City of Wheaton cannot make cars more fuel efficient, it can make local streets more inviting to bicycles. The City can't change the type of energy provided to its homes, but it can help homeowners make their homes more energy efficient through education, green power purchases and, where possible, grant funds.

The City of Wheaton can be a leader, demonstrating that being energy and resource efficient allows it to spend precious taxpayer dollars enhancing public services, safety and quality of life, rather than for maintenance of an aging infrastructure.

The City can't make cars more fuel efficient, but it can make local streets **more inviting to bicycles.**

we are thriving

environmental achievements prior to 2010

Over the past 10 years, Wheaton's municipal government, residents, the business community, local institutions and fellow government agencies have implemented a number of programs to increase recycling, reduce energy consumption and protect natural areas.

This section details the many actions already taken by the Wheaton community to improve performance in the areas of energy conservation, solid waste and recycling, natural areas protection, and education and outreach. In addition to City activities, profiles in this report include actions by the following:

WHEATON ENVIRONMENTAL IMPROVEMENT COMMISSION

For more than 30 years, Wheaton's **Environmental Improvement Commission (EIC)** has advised the City Council on relevant topics, and its members – all volunteers – coordinate a variety of events each year, all of which are described in this section. In addition to its many events, the EIC suggests information to be shared with residents through City communications.

The EIC also manages a **Green Team** [viii] to provide residents with volunteer opportunities focused on the local environment. The Green Team participates in the EIC's many environmental activities throughout the year and welcomes volunteers and new ideas to make Wheaton a more environmentally friendly city.

WHEATON PARK DISTRICT

The **Wheaton Park District's** commitment to environmental stewardship and appreciation of increasing public awareness and concern about environmental issues led to the creation of an Environmental Policy Committee and environmental policy. Educating the staff and community has resulted in positive environmental changes. The Park District is committed to setting an example and adopting a leadership position in establishing and maintaining sound environmental policies, practices and educational opportunities for employees and patrons.

The Environmental Improvement Commission has been going strong for **more than 30 years.**

green Team
Wheaton Park District

COMMUNITY UNIT SCHOOL DISTRICT 200

Community Unit School District 200 (CUSD 200) includes 20 schools and serves just over 13,400 students in pre-K through 12th grade. The district serves the communities of Wheaton, Warrenville and portions of Carol Stream, Winfield and West Chicago. This district's motto is "inspiring in everyone a passion to excel," and it believes strongly in the importance of a challenging, rigorous and comprehensive curriculum and extracurricular program. The issues explored in the field of sustainability blend perfectly with the district's overall educational goals.

WHEATON COLLEGE

Wheaton College is a member of the AASHE (Association for the Advancement of Sustainability in Higher Education) and the USGBC (United States Green Building Council). Since 2005, the Wheaton College Environmental Stewardship Advisory Committee (ESAC), composed of faculty, staff and students, has advised the president on ways the college can interact with and address environmental concerns. Acting upon recommendation from ESAC, Wheaton College joined the Illinois Sustainable University Compact.

WHEATON RESIDENTS & BUSINESSES

In the summer of 2010, the City's communications staff conducted interviews with residents and businesses to find out what they were doing to "be green." Vignettes from these interviews are included throughout this report.

{energy conservation & air quality}

Nationally, buildings account for **40% of all energy use**[ix] – powering lights, heating and cooling systems, heating water, and powering other equipment ranging from hair dryers and computers to refrigerators and hot tubs.

The vast majority of GHG emissions in Wheaton, 64% (455,615 MT CO_2e), are generated by consumption of electricity and natural gas. Therefore, actions to reduce such consumption should be a primary focus of the City's sustainability actions.

Transportation is also a major contributor to greenhouse gas emissions. According to the EPA, "transportation sources accounted for approximately 29% of total U.S. GHG emissions in 2006. Transportation is the fastest-growing source of U.S. GHGs, accounting for 47% of the net increase in total U.S. emissions since 1990."[x] Emissions associated with transportation account for close to 32% of Wheaton's total (225,635 MT CO_2e).

MANAGING BUILDING EMISSIONS

The community center on Blanchard Street, managed by the **Wheaton Park District,** features a large array of photovoltaic panels that provide electric power to the facility. The majority of the project was funded by a grant from the Illinois Clean Energy Community Foundation, and it is expected to complete its return on investment in 13 years. The Park District also features solar-powered lights at Lincoln Marsh and a solar-powered weather siren at Arrowhead Golf Course.

"We, as a conservationist agency, believe we should be taking the lead in advocating for cleaner energy. It's an opportunity to educate the public as well."

Mike Benard
Wheaton Park District Executive Director

Since the start of its Energy Program, **CUSD 200** has embarked on a journey through formal energy education and cost-savings programs. Led by Colin Wilkie, Energy Operations Manager, the Energy Program has achieved a cost avoidance savings of nearly $3 million, which includes a more than 25% reduction in energy use from 2009-August 2012. The district reports that this reduction translates into the equivalent of more than 175,000 MMBTUs removed from the atmosphere, 3,600 passenger cars removed from the road for a full year, or 510,000 new trees planted.

Only the top 25% of all schools in the nation have received an Energy Star Rating, and CUSD 200 is proud to report that each of its buildings has achieved an Energy Star Certification for 2010, 2011 and 2012.

This national energy performance rating is a type of national benchmark that helps energy managers assess how efficiently their buildings use energy relative to similar buildings nationwide. The rating system's 1-100 scale makes it easy to understand how a building is performing; a rating of 50 indicates average energy performance, while a rating of 75 or better indicates top performance. All CUSD 200 buildings have received a rating above 75 for 2012.


Lowell Elementary School

District 200's Energy Education Program has achieved a **cost avoidance savings of nearly $3 million,** which includes a more than 26% reduction in energy use from 2009-2012.

According to Mr. Wilkie, "The long-term impact on our environment is based on what we can accomplish now. Each day our students and staff show that doing even a little energy savings adds up to a big impact in the community environmentally as well as economically.

"Since 2009, our district has become a leader in making a significant contribution towards a 'greener' future for everyone."

MANAGING TRANSPORTATION EMISSIONS

The **Environmental Improvement Commission** enacted an initiative to encourage drivers to cut down on air pollution by reducing the amount of time they idle their vehicle engines. The commission worked to have signs placed near the two Wheaton train stations reminding people to turn off their engines because "it all adds up to cleaner air." EIC members point to the many opportunities drivers have to turn off their engines while waiting for trains, waiting for children after school or while running into a convenience store.

While turning off car engines helps reduce air pollution, it also can save drivers money. More than 10 seconds of idling uses more fuel than restarting the engine, and idling increases the wear on the car's exhaust system. City code also makes it illegal for any motor vehicle to be left unattended while the engine is running.

LOCAL EXAMPLES

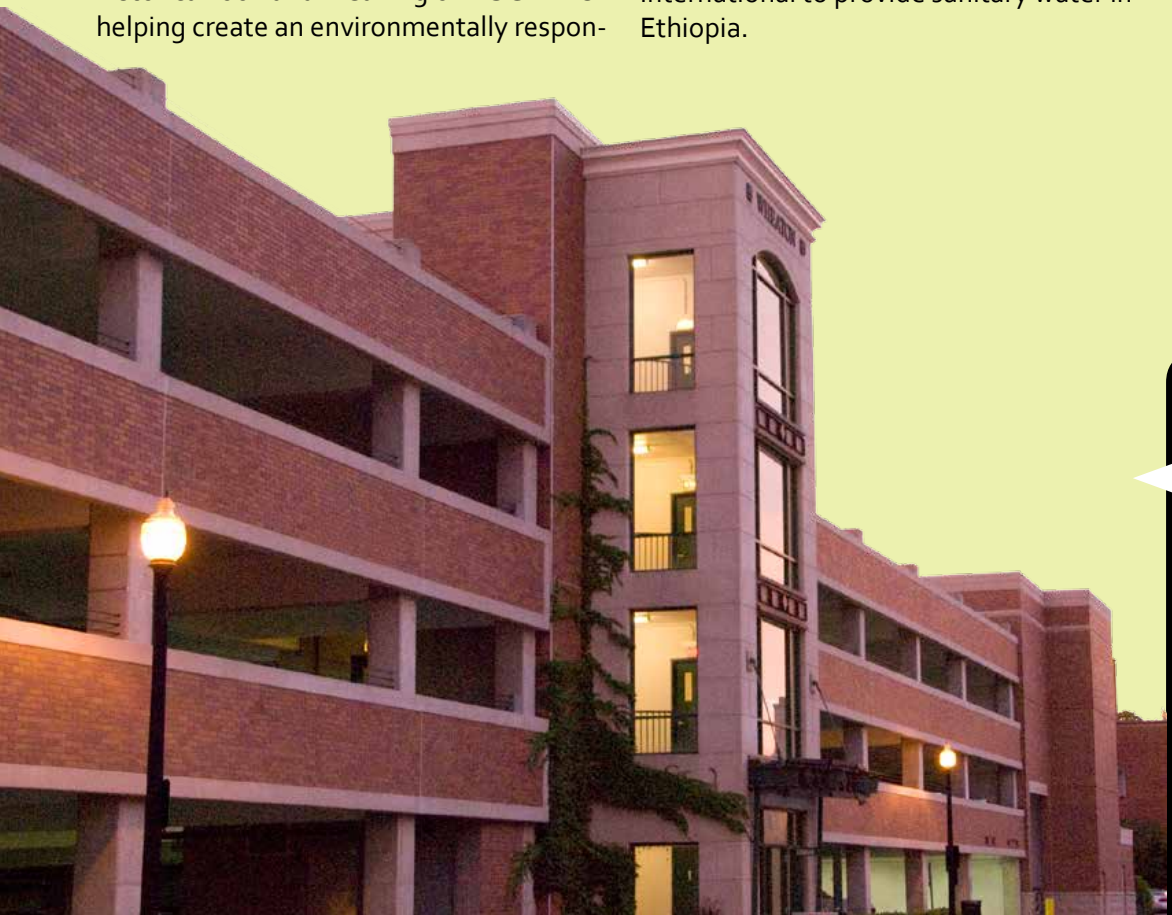
Wheaton College has emerged as a local leader in pursuing energy efficiency across its campus, including:

• The Science Center: LEED Gold. This new building uses 25% less energy than the typical standard in its class. Design techniques such as sun shades on the south facade and using energy-efficient mechanical systems result in the high level of efficiency. In addition, 70% of the building's energy is provided by Green-e certified renewable energy providers. Water use has been reduced by 41% over the baseline case by installing water-efficient fixtures.

• Memorial Student Center (MSC): LEED Silver. More than 95% of the existing building was kept in its original state, deferring many tons of waste from the landfill. By keeping much of the existing infrastructure, landscaping and building shell, the college was able to keep the historical look and meaning of MSC while helping create an environmentally responsible future for the next generations of Wheaties.


Wheaton College Science Center

• Wheaton's student body is involved with the college's energy-saving efforts. In March 2008, Earthkeepers, a college club devoted to recycling and other environmentally responsible initiatives, held a residence hall energy and water use reduction competition. Electrical savings of $5,000 were donated to Lifewater International to provide sanitary water in Ethiopia.



success story

The City of Wheaton replaced the lighting system in the Wesley Street parking garage and **reduced energy consumption by 87%!**

{solid waste & recycling}

Waste-related GHG emissions result from personal consumption and waste disposal patterns, as well as from pre-consumer commercial and industrial processes.

Per capita waste disposal has increased among Americans from 2.68 pounds per person per day in 1960 to 4.5 pounds per person per day in 2008, almost doubling the volume of waste disposed, recycled or composted.

In Wheaton, 4% of GHG emissions are associated with solid waste generation and disposal in landfills. Waste disposal creates emissions when organic waste (e.g., food scraps, yard clippings, paper and wood) is buried in landfills and anaerobic digestion takes place, emitting methane, a potent GHG. GHG emissions also are produced throughout a product's life cycle – through extraction and processing of raw materials, manufacturing processes and product distribution to consumers.

According to the EPA, the United States has an average recycling/composting rate of 33%, so Wheaton's rate of almost 42% is above average. Wheaton's above-average rate indicates that residents are aware of the importance of recycling and

understand how to best utilize the City's waste hauling and recycling services. The EPA states that per capita waste disposal has increased from 2.68 pounds per person per day in 1960 to 4.5 pounds per person per day in 2008,[xi] almost doubling the volume of waste disposed, recycled or composted. This increase places great pressure on regional infrastructure, from the number of waste trucks travelling on streets to the acres of valuable land set aside for landfills. Diverting more waste to recycling and composting efforts protect many natural resources from being harvested and extracted for the production of new goods, as well as protecting air quality and land use.

In addition to standard household and business waste, technological advances have resulted in a significant increase in the disposal of "e-waste" – electronic items such as television sets, obsolete computers and microwave ovens – which contain toxins such as cadmium and mercury. Awareness of the dangers of toxic chemicals also have increased the demand for proper disposal and recycling of alkaline batteries, compact fluorescent light bulbs (CFLs), household hazardous waste (such as paints and oils) and vehicle tires. Since Jan. 1, 2012, these types of materials cannot be disposed of through the refuse collection system in Illinois.

ACHIEVEMENTS TO DATE

Some of the most widely known reasons to support recycling include conserving natural resources, sustaining the environment for future generations and reducing the amount of materials that end up in landfills. However, recycling in Wheaton also is a smart financial move. Wheaton's garbage and recycling program was designed to encourage recycling by providing a financial incentive for residents to create less waste and recycle more. The City's program implements both a single-stream recycling process as well as a "pay-as-you-throw" garbage program.

Pay-as-you-throw

The pay-as-you-throw garbage program only charges for the amount of garbage generated by requiring garbage stickers for each container or bag. The less garbage a household creates, the fewer stickers residents need to buy. Recycling is unlimited and requires no stickers, which encourages as much recycling as much as possible at no extra cost.

Single-Stream Recycling

Wheaton's program uses single-stream recycling, a growing trend that allows all recycled materials to be mixed in one container. Each household receives a uniform 65-gallon recycling cart, and all recyclable items can be comingled within the cart. The larger cart on wheels encourages higher recycling rates by providing a convenient means to recycle.

Single-Stream Recycling in Wheaton

In Wheaton, residents can take advantage of a convenient single-stream recycling system in which all acceptable recyclable materials can be tossed into a 65-gallon cart – **no sorting required!**

Even before the state-wide ban on curbside collection of e-waste (in addition to household hazardous wastes), Wheaton provided alternative collection options for such items through special events and collection sites.

Electronic Recycling

Wheaton's monthly electronic recycling drop-off events are managed by the EIC in collaboration with DuPage County's contracted recycler. The types of items collected are continually expanded, including many types of electronics and small household appliances. In fact, residents can drop off nearly anything that has a plug. As of January 2012, state law prohibits the disposal of e-waste in residential waste, so having this community collection system already well established in Wheaton should help ease the transition.

In 2011, the City collected more than 310,500 pounds of e-waste through its multiple events. The City is paid for the most valuable contents of the recycled materials (i.e. copper wiring), and in 2011, this generated more than $7,000 in revenue.

In 2011, the City collected more than **310,500 pounds of e-waste** through its multiple events.

Prescription Disposal

The City joined a number of other Illinois communities in becoming a collection site for unwanted medicine through the RxBOX program, which prevents medications from entering the water supply and soil. The drop box is located inside the lobby of the Wheaton Police Department at 900 W. Liberty Drive. The EIC contributed to the program by purchasing the collection box and thermometer collection bags, and volunteers assist with the medication disposal.

Paper Recycling & Reduction

Sometimes it is more convenient to dispose of large paper products, such as boxes and packing materials, in a central location rather than at curbside. The Wheaton Park District hosts a community paper recycling program called the Paper Retriever, which collects paper products to be recycled into newsprint. This activity supports the district's environmental stewardship efforts and raises funds to contribute to the district's environmental programs. In 2011 the Park District collected just over 12 tons of paper!

Managing solid waste is not solely focused on recycling; reducing the rate of consumption is the best way to avoid production of waste. CUSD 200 found that many of the flyers that are distributed to students frequently never get out of the school bags or even make their way home at all. In an effort to address this issue, the district created an E-School Bag (Electronic School Bag) link on the district's website that houses the flyers and brochures that are usually distributed to students by community partners. Rather than distrib-

LOCAL EXAMPLES

Leslie Cummings

Resident Leslie Cummings says: "I use www.freecycle.org to get tons of free baby stuff – keeping things out of landfills. I sell, freecycle, donate or recycle my used items. I compost all veggie scraps and my bunny litter, and I use a green kitty litter."

Wheaton College student groups are actively engaged with recycling and waste reduction efforts on campus. Some of their recent activities have included:

- With the assistance of Bon Appétit, the College's food service provider, students conducted a food waste reduction drive in 2008 and 2009, raising awareness of the amount of food wasted in the dining hall
- Partnering with Residence Life to redistribute disposed couches from residence halls
- Working with the college bookstore to recycle books, batteries and printer cartridges
- Advocating for more recycling bins on campus

And **resident Madeline Menna** reports that not only did her household stop using disposable plates and utensils over the past few years, but she also subscribed to www.greendimes.com.

"I stopped all my junk mail and catalogs from coming to my house," Menna said.

success story

Kyle Thompson and Counselor Sheila Thorse

Monroe Middle School

has taken recycling to a whole new level. The recycling program, led by Monroe teacher Preston Boyd, participated in a nationwide recycling program called the Dream Machine Recycle Rally during the 2010-2011 academic year. To help the Dream Machine Recycle Rally program reach its national goal of collecting 22 million pounds of recycled material by June 2011, Monroe asked all students to bring as many empty beverage containers (plastic bottles and aluminum cans) as possible to school. The school earned points redeemable for rewards with local businesses such as sporting goods stores, educational events, music, books and videos. At the end of the program, Monroe had collected over 30,000 products to be recycled!

uting a paper flyer to each student to carry home, electronic copies are posted on the district's and each school's website for families to access.

Clothing & Textile Recycling

The Park District hosts a collection bin[xii] for USAgain, a for-profit company that collects unwanted textiles (such as clothes, shoes, blankets and towels) and resells them in the United States and abroad. Instead of throwing away unwanted clothes, consumers drop them off in the bin and the textiles are then diverted from landfills to be reworn, reused or recycled. The company collects one million pounds of clothing per week nationwide, which is then purchased by wholesale buyers, thrift store chains and textile recyclers. In 2009, USAgain collected more than 54 million pounds of discarded clothing nationwide. In 2011, the Wheaton Park District collected close to 7,000 pounds of clothing!

{water}

The water conveyance system – which includes bringing fresh water to homes and also water treatment – uses energy, but the total GHG impact of water consumption is very small.

In fact, Wheaton's GHG emissions related to water consumption and conveyance is barely 1% of the City's total emissions. However, the Chicago Metropolitan Agency for Planning (CMAP) has identified water consumption as an issue of critical importance for the northern Illinois region, and all communities have an interest in protecting water sources and reducing consumption of potable water.

Wheaton receives its potable water from Lake Michigan and has not had to fear water shortages experienced by the other communities that depend on dwindling ground water supplies. However, Illinois' allocation of water from Lake Michigan is strictly limited by a U.S. Supreme Court consent decree.[xiii] Through the 1990s the state

actually exceeded those limits and had to borrow against future year allocations.[xiv] Therefore, water is not a resource to be treated lightly.

In 2010, the City's Water Division reported[xv] an 18.6% decrease in average daily pumpage over the past 10 years. Even though Wheaton's population has grown in this time, the reduction is partly an indication that water conservation methods and improved maintenance are already working. It is likely that Wheaton is benefitting from more yards landscaped with native and drought-tolerant plants, and that residents and businesses are installing low-flow fixtures such as toilets, faucets and shower heads.

LAWN WATERING RESTRICTIONS

Lawn watering restrictions are used to minimize evaporation during the hottest time of the day. Lawn watering restrictions are in effect May 15 to Sept. 15. Residents with odd-numbered street addresses can water their lawns on odd-numbered days. Those with even-numbered street addresses are limited to even-numbered days. Sprinkling is prohibited between noon and 6 p.m. every day.

WATER CONSERVATION PLEDGE

Simple actions can make a big impact when it comes to water conservation, so the City's Water Division developed the water conservation pledge to encourage residents to help preserve the water supply by signing the Preserve Every Drop pledge.

The pledge is part of the City's Water Conservation and Protection Program in partnership with the DuPage Water Commission. The overall goal is for Wheaton to achieve a 10% reduction in per-person water use within 10 years,

Water Conservation Pledge

Water Conservation Pledge

Taking the pledge is simple:

1. Discuss with your family the changes you are willing to make.
2. Check the box(es) below next to at least one of the actions you will take to help conserve water.
3. Type in your name (and address if you choose), and click "Submit Form."

I pledge to Preserve Every Drop!

Water is a precious and valuable resource and is not mine to waste. I pledge to conserve water by:
(Choose at least one action listed below)

In the Bathroom

- ☐ Decreasing my shower by two minutes.
- ☐ Turning off the faucet while washing my hands or face, brushing my teeth, and shaving.
- ☐ Repairing leaky toilets.

In the Kitchen

- ☐ Not running the tap continuously while washing dishes or produce.
- ☐ Running the dishwasher only on a full load and using the shortest cycle.
- ☐ Keeping a chilled pitcher of water in the fridge.

In the Laundry Room

- ☐ Running the washing machine only on a full load.
- ☐ Washing clothes less frequently.

Outside

- ☐ Watering the lawn early in the day to minimize evaporation.
- ☐ Using a rain gauge to avoid unnecessary watering after precipitation.
- ☐ Avoid overwatering and watering the pavement if using a sprinkler.
- ☐ Using a broom instead of a hose to clean my driveway.
- ☐ Installing a rain barrel to capture rain water and reusing it for hand watering.

Generally

- ☐ Turning off taps tightly to avoid drips.
- ☐ Installing a low-flow aerators on all faucets.

which translates to a reduction of around 8 gallons per person; the current usage is around 84 gallons of water per person each day. Even small actions can help, such as decreasing shower time by 2 minutes, running the washing machine only on a full load and watering the lawn early in the day to minimize evaporation.

Renee Anderson

LOCAL EXAMPLE

Resident Renee Anderson reports that in 2010, her family "recycled more than 500 gallons of rain water by re-using water from the sump pump. The rain barrel is stored under our deck and I occasionally connect the sump pump hose to the top of it to collect the water. This supplied enough water to meet all of our summer gardening needs. I was inspired by the rain barrel on display at the Wheaton Community Center and purchased one from the Conservation Foundation."

{natural areas protection}

One of Wheaton's greatest assets is its acres of open spaces.

Trees, parks, ponds, prairies, woodlands – they all add to the quality of life in Wheaton, providing leisure and recreation opportunities and contributing to the biodiversity and environmental health of the region. Wheaton's reputation as a picturesque town would be impossible without this density of lush green spaces, and the City has implemented many programs and initiatives to enhance its natural infrastructure.


River Sweep

Arbor Day 2012

ARBOR DAY

Arbor Day is a nationally-celebrated observance that encourages tree planting and care. Founded by J. Sterling Morton in 1872, it is celebrated on the last Friday in April. Wheaton's annual event is co-managed by the City's Forestry Division and the EIC. For the City's 2012 celebratory tree planting, City Forester Kevin Maloney choose a tree for Wheaton North High School, and the Forestry Division planted it along with students from the school's Club Environmental Rescue.

SHARED COST PARKWAY TREE PROGRAM

Homeowners who would like to add a tree to the parkway in front of their homes can participate in the Shared Cost Parkway Tree Program. Qualifying homeowners select from nine species of trees and pay half of the cost, with the other half of the cost plus the planting provided by the City's Forestry Division.

Wheaton takes pride in consistently being named a Tree City USA by the National Arbor Day Foundation (26 years and counting!) for maintaining a high-quality tree program led by the Forestry Division. This division oversees a number of tree preservation programs and performs tasks such as the annual trimming of 3,500 parkway trees.

ILLINOIS PRAIRIE PATH CLEAN UP

Wheaton's participation in this annual event has been managed by the EIC for over a decade. The largest section of the path travels through Wheaton in three directions for a total of 8 miles. It is a very popular walking and biking path and over time collects a great deal of garbage, degrading everyone's enjoyment of the path. Thanks to the consistent work of the volunteers, there has been a great improvement in the care of the path; no longer do they find tires, mattresses and other large waste items. With more than 130 volunteers at the 2012 event, the people of Wheaton consistently demonstrate just how important this path is.

RIVER SWEEP

During this annual event in the spring sponsored by The Conservation Foundation, the EIC leads a group of volunteers to remove trash and debris and restore stream banks of the DuPage River and its tributaries.

ADOPT A HIGHWAY

The EIC manages this local clean-up activity throughout the year. In 2011, close to 100 bags were collected by Adopt a Highway volunteer groups, including the Democratic Party of both Milton Township and DuPage County, the Langlas Tae Kwon Doe and the Knights of Columbus.

Wheaton takes pride in consistently being named a Tree City USA by the National Arbor Day Foundation **(26 years and counting!)**

NATIVE PLANT SALE

Native plants require less water than common turf grass and need few, if any, fertilizers or pesticides to survive and thrive. This annual fundraiser is co-managed by the Wheaton Park District and the EIC. The 2012 sale was very well attended, as it has been in past years, too. Any unsold plants are used by the park district.

Many volunteers assist with this project, and local garden clubs are also very helpful.

FREE WOOD CHIPS

When available, the City's Forestry Division provides free wood chips to residents. The Forestry Division will deliver wood chips in quantities of 12 cubic yards.

Mayor Gresk

LOCAL EXAMPLES

Michael Gresk, Mayor of Wheaton, says that "for many years we have made use of our garden in terms of leaf raking. Towards the end of the autumn season, we'll rake our leaves into the garden and then have them roto-tilled under before winter. Also, in terms of grass clippings, we have rather large mature trees on our property, and with that comes the opportunity to recycle those clippings into the tree beds around the trees."

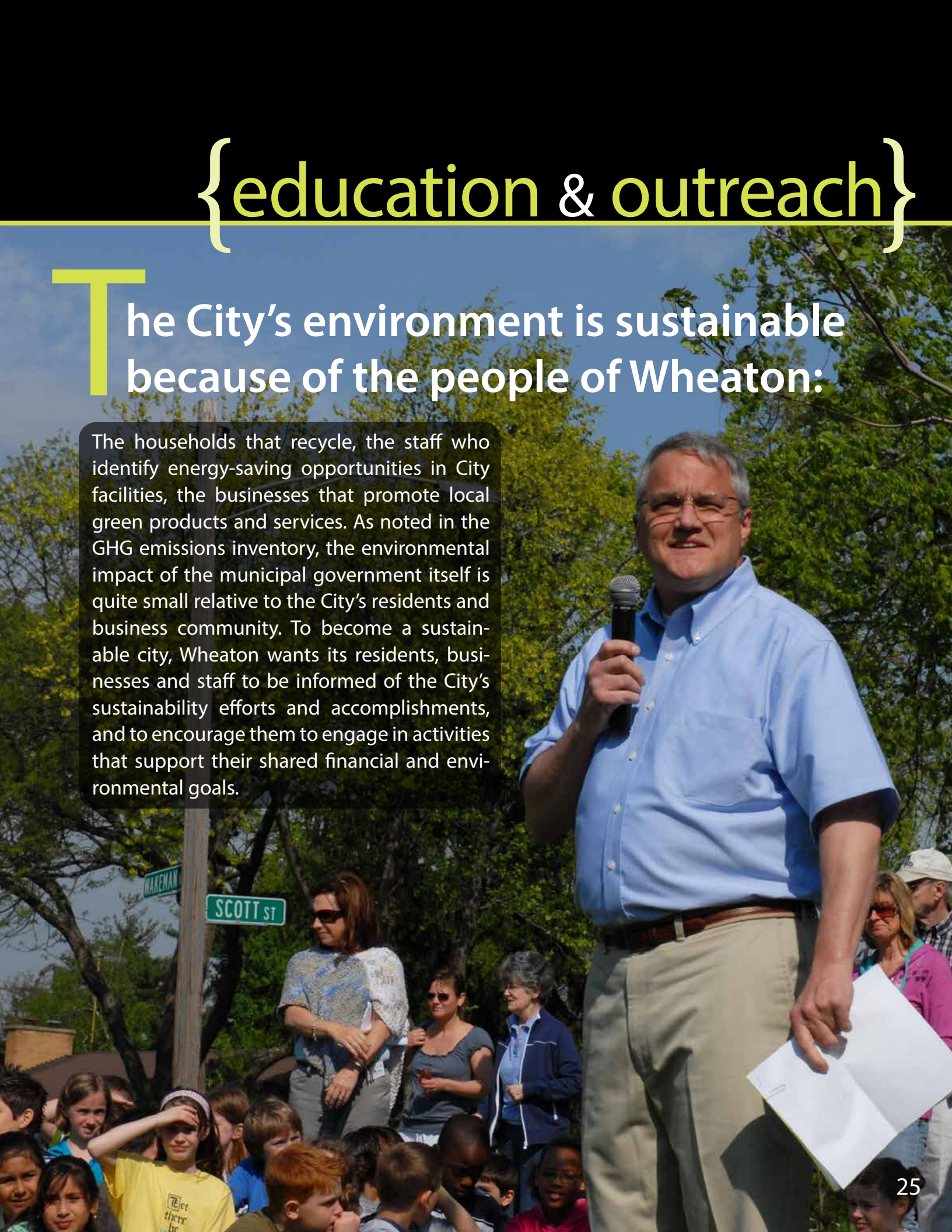
Bob Young, a volunteer with the Environmental Improvement Commission, has been treating his lawn for the past 15 years using a local organic lawn service. "Because our lawn is so rich and thick, the weeds have a tough time getting hold. We can hand weed easily to keep up with them. We have eliminated many gallons of toxic weed control chemicals from being introduced into our soil."

Wheaton College student groups love the great outdoors! Their recent efforts to improve the local environment have included working on a vernal pool research in partnership with DuPage County Forest Preserve and cleaning a stretch of Roosevelt Road in Wheaton four times a year.

{education & outreach}

The City's environment is sustainable because of the people of Wheaton:

The households that recycle, the staff who identify energy-saving opportunities in City facilities, the businesses that promote local green products and services. As noted in the GHG emissions inventory, the environmental impact of the municipal government itself is quite small relative to the City's residents and business community. To become a sustainable city, Wheaton wants its residents, businesses and staff to be informed of the City's sustainability efforts and accomplishments, and to encourage them to engage in activities that support their shared financial and environmental goals.



PUBLIC EVENTS

The **Wheaton Park District** routinely hosts free or low-cost classes for residents on a variety of environmental subjects. Past classes have featured rain barrels and composting.

INFORMATION SHARING

Every year, the **Environmental Improvement Commission** raises funds through many of its events, and a portion of these funds are used to purchase environmentally focused books for the public library. In 2011 the group donated 12 books with environmental themes, including "Composting Inside and Out" by Stephanie Davies, "Earth: The Operators Manual" by Richard B. Alley and "Life Without Oil" by Steve Hallett.

Wheaton institutions make the most of the internet. The **Wheaton Park District** posts monthly Green Tips on its website, featuring many articles and suggestions for going green at home. The **City's own website** features a great deal of relevant and updated information under its Turn Wheaton Green section.

The **Wheaton Park District** created an Environmental Committee whose mission is to establish and maintain sound environmental policies, practices and educational opportunities for the employees and patrons of the Wheaton Park District.[xvi] The environmental policy includes the following focus areas:

1. Purchase and use environmentally safe and sensitive products
2. Wise use and protection of air, water, soil and wildlife
3. Wise use of energy resources
4. Reduction and handling of waste
5. Open space planning and preservation
6. Environmental education and interpretation

Having such strong environmental stewardship embedded in the Park District's culture helped it win the Illinois Association of Park Districts Best of the Best Green Practices Award in 2010.

A portion of the Environmental Improvement Commission's funds are used to purchase **environmentally focused books** for the public library.

LOCAL EXAMPLES

Club Environmental Rescue (E.R.) at **Wheaton North High School** attracts students who want to help improve the environment; Club E.R. helps to preserve the Earth one meeting at a time. Students recycle, plant trees and plants, conduct environmental cleanups, take fun field trips, promote environmental issues to others, and manage fundraisers to support the environment. The club's vision is to be an integral asset of the community which, through environmental leadership and adoption of best practice, achieves and enhances a healthy natural environment. Its purpose is to:

- Stay **current** on environmental issues and procedures that preserve and improve the environment
- Foster **active** participation in environmental cleanups, restoration projects and recycling
- **Educate** others about environmental issues

In the 2011-12 school year, the students were the DuPage Envirothon Champions. During the 2011-12 school year, they recycled paper and co-mingled products, fundraised to purchase a green roof for the school, cleaned up in the surrounding neighborhood and hosted environmental speakers to educate others.

In the 2011-12 school year, Wheaton North High School's Club Environmental Rescue student group won the title of **DuPage Envirothon Champions.**

Student groups at **Wheaton College** are active in caring for the environment in many ways. Their recent efforts to educate peers and the college community have included:

- Creation Care seminar with Care of Creation USA
- Annual Campus Sustainability Day
- The 2007 Summit for Climate Change, drawing environmental leaders from 10 Christian college campuses to Wheaton College

energy efficiency grant

we are active

In the fall of 2009, Wheaton received an Energy Efficiency and Conservation Block Grant (EECBG) from the U.S. Department of Energy (DOE), to initiate projects that would reduce energy costs and create or retain local jobs.

The grant provided the City with $514,400, and this section of the report details those projects and discusses the early results.

DEVELOPING THE EECBG STRATEGY

In order to access the DOE funding, the City was required to develop a detailed strategy for how the money was to be spent. Wheaton employed a two-pronged approach to develop the strategy: (1) utilize the energy and innovation of the long-standing Environmental Improvement Commission and (2) engage a consultant to manage the process. The consulting firm AECOM was engaged through a competitive bidding process, and it set to work collaborating with City staff and the EIC.

The EIC established a sub-committee of volunteers to focus specifically on the EECBG plan. Over the course of six months, many projects, technologies and ideas were explored in a series of public meetings, ultimately resulting in a recommendation to City Council. With the Council's approval and support, this package of projects was submitted to the DOE for approval. The programs were officially launched in May 2010.

The EECBG strategy established two categories of projects: (1) those providing direct benefit to residents and business owners, and (2) those focused on municipal operations.

{community programs}

RESIDENTIAL GRANTS

The objective of this activity was simple: reimburse homeowners[xvii] for implementing energy efficiency projects, providing more funding if the homeowner also participated in a free energy review by a City engineer. Each household was eligible for a 50% match of their project's cost up to $1,000. More than 150 households took advantage of the project, and an additional 25 participated in the free energy audit without applying for grant funds.

Ryan Gagliano

On average, each household's energy efficiency project is expected to reduce energy consumption by close to 6,300 kWh/year (according to DOE calculations), which at current rates would save $505 per year. Combined, these projects will save Wheaton homeowners almost $76,000 per year with a return on investment in just over four years, reduce energy consumption by 950,000 kilowatts and result in 907 MT CO_2e avoided! Equally important, the $114,000 in grant funds combined with the personal spending of the homeowners resulted in a total of $450,000 spent directly in the local economy.

One model household is the **Gagliano family.** Ryan Gagliano applied for reimbursement funds to install new doors and have insulation blown into his home's attic. The family quickly noticed a significant reduction in energy consumption during the summer months. They especially appreciated the improved stability in their energy costs; since the weatherization work, there seems to be less of a wide range in energy costs depending on the weather.

Mr. Gagliano reports that "with the added insulation in our attic, especially with our home being a Cape Cod, we saw about a three-degree improvement (decrease) in the ambient second-floor temperature after adding the insulation."

BUSINESS GRANTS

Wheaton has a vibrant downtown business district housed almost entirely in buildings that are at least 50 years old, so the City wanted to extend the benefits of energy-saving investments to this community as well. Knowing that energy-consuming systems in businesses are much larger than in single-family homes, grants of 50% of the project cost, up to $10,000, were made available, with a requirement that the business spend at least $1,000 up front on the funded project. A total of 11 businesses and nonprofits took advantage of the program. The combined projects will reduce energy consumption by 360,000 kilowatts per year, a reduction in GHG emissions by 344 MT CO_2e, and each project should yield a return on investment in just over five years.

RJN Group was one of the first businesses to apply for the Business Energy Wise Fund and used its funding along with ComEd incentives to replace all 190 ceiling light fixtures. The new low-wattage T8 fixtures are on track to reduce the company's annual energy consumption by 20%. This improvement should result in savings that will pay for the investment in less than three years.

BIKE PLAN

The City engaged the Active Transportation Alliance (ATA) to develop a long-range bike plan. ATA is the leading advocate for bike and pedestrian transportation infrastructure in the northern Illinois region, and it has significant experience developing municipal bike plans. In addition to touring the entire community on bike, ATA also met with residents to develop the plan. The City established a Bicycle Task Force to collaborate on the bike plan, creating a new opportunity for residents to take a more active role in the planning, and included representatives from the EIC, Wheaton Park District, DuPage County Forest Preserve, local school districts, Wheaton College and City departments. ATA and the City hosted a public forum to discuss the plan, and close to 70 people attended. The City Council held a public hearing about the plan in January 2012 and formally added the Bicycle Plan to the City's Comprehensive Plan through an amendment passed on Feb. 6, 2012.

KILL-A-WATT

This was a simple and low-cost initiative but has the potential to benefit residents and businesses for years to come. The Kill-a-Watt is a device used to determine how much energy is required to power household appliances, from hair dryers and coffee makers to refrigerators and computers. With a small amount of EECBG funds, the City purchased 10 devices and made them available for loan at no cost through the Wheaton Public Library. Each device comes with instructions and a CD that includes a simple Excel spreadsheet for the user to track their results. The device can help the user decide to use a specific appliance at a time of day when energy costs are lower, or even to replace an appliance they didn't realize was an "energy hog." The devices were checked out from the Library 87 times between February 2010 and October 2011, and they remain available for public use.

Residents can check out a Kill-a-Watt device to learn more about how much energy they are using.

{municipal projects}

Police Department lighting retrofit

FLEET UPGRADES

Every year Wheaton schedules the replacement of some of its municipal vehicles. Thanks to the EECBG grant, the City was able to upgrade three scheduled replacements from conventional vehicles to hybrid models; a portion of the cost difference between the models was paid for with grant funds. As compared to the conventional models (the Ford Escape and the Ford Fusion), each hybrid is expected to be 35% more fuel efficient. With an average mileage of 10,000 miles per year, mostly "city" driving, each hybrid is expected to save at least $1,300 per year in fuel costs, giving the hybrid purchases a four-year return on investment.

WESLEY GARAGE LIGHTING

Finding a way to reduce the cost of lighting inside the Wesley Street parking garage was a top priority for the EECBG strategy. As a revenue-generating facility, the City pays ComEd for the energy the garage consumes. In 2008, an energy audit of the facility revealed that by retrofitting the lighting system, the City stood to save a significant amount of money.

Through a competitive bidding process that explicitly described the required energy savings, a local contractor was selected to purchase and install the new lighting system. It sounds simple, but not only did the City need to ensure that the energy savings would materialize, but it also had to be confident that the illumination of the space would be sufficient with the new T-8 fluorescent bulbs.

The project received an additional grant of just over $15,000 from the Illinois Department of Commerce and Economic Opportunity (DCEO), stretching the EECBG grant further. The anticipated energy savings indicate that the project will pay for

itself in two years or less. The new system should reduce energy consumption from 233,542 kWh/year to 30,198 kWh/year (an 87% reduction), and an annual cost savings of almost $19,000.

POLICE STATION LIGHTING & BOILER

The Smart Energy Design Assistance Center (SEDAC) is a state-supported program of the University of Illinois at Champaign-Urbana. It provides free energy audits for municipal facilities, and Wheaton was fortunate to receive an audit for the Police Station. The SEDAC report identified close to $40,000 in annual cost savings from energy efficiency improvements, a reduction of 35% in the facility's energy use. Implementing the recommended measures will demonstrate responsible stewardship, reduce vulnerability to fuel price fluctuations, reduce environmental impact and save energy dollars. Using the EECBG process, Wheaton decided to implement two of the top recommendations: improving the lighting system and replacing the boiler.

The project received an additional grant of $5,000 from the DCEO and a $6,000 rebate from Nicor Gas, stretching the EECBG grant even further. The anticipated energy savings indicate that the combined projects will provide a return on investment in two years or less. The new lighting system and HVAC modifications are projected to reduce energy consumption from 1,237,582 kWh/year to 947,602 kWh/year.

CITY HALL HEATING & COOLING SYSTEM

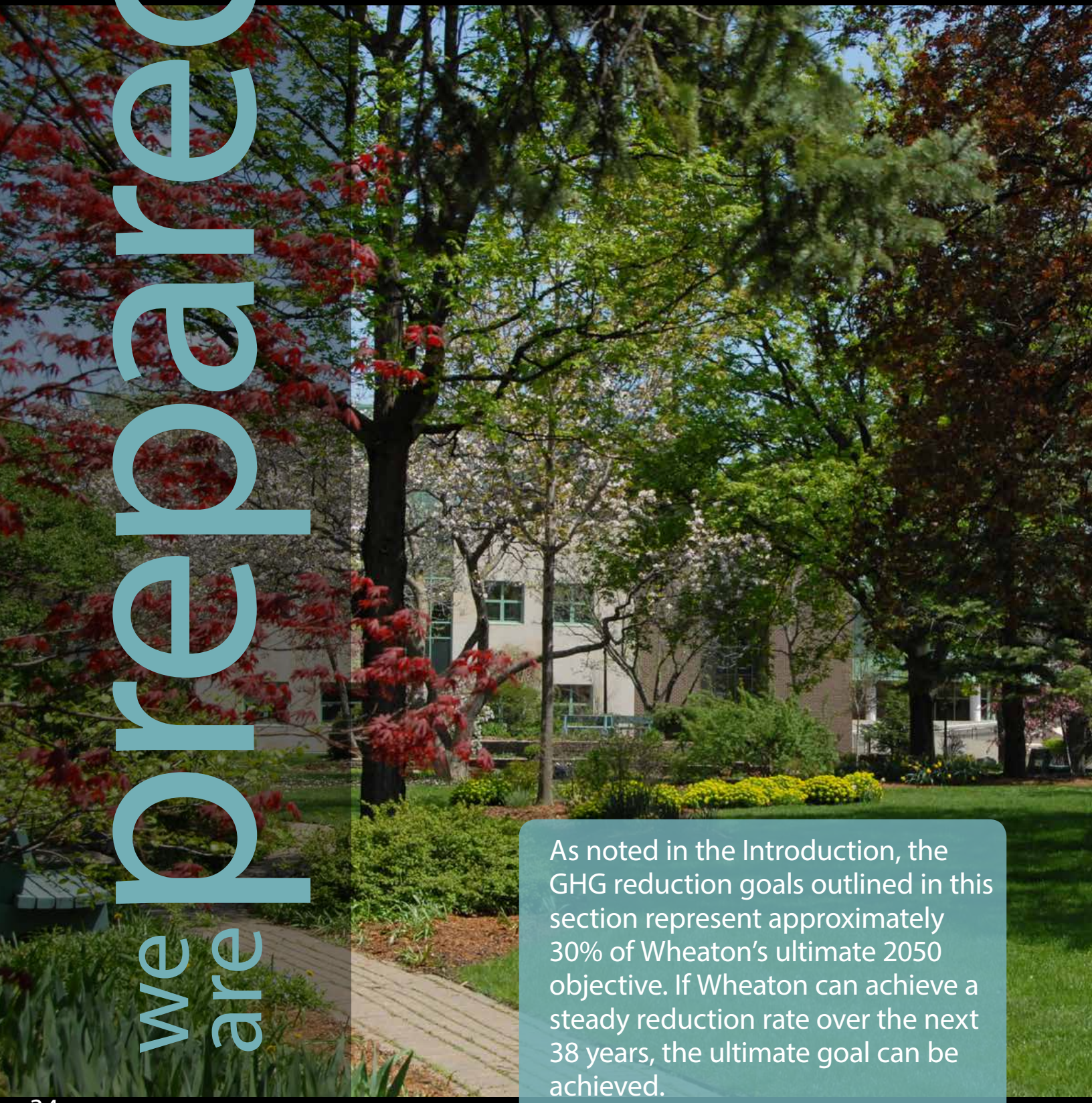
This project was conducted during the same time period as the EECBG-funded activities, but the City actually used separate funding sources. Wheaton decided to upgrade the heating, ventilation and air conditioning (HVAC) system to a more efficient model in City Hall to reduce the energy consumption and resulting costs associated with cooling the building.

The anticipated energy savings for City Hall indicate a return on investment in two years or less. The new HVAC system should reduce energy consumption from 30,000 kWh/year to 24,540 kWh/year.

The anticipated energy savings from the Police Station's improved lighting system and new boiler are expected to provide a return on the investment in **two years or less.**

we are prepared

GHG reduction goals



As noted in the Introduction, the GHG reduction goals outlined in this section represent approximately 30% of Wheaton's ultimate 2050 objective. If Wheaton can achieve a steady reduction rate over the next 38 years, the ultimate goal can be achieved.

{energy & air quality}

There are environmental and public health benefits in managing energy wisely, and with energy providers routinely securing rate hikes in order to cover the cost of transmission infrastructure upgrades, Wheaton and its residents also have a financial incentive to use energy efficiently. The federal government occasionally provides grant funds to encourage municipalities to determine how best they might reduce energy consumption and to implement energy conservation programs. By continually reviewing the energy consumption of municipal buildings and its vehicle fleet, the City is prepared for future opportunities as funding becomes available.

MANAGING BUILDING EMISSIONS

For the infrastructure it controls (i.e., facilities and equipment owned by the City), Wheaton is well-positioned to initiate projects and renovations to improve energy efficiency. For infrastructure outside of its control (i.e., existing homes and businesses), the City can promote the many incentive programs to encourage home and building owners to implement their own energy-saving projects, such as those by ComEd and Nicor. As new construction picks up, Wheaton also will benefit from the State of Illinois' building energy code, updated in 2009, which will ensure that all new buildings – commercial, residential or municipal – will be at least 18-22% more efficient[xviii] than those built under the previous state energy code.

To reduce costs and the City's environmental impact, Wheaton will focus on improving the energy efficiency of municipal infrastructure. For the City as a whole, municipal officials and staff will continue to work with other governmental agencies, local institutions and residents to assist with their efforts to become more energy efficient. If Wheaton can produce its own power from renewable sources or purchase power generated by renewable systems, then its total GHG emissions burden will be reduced.

MANAGING TRANSPORTATION EMISSIONS

According to the Chicago Metropolitan Agency for Planning (CMAP),[xix] Chicagoland residents currently spend a combined 253 million hours each year in traffic delays, and by 2040, the population of this region is projected to grow by approximately 2 million people. Wheaton has limited space for roadway expansion, therefore promoting mass transit, bicycles and pedestrian mobility is necessary to avoid a congested and polluted future. It is the City's goal to reduce vehicle emissions by encouraging the use of mass transit, enabling safe passage for bikes and pedestrians, and managing its fleet vehicles effectively. Enabling residents to make more trips by bike and on foot will have a noticeable impact on the City's GHG emissions rate.

GOALS

- **Improve energy efficiency in buildings (all types) by 36% (82,000 MT CO_2e)**
- **Reduce transportation emissions by 3% (6,700 MT CO_2e)**
- **Engage green power supplies (GHG reduction impact TBD)**

STRATEGIES

Re-commission the Wheaton Public Library; implement retrofit projects

• *Potential GHG reduction = 280 MT CO_2e / year*

The Wheaton Public Library was constructed in 1965, and additions were made in 1979 and again in 2007. In May of 2011, the library received a free energy audit from SEDAC; at a total of 124,518 ft², this is one of the largest libraries for which SEDAC has conducted an energy assessment. The library serves an average of 1,500 patrons per day and has made great strides in energy efficiency through the use of high-efficiency lighting, a high-performance building envelope on the 2007 addition, and high-efficiency mechanical equipment.

SEDAC identified six different energy-efficiency projects that could reduce the library's annual energy cost by more than $50,000. With a total investment, including grants, of around $65,000, the combined retrofits could result in a return on investment in less than two years. The City is in the process of securing the grant funds for 2012 and will implement these energy saving activities as the funding becomes available. When all of the projects have been implemented, the library should experience a reduction in energy use of at least 400,000 kWh per year.

Implement more municipal facility retrofit projects recommended by the SEDAC audits

• *Potential GHG reduction = 315 MT CO_2e*

The Police Station's SEDAC audit revealed a potential reduction of more than 450,000 kWh through nine retrofit projects. As described in this report, the lighting and HVAC upgrades were completed in 2011. The City will implement more of the energy-saving activities as additional funding becomes available.

When possible, the City will also request additional facility audits by SEDAC and use the results to secure grant funds and initiate projects. All government agencies can participate in the SEDAC energy audit program.

Promote Energy Saving Programs

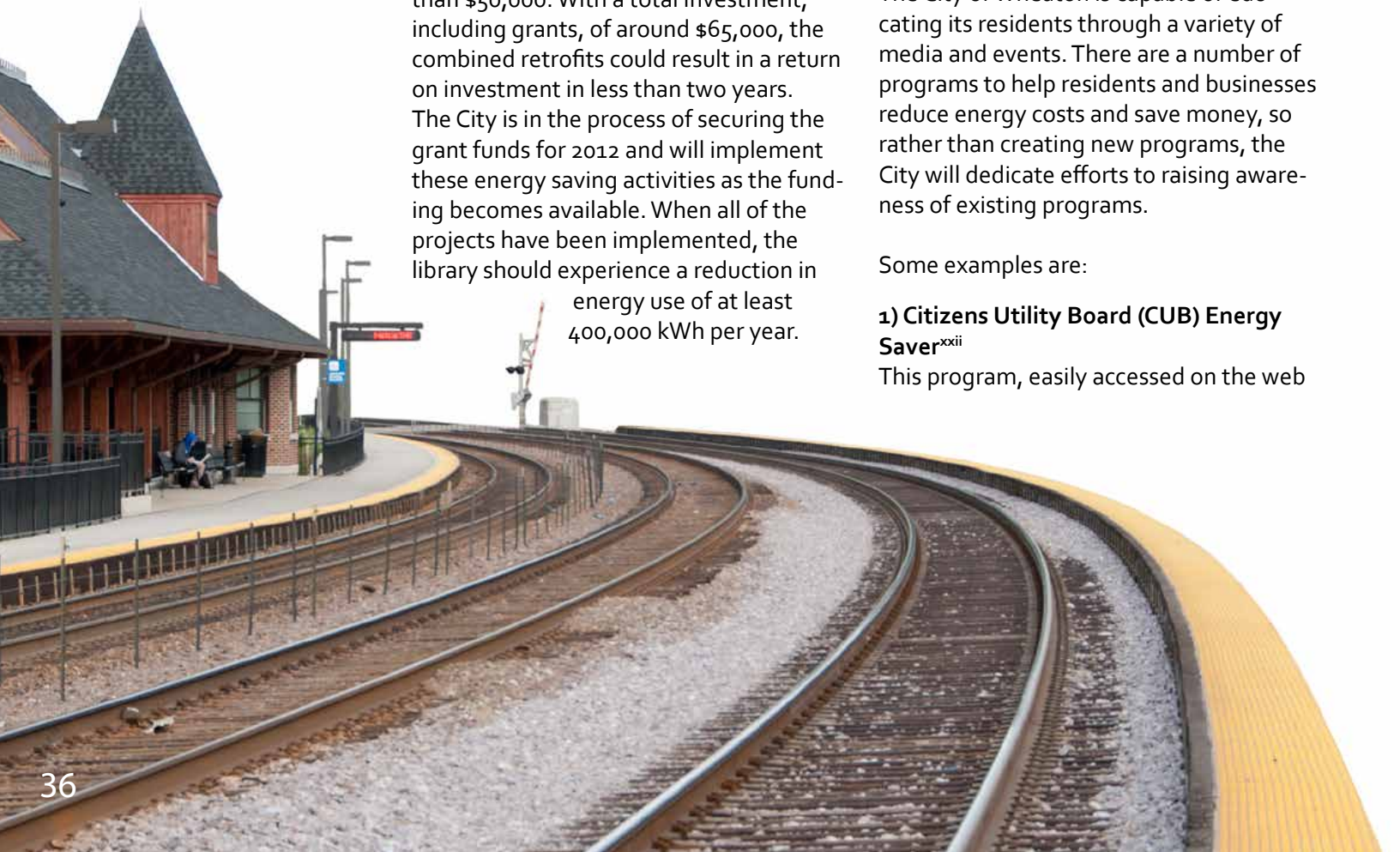
• *Potential GHG reduction = To be determined*

The City of Wheaton is capable of educating its residents through a variety of media and events. There are a number of programs to help residents and businesses reduce energy costs and save money, so rather than creating new programs, the City will dedicate efforts to raising awareness of existing programs.

Some examples are:

1) Citizens Utility Board (CUB) Energy Saver[xxii]

This program, easily accessed on the web



with just an electricity account number, provides suggestions for ways to reduce energy consumption and reduce costs. When a user confirms their reductions each month, points are earned that can be redeemed with local retailers.

2) ComEd's Small Business Energy Savings[xxiii]
This program provides guidance and assistance to qualified small business owners to make their businesses more energy efficient. The service includes:
• A free energy-use assessment (for most businesses)
• Free installation of energy-saving products such as compact fluorescent lamps (CFLs), faucet aerators, vending machine controls, pre-rinse sprayers and shower heads.
• A list of recommendations for additional energy efficiency capital investments that qualify for rebates of up to 50 to 70 percent through ComEd and Nicor Gas, North Shore Gas or Peoples Gas.
• Assistance with completing a Smart Ideas application for incentives and help with the scheduling and installation of energy savings recommendations.

3) Nicor/ComEd Energy Efficiency Program
Nicor offers rebates to residential customers who purchase and install high-efficiency gas furnaces, boilers, water heaters and energy-efficient improvements. There are also rebates for ComEd customers who purchase and install a qualifying furnace and central air conditioner.

4) Energy Impact Illinois
This alliance, led by the Chicago Metropolitan Agency for Planning, partners with the City of Chicago, City of Rockford, ComEd, Illinois Science & Technology Coalition, Nicor Gas, North Shore Gas, Peoples Gas and the Northern Illinois Energy Project in order to increase access to information, financing options and workforce resources for residents and businesses in the Chicago region in order to help save energy and money. It is funded by the U.S. Department of Energy BetterBuildings initiative.

The alliance launched a website, www.energyimpactillinois.org, which serves as a centralized repository of resources such as local and national incentives, certified contractors and answers to frequently asked questions about eligibility and how to get involved.

Mayor Gresk held a press conference to inform residents about CUB Energy Saver.

The CUB Energy Saver program suggests ways to **reduce energy consumption** and **reduce costs**. All that residents need to enroll is their ComEd account number.

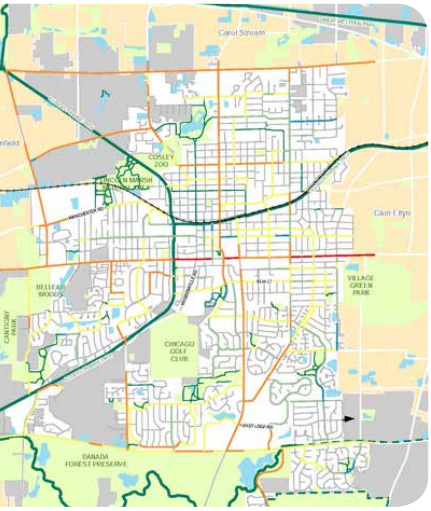
Continue to upgrade the City Fleet

• *Potential GHG reduction = 150 MT CO_2e*

If the City is able to continue replacing standard model vehicles with fuel-efficient and hybrid models with at least one vehicle per year for 15 years, then the City will realize a GHG reduction of 120 MT CO_2e at full implementation.

The City can further improve the fuel efficiency of its complete fleet of vehicles, including heavy-duty trucks, through behavior modification. If grant funding becomes available, the City may be able to install monitoring equipment in its vehicles to encourage drivers to operate efficiently.

Wheaton Bicycle Plan: Bicycle parking and education



Implement the Wheaton Bike Plan

- *Potential GHG reduction = 12 MT CO_2e*
  - *25,400 fewer miles per year in personal vehicles*

The active transportation network recommended in the plan provides door-to-door safe access to key places in Wheaton. The plan focuses on connecting people to places and the bicycle facilities that will help make those connections. It also recommends new policies and ordinances as well as education and outreach programs. At the point of full implementation, the Wheaton Bike Plan is expected to reduce vehicle miles travelled by 25,400 miles per year and reduce the resulting GHG emissions by 12 MT CO_2e per year.

A note about transportation emissions:

The two transportation emissions reduction goals noted here amount to a fraction of the City's total goal. The ultimate goal of a 43% reduction in transportation GHG emissions can only be achieved with a significant increase in usage of public transportation and shift in personal vehicles to alternative fuels such as hybrids, plug-in electric vehicles and compressed natural gas. The City of Wheaton lends its support where possible to efforts to improve and expand PACE bus routes and accessibility, and the City benefits tremendously by its direct access to the Metra commuter rail.

At this time, advocating for general improvements to the region's public transit infrastructure is likely the only type of influence Wheaton can have on this category of emissions. Additionally, Wheaton will examine its zoning and building codes to ensure that it is prepared for any changes in vehicle infrastructure, such as electrical vehicle charging stations.

{solid waste & recycling}

All consumers of goods and services generate waste and related GHG emissions. Our choices as consumers and the behaviors concerning waste reuse, reduction and recycling determine our personal contributions to community waste generation. Increasing waste reduction behaviors and altering product purchase decisions can substantially reduce our individual GHG emissions and in the process reduce community waste generation.

The City currently contracts with Veolia to provide residential waste collection and recycling. As regional land becomes less available for new or expanded landfills, disposing of solid waste may become more expensive. Most waste reduction practices focus on diverting waste products from landfills through recycling. However, it is also important to consider programs that reduce overall waste generation, as well as product and material reuse alternatives.

According to the EPA, every ton of waste landfilled or recycled has an impact on CO_2 emissions based on national averages:[xxiv]

- 1.15 MT CO_2e is emitted per ton of municipal solid waste that is landfilled
- 0.11 MT CO_2e is emitted per ton of yard waste that is landfilled
- 3.51 MT CO_2e is avoided per ton of paper that is recycled
- 2.87 MT CO_2e is avoided per ton of mixed material (plastic/paper/metal) that is recycled

GOAL

- **Reduce waste-related emissions by 15% (4,160 MT CO_2e/year)**

STRATEGIES

Encourage increased recycling and reduced waste production among households and businesses

- *Potential GHG reduction = 4,100 MT CO_2e*

According to Wheaton's waste hauling and recycling records, this goal could be achieved if every household reduced its solid waste by 10% and increased recycling by 15%. However, this change could actually be lower if the City had a recycling requirement for all households (i.e., multi-unit buildings) and for the business community. In fact, including those groups could make a significant impact in Wheaton's waste-related GHG emissions, easily surpassing the City's goal.

Include recycling statistics from non-City sources

- *Potential GHG reduction = 100 MT CO_2e*

The Wheaton Park District, Library, CUSD 200 and Wheaton College likely maintain waste management records that include recycling statistics. Adding these statistics to the City's record would capture their impact on the GHG emissions reduction efforts.

{water}

According to a water-specific report by CMAP,[xxv] population in the collar counties (including DuPage) will grow by at least 40% by 2050, with a commensurate increase in the demand for water.

Population growth of the entire metropolitan area will increase pressure on Wheaton's use of water, as will any degradation of the quality of the water at its source. Future increased demand will likely lead to higher prices for consumers and possibly use restrictions, so it is in the City's interest to pursue policies and practices that protect the region's water sources and conserve the use of potable water. At the time of this report, the City of Chicago had just implemented a major rate hike for all purchasers of its water, which includes the City of Wheaton. Even without the squeeze of a population increase, Wheaton consumers are already experiencing increased water costs.

To conserve water means to use less water for everyday tasks, from taking showers and flushing toilets to washing cars and managing industrial operations. Whether through a change in process or by installing a low-flow fixture, there are many things people and institutions can do to use water wisely. Conserving water also means using less of it to maintain lush landscapes, which can be achieved by favoring native plants with deep root systems over turf grass, which has shallow roots and requires a great volume of water to thrive.

Stormwater management and water conservation efforts often complement one another. For instance, replacing areas of water-hungry Kentucky bluegrass with drought-adapted native plants reduces the amount of potable water used (conservation) and at the same time reduces the amount of stormwater runoff during rain events (management). If more stormwater could be directed into the ground where it can be absorbed, or captured for storage and reuse, then less water will flow to the sewer system, where it backs up into homes and businesses as it waits for the sewers to empty.

GOAL

- **Reduce water-related GHGs by 10%**
- *Potential GHG reduction = 480 MT CO_2e*
  - *Nearly 162 million gallons less than currently consumed per year*

The City of Wheaton consumes just over 1.6 billion gallons of water per year, approximately 83 gallons per person per day. The City's Water Department committed to a 10% reduction in water consumption per resident when it launched the Water Pledge in 2010. This translates to a reduction of around 8 gallons per person per day, or 22 gallons per household per day. Much of this aggressive goal will be achieved by the Water Department itself, which is currently implementing new operations and maintenance procedures for reducing the amount of unmetered water losses by improving system efficiency and preventative measures. The people of Wheaton can also contribute to meeting this goal through a number of behavior and equipment changes,[xxvi] such as:

• Switching from a regular shower head to a low-flow shower head can save up to 45 gallons in one 10-minute shower!

• Replacing a regular toilet with a low-flow model can save close to 5 gallons per flush. Assuming at least four flushes per household each day, this one change can save at least 20 gallons per day.

• Filling the bathtub with less water can also save many gallons. Assuming that a full tub (with room for one adult or a couple of kids) consumes around 30 gallons, then a tub that is half full saves 15 gallons.

Switching to a low-flow shower head can save **up to 45 gallons in one 10-minute shower!**

{CONCLUSION}

The City of Wheaton is a stable community of residents, small businesses, nonprofit organizations and cultural institutions, all of which are engaged in environmental stewardship in some way.

As demonstrated by the many facts and figures in this report, Wheaton's impact on the environment has not changed significantly over the past 20 years. Technological advances are and will continue to make equipment, appliances and vehicles more efficient, and modest behavioral changes – such as replacing short driving trips with biking or walking – will greatly aid the City in meeting its goal of a 43% reduction in GHG emissions by 2050.

As the City of Wheaton continually seeks opportunities to green the community, this report has documented all of the efforts and initiatives to date by the City and its residents to Turn Wheaton Green, and it has established GHG reduction goals and presented a number of strategies for achieving those goals. The City has a clear focus on improving the energy efficiency of existing buildings and will work to promote incentive and rebate programs available to the majority of homeowners and businesses. Thanks to the detailed Bike Plan, the City can establish a solid biking infrastructure network that, hopefully, can be fully implemented by 2050. Wheaton's sustainability goals will also benefit from the regional focus on water conservation, and its own Water Department has set the tone by declaring the goal of a 10% reduction in water use per person.

The City of Wheaton is united in its efforts to become one of the premier local communities for environmental responsibility and stewardship. This inaugural report is only the beginning, and it provides the City an effective tool for measuring its progress over time. Together, the people of Wheaton will truly turn the City green.

{APPENDIX A: Calculation Methodology}

POPULATION FORECAST

Some of the calculations in this report are dependent on population figures, such as the 1990 GHG baseline and the 2050 "business as usual" projection. For 1990, actual Census data is available. A 2030 population forecast for the Chicagoland region was developed by the Northeastern Illinois Planning Council (NIPC) in 2006 (NIPC has since become part of CMAP), but the 2010 Census data indicates the growth may not be advancing as rapidly as predicted. Therefore AECOM studied the available population figures and determined an estimate for 2050.

POPULATION	HOUSEHOLDS	SOURCE
51,464		1990 Population per US Census
55,416	19,377	2000 Population per US Census
54,611		2006 American Community Survey
52,984	19,967	2010 Population per US Census (#households is a City figure)
61,960		*2030 Forecast by NIPC*
56,000	20,471	**Estimated 2050 population**

WATER AND WASTEWATER GREENHOUSE GAS EMISSIONS

Greenhouse gas (GHG) emissions associated with treatment of water taken directly from Lake Michigan ("water supply") and with treatment of the combined sewer water ("wastewater") involve several sources. A major source is electricity usage. Electricity consumption associated with water supply is approximately 1,407 kWh per million gallons of water treated. For wastewater, the figure is 1,000 kWh per million gallons of wastewater treated. These values are taken from a report by the Electric Power Research Institute.[xxvii] These then can be converted to greenhouse gas emissions using EPA emissions factors developed for the Chicago/Midwest region (700 MT CO_2e per Gigiwatt [GWh]).[xxviii] The result is 1 MT of CO_2e per million gallons for water supply, versus 0.7 MT of CO_2e per million gallons for treatment of wastewater.

In the case of water supply, electricity use dominates the overall production of GHGs, as much energy is necessary to move water. Wastewater systems, on the other hand, rely to a much greater extent on gravity to move water. Thus, for wastewater treatment, other sources of GHG emissions may be significant, including emissions due to facility heating and cooling, those associated with fleet vehicle operation and emissions from the

wastewater treatment process itself. These latter emissions do not necessarily all need to be accounted for, as the stock (wastewater) going into the process is mostly biological in nature, and therefore carbon neutral. However, the wastewater stream may include significant portions of industrial effluent, such as hydrocarbons, agricultural nutrients, etc. that will result in a net positive GHG potential. In light of these issues, electricity alone may not be a good measurement for GHG emissions associated with wastewater treatment. Examining the Water UK Sustainability Reports, wastewater treatment in the United Kingdom (UK) was reported to generate between 1.5 and 2.8 MT CO_2e per million gallons depending on the assessment year (the numbers given here cover 2005-2009).[xxix] In order to take into full account the greenhouse gas contribution of wastewater treatment, the GHG emissions for wastewater used in this report will be 2.4 MT CO_2e per million gallons (based on the average UK value). GHG emissions for UK water supply are on average 1 MT CO_2e per million gallons, very comparable to the number calculated above based on electricity alone.

Water and wastewater usage for the City of Wheaton was estimated using water billing data supplied by the City as part of its 2010 annual water use audit. According to this record, approximately 4.4 million gallons per day were consumed. The estimate of wastewater production was assumed to be 80% of this figure.[xxx] On an annual basis, Wheaton consumes approximately 1.6 billion gallons of water. Thus, using the above GHG numbers, Wheaton produces approximately 4,815 MT of CO_2e annually associated with water and wastewater treatment.

Neither the City of Wheaton nor the Chicago Department of Water Management (from which Wheaton purchases water and sewer services) measures actual sewage outflow. Instead, sewer charges are based on the total consumption of treated water. Therefore, stormwater that enters the sewer system – water that is not absorbed by landscapes or otherwise captured – is not reflected in the GHG calculation. Roughly 9 billion gallons of rain fall on Wheaton annually, and it is conceivable that 30% or more of this volume makes its way to the wastewater system.

TRANSPORTATION GHG EMISSIONS

GHG emissions attributable to transportation were calculated based on vehicle miles traveled reported in the CNT report. According to CNT, 353 million miles were attributed to households, and 91 million miles to others. Using EPA average passenger vehicle GHG emissions of 0.45 MT CO_2e per 1,000 miles, the household transportation GHG contribution is 167,722 MT CO_2e.[xxxi]

The non-household vehicle miles traveled (VMT) was assumed to be generated predominantly by diesel vehicles such as public busses and delivery trucks. According to the EPA, CO_2 emissions from diesel fuel amount to 10.1 kg per gallon.[xxxii] An additional 5% is assumed for other GHGs, giving a total GHG contribution of 10.6 MT of CO_2e per 1,000 gallons of diesel. Finally, it was assumed that the average fuel efficiency for non-household vehicles is 15 mpg. The total GHG emissions due to non-household VMT are therefore estimated as 66,500 MT CO_2e. The combined VMT GHG contribution is thus 234,263 MT CO_2e.

The detail below further explains the inputs of the calculation to determine the GHG impact of vehicle fuel.

- One gallon of gasoline when oxidized (99% efficiency) will emit 8.8 kg CO_2 per gallon. The act of oxidizing gasoline combines carbon in the fuel with oxygen from the air.
- Burning fuel emits other GHGs in addition to carbon, which is taken into account by a factor of 100/95, or approximately an additional 5% by mass.
- This report assumes the average car gets 20.3 MPG.

Combining the factors above, the conversion to pounds (lbs) GHG per mile is:

- 8.8 kg CO_2e/gal x 100/95 x 1 gal/20.3 miles x 2.2 lb/kg = approximately 1 lb CO_2e per mile

SOLID WASTE

It is challenging to calculate the exact amount of solid waste generated in Wheaton. The municipal facilities and 88% of residences are serviced by the City's waste hauler, Veolia. All businesses, other governmental agencies (schools, parks, library) and the other 12% of residences are serviced by private haulers, and the data for that volume of waste is not available. The CNT report states that its figure was "based on regional totals previously analyzed for a regional profile developed for the Chicago Metropolitan Agency for Planning (CMAP)." For this report, AECOM conducted a separate calculation based on the GHG emissions associated with solid waste as cited by the US EPA.

The EPA provides data[xxxiii] to determine how much CO_2e is emitted per ton of waste sent to landfill and per ton of waste recycled. The following provide background behind the EPA's formulation of that data.

WASTE DISPOSED IN LANDFILLS

GHG generation from landfilling is a function of the following:
- Total amount of waste landfilled;
- Composition of the waste landfilled;
- Methane (CH_4) emissions (converted to CO_2e);
- Transportation related to CO_2 emissions;
- Carbon storage that will result from landfilling (because food discards, yard trimmings and paper are not completely decomposed by anaerobic bacteria, some of the carbon in these materials is stored in the landfill).

The EPA also developed separate estimates of emissions for different types of landfills:
- Landfills without gas recovery systems;
- Landfills with methane flares;
- Landfills that combust CH_4 for energy recovery;
- The national average mix of these three categories (we used this one).

Although waste is expected to increase as the population increases, the portion of waste landfilled may decrease due to increased recycling and composting programs. Additionally, the amount of CH_4 either flared or used for energy will also decrease the GHG impacts.

WASTE RECYCLED

The GHG reduction from recycling is a function of the following:
- Negative raw material and manufacturing GHG emissions (avoids baseline emissions from production)
- Negative GHG from forest carbon sequestration benefits (trees consume CO_2)
- Zero landfilling GHG emissions

The numbers used in the report are averages, and the conversion can be more specific with more specific data.

FINAL WASTE CALCULATION	
56,000	Est. 2040 population
4.34	lbs waste per person per day[xxxiv]
-1.09	lbs recovery for recycling
-0.37	lbs recovery for yard waste
-0.52	lbs recovery for combustion w/energy recovery
2.36	net lbs waste per person per day
132,160.00	lbs waste per day citywide
365	days per year
48,238,400.00	lbs per year city wide
2,000.00	lbs = 1 ton
24,119.20	tons waste per year city wide
1.15	1.15 MT CO_2e is emitted per ton of municipal solid waste that is landfilled[xxxv]
27,737.08	**MT CO_2e per year**

{ END NOTES }

[i] http://conservatree.org/learn/EnviroIssues/TreeStats.shtml; http://www.cusd200.org

[ii] http://www.treehugger.com/files/2009/07/are-paper-napkins-more-environmentally-friendly.php

[iii] On February 13, 2007, Governor Rod Blagojevich of Illinois announced new statewide greenhouse gas (GHG) emission reduction targets of 1990 levels by 2020 and 60 percent below 1990 levels by 2050. http://illinois.gov/PressReleases/ShowPressRelease.cfm?SubjectID=2&RecNum=5715

[iv] IPCC Fourth Assessment Report: Climate Change 2007, Chapter 2, Change in Atmospheric Constituents and in Radiative Forcing. Available at www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

[v] http://www.weho.org/Modules/ShowDocument.aspx?documentid=7262 West Hollywood, CA Climate Action Plan (by AECOM)

[vi] http://www.union-city.ca.us/green_city/Green_city_PDFs/Union%20City%20CAP_Final.pdf

[vii] http://www.clrsearch.com/Wheaton_Demographics/IL/Population-by-Age

[viii] To join Wheaton's Green Team, please call 630-653-3427 or 630-690-1237, or send an email to nallured@gmail.com.

[ix] US Department of Energy, Buildings Energy Data Book, http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.1.1

[x] United States Environmental Protection Agency, http://www.epa.gov/otaq/climate/index.htm

[xi] Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2008, US EPA, http://www.epa.gov/osw/nonhaz/municipal/pubs/msw2008rpt.pdf

[xii] The clothing and textile recycling bin is located in the southwest corner of the Wheaton Park District Community Center parking lot at 1777 South Blanchard Road in Wheaton (near the corner of Naperville and Blanchard Road).

[xiii] CMAP Water 2050 plan pg 15, Wisconsin v. Illinois, 388 U.S. 426 (1967); 449 U.S. 48 (1980)

[xiv] CMAP Water 2050 plan, pg 15, graph pg 16

[xv] 2010 City of Wheaton Water Division Annual Report

[xvi] For more information, please contact the Wheaton Park District Green Team at twhelan@wheatonparks.org.

[xvii] Program was limited to owner-occupied, single-family detached homes built prior to 1980.

[xviii] http://www.ildceo.net/dceo/Bureaus/Energy_Recycling/IECC.htm

[xix] Regional Snapshot, Chicago Metropolitan Agency for Planning, www.chicagoareaplanning.org\snapshot

[xx] http://www.oak-park.us/aggregation/

[xxi] http://www.oak-park.us/aggregation/

[xxii] https://cubenergysaver.com/

[xxiii] https://www.comed.com/sites/businesssavings/Pages/smallbus.aspx

[xxiv] Waste Reduction Model, EPA, August 2010. http://ww.epa.gov/climatechange/wyed/waste/calculator/Warm_Form.html

[xxv] Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan, CMAP, http://www.cmap.illinois.gov/watersupply/default.aspx

[xxvi] http://fi.edu/guide/schutte/howmuch.html

[xxvii] Water and Wastewater Industries: Characteristics and Energy Management Opportunities: A Report That Describes How Electricity is Used and Can Be Managed Efficiently in Water and Wastewater Treatment, EPRI, Palo Alto, CA: 1996. Product ID # CR-106491

[xxviii] US EPA eGRID2007 Version 1.1, year 2005 annual output emission rates for eGRID sub-region RFCW

[xxix] Water UK Sustainability Reports, 2008/2009: http://www.water.org.uk/home/news/press-releases/sustainability-indicators-2008-09/sustainability-2009.pdf

[xxx] George Tchobanoglous, Franklin Burton, H. David Stensel, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, 2002. A range of 60-90% is cited, depending on climate and time of year. 80% was selected as representative of the average for northern states over the course of the entire year.

[xxxi] Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle. USEPA document EPA420-F-05-004 February 2005. http://www.epa.gov/oms/climate/420f05004.htm

[xxxii] Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel. USEPA document EPA420-F-05-001 February 2005. http://www.epa.gov/oms/climate/420f05001.htm

[xxxiii] EPA Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks, 3rd Edition, September 2006 and EPA's Waste Reduction Model (Warm) Recycling Documentation (http://www.epa.gov/climatechange/wycd/waste/downloads/recycling-chapter10-28-10.pdf)

[xxxiv] Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2009, http://www.epa.gov/osw/nonhaz/municipal/pubs/msw2009-fs.pdf

[xxxv] http://www.epa.gov/climatechange/wycd/waste/downloads/landfilling-chapter10-28-10.pdf chapter specific to landfills: http://www.epa.gov/climatechange/wycd/waste/SWMGHGreport.html







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