Green Church Case Study: Implementing Incremental Improvements in Sustainability

Brian Gedlinske  
*University of Northern Iowa. Iowa Waste Reduction Center,* brian.gedlinske@uni.edu

Bryant Campbell  
*University of Northern Iowa. Iowa Conservation Corps.*

Let us know how access to this document benefits you

Copyright ©2017 Brian Gedlinske and Bryant Campbell

Follow this and additional works at: [https://scholarworks.uni.edu/other_facpub](https://scholarworks.uni.edu/other_facpub)

Part of the [Environmental Sciences Commons](https://scholarworks.uni.edu/other_facpub)

**Recommended Citation**

Gedlinske, Brian and Campbell, Bryant, "Green Church Case Study: Implementing Incremental Improvements in Sustainability" (2017). *Other Faculty and Staff Publications.* 5.  
[https://scholarworks.uni.edu/other_facpub/5](https://scholarworks.uni.edu/other_facpub/5)

This Report is brought to you for free and open access by UNI ScholarWorks. It has been accepted for inclusion in Other Faculty and Staff Publications by an authorized administrator of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.
Green Church Case Study

Implementing Incremental Improvements in Sustainability

Orchard Hill Church

Brian Gedlinske and Bryant Campbell
UNIVERSITY OF NORTHERN IOWA CONSERVATION CORPS
IOWA WASTE REDUCTION CENTER

MAY 2017

brian.gedlinske@uni.edu
INTRODUCTION

Orchard Hill Church (OHC), a project of the Reformed Church in America denomination, is located in Cedar Falls, Iowa. Since gaining approval for establishment in 1961 and its initial groundbreaking in 1962, OHC has grown dramatically in attendance, staffing, and building additions. During a time when a vast majority of churches are seeing declining numbers and donations, OHC has been expanding by catering to people wanting to experience worship in an informal, contemporary style with relevant teachings targeted to growing Christians and their families. Sunday service attendees are greeted at the door, frequent OHC’s coffee shops, and enjoy contemporary live worship music as an integral part of Sunday’s teaching message. Total attendance for all Sunday services is approximately 1,600.

OHC has also been particularly deliberate and effective in providing a welcoming and busy social environment, developing programs and activities for all age groups, and seeking out ways to serve its community. Details on the various programs offered by OHC are available on-line at: http://www.orchardhillchurch.org/. OHC is also used as a frequent venue for bible, membership, and leadership classes, small group meetings, luncheons, and dinner events. It also opens its doors to community events and organizations such as school team banquets, fitness classes, after-prom parties, scout events and serves as a remote host site for the annual Global Leadership Summit.

In the Spring of 2016, OHC partnered with the University of Northern Iowa Conservation Corps (UNICC) to identify and implement sustainability initiatives that could be readily put into practice by community churches. The UNICC is an initiative created by UNI’s Center for Energy & Environmental Education (CEEE) and funded by the Roy J. Carver Charitable Trust to support students and staff with projects that implement positive change in the context of community environmental conservation. The UNICC team for OHC included a UNI student and an environmental specialist from the Iowa Waste Reduction Center (IWRC), a program housed under UNI’s Business & Community Services group that provides environmentally focused education, training, and assistance to Iowa businesses.

Objective

Quality case studies are often an effective means of inspiring change. The intent of the Green Church Study was threefold: 1) to review OHC’s operations and identify opportunities for OHC to become more environmentally sustainable; 2) implement simple and affordable sustainability changes acceptable to OHC and quantify results whenever possible; and 3) document barriers to sustainability initiatives. The following areas were targeted for this project:

- Energy Conservation;
- Land Use and Storm Water Runoff;
- Recycling; and
- Water Conservation.
STUDY APPROACH AND FINDINGS

Through the years, OHC has experienced three building expansions, culminating in a structure that is almost 56,000 square feet (ft²) in area. Characteristics of the building have also changed over time, growing more contemporary in design, particularly as one moves east through the church.

Energy Conservation

As part of the project, roughly two years of utility records (providing three years of data) were obtained for OHC and reviewed by the UNICC. An assessment of church lighting fixtures was also performed with OHC staff in an effort to identify simple changes that could be made to readily reduce electricity usage. Staff from the municipal utilities company, Cedar Falls Utilities (CFU), were also consulted for potential energy savings ideas and rebate opportunities.

Not surprisingly, a review of utility records found that the bulk of OHC’s utility bill was for electricity usage. As shown in Figure 1, electricity accounted for approximately 71% of OHC’s 2015 utility costs. The average monthly cost for electricity usage in 2015 was roughly $2,700.

![Figure 1 – 2015 Breakdown of OHC’s utility costs.](image)
UNICC Sustainability Demonstration Efforts and Results. To reduce OHC’s electricity usage, use UNICC grant funding in a cost effective manner, and demonstrate simple sustainability changes, UNICC targeted energy efficiency lighting improvements for fixtures that saw a high degree of use and/or relied on incandescent bulbs. Figure 2 illustrates the location of fixtures converted over to LED lighting. As shown in Figures 2 and 3, this included most of the main hallway lighting and pendant lighting within OHC’s sanctuary. Four foot, 4100K 17W LED plug-and-play lamps rated at 2200 lumens were used to replace 32W T8 fluorescent lamps used in the main hallway fixtures. A mix of incandescent bulbs in sanctuary pendent lights (standard A19 and flood ranging from 40W to 65W) were replaced with 10W A19 and 11W flood LEDs. Support from the Roy J. Carver Charitable Trust grant in addition to OHC cost sharing donations (at approximately 52%) were used to fund the switch to LED lamps and bulbs.

Figure 2 - Location of LED lighting changes at OHC.
Prior to converting over to LED lighting, LED alternatives were first demonstrated to OHC staff in the targeted areas to ensure the quality would be satisfactory. The only problem experienced during the effort was the dimming quality of LED flood lamps placed in the sanctuary fixtures. Once several bulbs were installed, performance testing found they began to flicker when dimmed. This problem was corrected by removing LED floods from some of the pendant fixtures. Fortunately, these LED flood lamps did not need replacement as the LED A19 bulbs used in these same fixtures provided sufficient stand-alone lumen output.

Table 1 summarizes lighting changes made and the projected annual savings in energy costs. As shown, the sanctuary and hallway lighting changes are projected to reduce electricity usage by 15,289 kilowatt hours per year (kWh/yr). This reduced energy consumption, in combination with associated rebates (both retail and CFU rebates), produced an estimated payback period of just under nine months for all lighting changes combined.

<table>
<thead>
<tr>
<th>Location</th>
<th>Lighting Replaced</th>
<th>LED Cost</th>
<th>Projected kWh/yr Reduction</th>
<th>Projected Annual Savings (^b)</th>
<th>Estimated Payback (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanctuary</td>
<td>40-65W Incandescent</td>
<td>$123(^a)</td>
<td>8,507</td>
<td>$612</td>
<td>0.2</td>
</tr>
<tr>
<td>Main Hallway</td>
<td>32W 4’ Fluorescent Lamps</td>
<td>$681</td>
<td>6,782</td>
<td>$488</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>COMBINED TOTAL</strong></td>
<td></td>
<td><strong>$804</strong></td>
<td><strong>15,289</strong></td>
<td><strong>$1,100</strong></td>
<td><strong>0.73</strong></td>
</tr>
</tbody>
</table>

\(^a\) - Cost after store and/or utility company rebate;  \(^b\) - Based on a cost of 7.2 cents per kWh;

Energy savings realized by LED lighting improvements can also be correlated to reduced air emissions and greenhouse gases from the power generating plant serving OHC. Based on emission factors from the U.S. Energy Information Administration’s 2014 electricity profile for Iowa, OHC’s projected kWh savings equates to a reduction in sulfur dioxide, nitrogen oxides, and carbon dioxide emissions by approximately 40, 23, and 23,255 lbs/year, respectively.

Other benefits of the lighting changes include a brighter hallway due to higher lumen output, a more uniform look due to consistent lighting temperature ratings, and longer lamp life. It’s also anticipated that LED bulbs used in the sanctuary will be less susceptible to shortened life caused by the sound vibration from live worship music, an issue experienced with incandescent bulbs.
**Future Sustainability Opportunities with Lighting.** Table 2 identifies other lighting changes that could be pursued by OHC in future sustainability efforts. These priority locations were selected based on hours-of-use estimates, a key consideration for greatest impact and return on investment. As shown in Table 2, the projected energy savings and payback periods are quite favorable.

<table>
<thead>
<tr>
<th>Location</th>
<th>Existing Lighting</th>
<th>LED Cost</th>
<th>Projected kWh/yr Reduction</th>
<th>Projected Annual Savings</th>
<th>Estimated Payback (Years)</th>
<th>CO2 Reduction lbs/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Center Lobby</td>
<td>89 - 32W 4’</td>
<td>$623a</td>
<td>7,289</td>
<td>$525</td>
<td>1.19</td>
<td>11,087</td>
</tr>
<tr>
<td>Commons/Lobby</td>
<td>187 - 32W 4’</td>
<td>$1,309a</td>
<td>9,214</td>
<td>$663</td>
<td>1.97</td>
<td>14,014</td>
</tr>
<tr>
<td>Community Center</td>
<td>16 - 400W HID</td>
<td>$3,200c</td>
<td>11,867</td>
<td>$854</td>
<td>3.74</td>
<td>18,050</td>
</tr>
<tr>
<td><strong>COMBINED TOTAL</strong></td>
<td><strong>$4,509</strong></td>
<td><strong>28,370</strong></td>
<td><strong>$2,042</strong></td>
<td><strong>$8,426</strong></td>
<td><strong>2.21</strong></td>
<td><strong>43,151</strong></td>
</tr>
</tbody>
</table>

a - Assumes $7.00 per lamp (from recent price reduction); b - Based on a cost of 7.2 cents per kWh; c – Assumes $200 per lamp
Figure 3 – OHC lighting fixtures converted over to LED lamps and bulbs. Top left photo illustrates the light output of an LED lamp (left side) vs the output of the replaced fluorescent lamps (right side).
Land Use and Storm Water Runoff

To better understand OHC’s land use-land cover (LULC), grounds keeping practices and costs, snow removal and deicing practices, and storm water runoff conditions, UNICCC met with OHC staff, reviewed OHC’s surface drainage characteristics, and mapped drainage-related structures. County assessor data was also reviewed to determine the size and layout of the property. Information collected was then compiled, digitized, and integrated into a Geographic Information System (GIS) database created for OHC. The GIS database also included aerial photography and topographic data sets.

Land Use and Site Drainage Characteristics. Figure 4 shows the extent of OHC property on 2016 aerial imagery. Based on county assessor information, OHC’s property is approximately 21.75 acres. Like most churches, much of the property is dedicated to parking and the building, creating a considerable amount of impervious surface area. GIS analysis indicates roughly 8.2 acres (38% of the property area) consists of impermeable surfaces such as buildings, pavement, and compacted gravel. The remaining area is largely lawn. Residential properties surround OHC.

Non-residential properties in Cedar Falls are assessed a storm water fee based on their impervious surface area. These fees are used to fund Cedar Falls’ municipal separate storm sewer system (MS4) permit compliance requirements. OHC’s impervious surface area has resulted in a sizable storm water management fee tacked on to its monthly utility bill, amounting to roughly $1,700 per year.

Drainage characteristics for OHC are illustrated in Figure 5. It displays spatial locations and attributes of downspouts, storm water structural controls, storm sewer outfalls, and topography. As shown, OHC is situated in an upland area with a north-northwest trending topographic divide cutting across the property. Property runoff is routed in a manner that causes it to concentrate at four distinct locations (see Figures 5 and 6): a shallow storm water detention area in the southwestern corner of the property; the field off the northeast corner of OHC’s north parking lot; the field east of the OHC building; and a storm sewer that runs alongside the southeastern half of the OHC building to a storm water detention pond/city storm sewer system northeast of the building. Berms have been constructed along the north-northeast and southwest edges of the property boundary to contain runoff and shield neighboring properties.

Concentrated runoff has created barren patches, washed-out areas, and channelized pathways in the lawn due to repeated inundation and erosion (Figure 7). Soft ground conditions in these areas are also problematic to mowing. Additionally, as evident by homeowner efforts to divert drainage toward OHC’s northeast detention pond (Figure 8), roadway runoff continues to be an issue. UNICCC discussions with the property owner found that sediment transported from OHC and deposited in the street continues to be a problem during heavy rainfall events.
Figure 4 - OHC Property Boundary and Area Land Use - Land Cover

Spring 2016 Imagery obtained from http://ortho.gis.iastate.edu/
Prepared by: Brian Gedinske UNL
Figure 5 - OHC Drainage Attributes

Legend
- Concentrated Impervious Surface Runoff Point
- Storm Sewer Discharge
- Storm Sewer Inlet
- Downspout to Pavement
- Downspout to Lawn
- Downspout to Storm Drain
- Drainage Divide
- Berm
- Storm Sewer
- Storm Water Detention
- Elevation Contour (ft)

Spring 2016 Imagery obtained from http://ortho.gis.iastate.edu/
Prepared by: Brian Gedlinske, UNI
Figure 6 - Concentrated surface runoff locations A (top left), B (top right) and C (bottom) near the end of a 30 minute rainfall event of 0.52-inches on August 19, 2016.
Figure 7 - Channelized runoff just downstream of point B (top); Perc test soil boring locations in barren areas downstream of point C (middle); and Washed out area at point C.
Grounds Keeping Practices. OHC maintenance staff indicated lawn areas are mowed as needed by staff and volunteers, taking roughly eight hours to complete. During the mowing season, OHC spends roughly $35 every two weeks for fuel and $700 per season on equipment maintenance. In the past, OHC staff considered converting some lawn to prairie as a possible way to reduce mowing. Concerns over cost, availability of technical assistance, and acceptance by OHC members and neighboring homeowners caused the effort to stall.

Winter grounds keeping activities consist of snow removal and road salt deicing on paved and gravel surfaces. Of particular interest is the snow removal practices for the southern parking areas. Snow in this area is predominantly pushed to the south edge of the lot. As evident in Figure 9, snow piled along the south and southeast edge of the gravel lot contains considerably more sediment than snow piles created from plowing the southwest concrete lot. Consequently, snowmelt laden with sediment and deicing salt reaches the concentrated runoff points designated as “B” and “C” in Figure 5.
UNICC Sustainability Demonstration Goals, Efforts, and Results. To demonstrate sustainability practices relevant to storm water runoff and grounds keeping, UNICC proposed the construction of a rain garden and development of a small-scale native plant area (i.e., prairie). Goals of this effort were twofold: 1) promote on-site infiltration of impervious surface runoff to decrease the downstream impact of OHC; and 2) showcase native plants and appealing infiltration-based landscaping to OHC staff and neighboring homeowners. Drainage data collected for OHC was used to identify potential sites that would provide maximum benefit for limited UNICC project funds. UNICC also consulted with OHC staff and a representative from the Black Hawk County Soil and Water Conservation District (SWCD) to review potential areas, perform percolation tests, and subsequently, select site locations.

Funding incentives were also investigated. At a municipal level, funding incentives were unavailable. While some cities use storm water fee credits or cost share programs to incentivize property owners toward storm water best management practices (BMPs) that promote infiltration, this approach has not yet been adopted by the City of Cedar Falls. Although a provision exists in the city code indicating billing adjustments are possible if a property owner demonstrates that storm water does not directly or indirectly enter the city’s MS4, this option was not pursued due to the ambiguous requirement and time constraints. On a more regional level, the Black Hawk County SWCD offered a 75% cost reimbursement program for rain gardens constructed within OHC’s watershed. However, UNICC elected to forego this option due to time constraints and desire for greater design flexibility.
Figure 10 illustrates the site selected for rain garden construction. This location was selected because: 1) a percolation test revealed an infiltration rate greater than one inch per hour for the area; 2) it’s located near downspouts that discharge directly to storm sewer inlets (Figure 11); 3) it’s a high-visibility area; and 4) it’s situated in a bowl-shaped depression with a storm sewer inlet at its low point, providing an existing overflow outlet in case diverted runoff overwhelms the garden’s infiltration capacity. Construction of the rain garden in this area also simplified mowing and allowed for tying-in additional downspouts at a later date.
Figure 10 - UNICC Rain Garden Location

Legend
- Storm Sewer Inlet
- Downspout to Pavement
- Downspout to Lawn
- Downspout to Storm Drain
- Storm Sewer

Spring 2016 Imagery obtained from http://ortho.gis.iastate.edu/
Prepared by: Brian Gedlinski, UNI
Figure 11 – Left photo shows a downspout re-routed from storm sewer (and foundation) discharge to the UNICC rain garden. The right photo illustrates the south end of OHC’s NE storm water detention basin. Drainage from a portion of OHC’s roof discharges from the storm sewer outlet (top-center of photo behind saplings) to the city storm sewer (lower left of photo). Re-routing downspouts to the rain garden will attenuate storm water discharge to the detention basin and city storm sewer.

Figure 12 illustrates construction phases of the 250+ ft² rain garden. Two downspouts were diverted from storm sewer discharge to the garden area, giving runoff from over 1,500 ft² of roof an opportunity to infiltrate. This simple landscaping change will reduce the amount of runoff leaving the property, further attenuating OHC’s downstream impact.
Figure 12 – Construction phases of the UNICC rain garden. Drainage from two downspouts was diverted from direct storm-sewer discharge.
Construction of the garden was completed at a cost of approximately $150 (roughly 66% from the Roy J. Carver Charitable Trust grant and 33% from OHC donated funds). Construction of the garden also included roughly 20 hours of volunteer time, donated plants, and free compost and mulch obtained from the Cedar Falls yard waste compost facility.

To further reduce the amount of runoff from OHC property, development of a rain garden/demonstration prairie strip and some drainage landscaping began in the Spring of 2017. This prairie strip area is located on the east side of the property near OHC’s northeast entrance (Figure 13). This area was selected because: 1) it’s situated in a high visibility area; 2) the area receives a significant amount of runoff from the parking lot and building; and 3) with some drainage modification, it should ease some of the downgradient roadway runoff concerns of neighboring homeowners. Figure 14 shows runoff in the area during a 2016 storm event.

In the Fall of 2016, a variety of native plants, with an emphasis on deep rooted varieties, were ordered to populate the rain garden/demonstration prairie strip area. Most varieties ordered were also suitable for thriving in wet soil conditions. The intent of the demo planting area is to: 1) provide OHC members and neighboring homeowners with a visual sampling of native plant types; 2) educate the public on how these plantings could be used in an aesthetic manner to reduce surface runoff through deep/dense root system macropore development, increased permeability/water holding capacity, and transpiration; and 3) inspire future larger-scale, deep-rooted prairie plantings in areas where surface runoff is most problematic.
Figure 13 - Location of Rain Garden/Demo Prairie Strip Area.

Legend
- ▲ Concentrated Impervious Surface Runoff Point
- ▼ Prairie Strip

Spring 2016 Imagery obtained from http://ortho.gis.iastate.edu/
Prepared by: Brian Gedlinske, UNI
Figure 14 - Runoff on the east side of OHC property following a 2016 storm event. 2017 landscaping will re-direct runoff alongside the drive out to a rain garden/demo prairie strip area in the grass field.
**Future Sustainability Opportunities.** Figure 15 illustrates other target locations where infiltration-focused landscaping may be used or expanded to reduce OHC runoff in future efforts. These were identified as priority areas based on impervious surface drainage area, storm sewer interconnectedness; problematic runoff areas, and surrounding land use characteristics. Table 3 quantifies the approximate impervious surface area associated with each of these target locations. Although drainage from some of these locations cannot be addressed solely through infiltration due to the sheer extent of impervious surface involved, increasing the opportunity for infiltration in these locations will attenuate detrimental downstream effects of OHC property runoff.

<table>
<thead>
<tr>
<th>Landscaping</th>
<th>Location Description</th>
<th>Impervious Surface Area Addressed</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Garden</td>
<td>Route 3 downspouts NE of the UNICC Rain Garden</td>
<td>3,300 ft²</td>
<td>Roof</td>
</tr>
<tr>
<td>Rain Garden</td>
<td>Near “E” entryway</td>
<td>1,900 ft²</td>
<td>Roof</td>
</tr>
<tr>
<td>Rain Garden</td>
<td>Concrete Channel Drainageway between “G” and “F” entryways</td>
<td>5,100 ft²</td>
<td>Roof</td>
</tr>
<tr>
<td>Rain Garden Strip</td>
<td>Along NE edge of OHC Building</td>
<td>2,575-5,600 ft²</td>
<td></td>
</tr>
<tr>
<td>Prairie/Rain Garden</td>
<td>E of OHC building S of Drive</td>
<td>62,000 ft²</td>
<td>SE Parking Lot</td>
</tr>
<tr>
<td>Prairie/Rain Garden</td>
<td>NE of N Parking Lot</td>
<td>46,000 ft²</td>
<td>NE Parking Lot / Roof</td>
</tr>
<tr>
<td>Prairie/Rain Garden</td>
<td>W side of S Entrance</td>
<td>145,000 ft²</td>
<td>S Parking Lot / Roof</td>
</tr>
</tbody>
</table>
Figure 15 - OHC Potential Infiltration-Focused Landscaping Areas

Legend

Conceptual Rain Garden-Prairie Area

Spring 2016 Imagery obtained from http://ortho.gis.iastate.edu/
Prepared by: Brian Gedlinske, UNI
Recycling

A review of OHC’s waste management practices found that recycling was limited to cardboard and office paper. Only one recycling bin was located at OHC and the recycling that was done was accomplished through volunteer action of an OHC member rather than any organizational effort. Other wastes are typically landfilled.

Two dumpsters are used by OHC at a cost of approximately $332 per month. This includes a two cubic yard front-load wheeled dumpster situated just outside the kitchen area and a six cubic yard front-load dumpster on the Community Center side of OHC in the far southeast corner of the south parking lot. The kitchen dumpster is picked up twice per week while the community center dumpster is once per week. A cursory look at the trash generated on the Community Center side of OHC readily revealed that styrofoam coffee cups form the bulk of the trash going to the landfill (Figure 16).

![Figure 16 - Styrofoam coffee cups account for a large volume of trash.](image)

UNICC Sustainability Efforts. UNICC efforts to improve recycling at OHC included investigating curbside vendor options, costs, and accepted materials. To better gauge how staff and members would respond to recycling, two 28-gallon recycling bins were purchased for an OHC recycling pilot project. During this trial period, UNICC checked on the bins weekly and hauled off recyclables to a satellite recycling station operated by the Cedar Falls Public works department. Cedar Falls has an exceptional community recycling program in terms of the materials accepted and access. Materials accepted include metal, plastics #1-#7, cardboard, paper (office, newspaper, and magazines), plastic grocery bags, glass (all colors), and even styrofoam. Five city recycling stations are distributed throughout Cedar Falls, one of which is located within two miles of OHC.

Placement of the recycling containers in key areas apparently sparked a growing effort to recycle at OHC. Early into the effort, the bins were lightly used and could go for two to three weeks before needing to be emptied. As the program continued, volumes and the assortment of materials placed in the bins gradually increased, leading to the purchase of two additional bins (14 and 18 gallon containers – Figure 17) and weekly to bi-weekly trips to the recycling station.
Water Conservation

**UNICC Sustainability Efforts.** With limited funds, UNICC efforts toward water conservation were kept simple and affordable. Plumbing fixtures at OHC were inventoried by UNICC and low-flow aerators were subsequently installed at 12 sinks throughout the building. These sinks were primarily used for hand washing. This simple effort replaced aerators typically rated at two gallons per minute [gpm] with one gpm EPA-WaterSense aerators with no change in appearance or loss in performance other than the reduced flow rate.

**Future Sustainability Opportunities.** Future water conservation opportunities for OHC would likely be expensive since they would involve the installation of new porcelain fixtures. Currently OHC’s toilets are rated at 1.6 gallons-per-flush (gpf) and urinals at 1.0 gpf. Replacement with EPA WaterSense fixtures would reduce water usage to 1.28 and 0.5 gpf,

*Figure 17 - Bins used for the OHC recycling pilot project.*
respectively, reducing the gpf by 20 and 50%. However, because of low water and sanitary
sewer usage rates, the payback period for new fixtures would be lengthy. EPA WaterSense
estimates that 45% and 37% of total water use at educational facilities and office buildings is for
domestic/restroom purposes, respectively. By assuming 45% of OHC’s water use is for restroom
use and a 30% reduction in restroom water use would be realized by installing WaterSense
fixtures, OHC would realize a savings of roughly $410 per year from reduced water and sanitary
sewer charges. Because of the lengthy payback implied by this number, the most pragmatic
approach would be to switch to EnviroSense fixtures gradually as the need for new fixtures arise.

REALIZATIONS, RECOMMENDATIONS AND CHALLENGES

Study results indicate churches likely have numerous opportunities to become more sustainable
through some simple, relatively inexpensive changes. In most cases, these changes are
synonymous with cost savings, reduced environmental impact, and improved efficiency.
Barriers to implementing sustainability changes tend to originate from tradition (i.e., the way
we’ve always done it), budget constraints, limited personnel resources, mis-guided perceptions,
and lack of funding incentives. The following highlights key realizations from completion of
the UNICC project.

• Undoubtedly the most valuable (and perhaps untapped) resource available to churches in
terms of implementing sustainability projects and exploring funding options is its members.
Church members likely include people with the time, talent, and interest needed for
identifying and completing sustainability projects. As evident by this study, some members
may also find merit in donating materials and/or financial support toward these efforts.
Effectively tapping into this human capital is likely the most important step church
leadership can take towards identifying and evaluating potential sustainability ideas and
implementing productive projects.

• LED lighting alternatives are a quick, easy, and effective way churches can become more
sustainable. LED lighting continues to become more affordable for a wide variety of
applications (during the short time frame used to complete this project, the four foot LED
lamps used at OHC dropped 30% in price). Additionally, utility companies and home
improvement stores may offer rebates that accelerate the return-on-investment (ROI).
Taking time to evaluate potential rebate opportunities, long term savings, and calculate ROIs
are essential and often inspire sustainability improvements.

It’s important to note that existing utility rebates may or may not be worth pursuing. As
discovered during the OHC project, some rebate opportunities were more attractive than
others. A 50% utility rebate on Energy Star rated LED bulbs for OHC’s sanctuary proved to
be an easy program to participate in and greatly shortened the projected payback period for
the change. On the other hand, although a utility rebate opportunity existed for troffers and
wraparound fluorescent fixtures targeted for LED replacement, rebate eligibility required
complete fixture replacement with an integrated LED unit. Simply replacing fluorescent
lamps with plug-and-play LEDs was not a rebate eligible option. Considering the ease of
plug-and-play LED replacements (no electrical work required), their cost relative to integrated LED fixtures even after rebate, and their comparable energy-savings benefit, the plug-and-play option proved to be the more attractive option.

Finally, in addition to energy efficient lighting upgrades, OHC should also encourage staff to shut off lighting in unattended areas. During project site visits, it was not uncommon to find lights on in a number of empty rooms. A campaign aimed to make OHC staff and members aware of lighting usage and associated costs could be an effective approach toward energy conservation, cost reduction, and future lighting modifications.

- Like LED lighting, low flow aerators are another quick, easy, and affordable sustainability change. Faucets equipped with aerators rated at 2.2 gpm are common – especially with older fixtures. Although quantifying the benefits of retrofitting wash sinks with 1.0 gpm aerators is impractical, it’s clearly a simple sustainability step that can be taken to conserve water, reduce energy usage, and decrease wastewater.

- Low-cost landscaping (e.g., rain gardens, native plantings) may be used to improve aesthetics, simplify grounds keeping, and reduce runoff by increasing on-site infiltration. Increasing the opportunity for on-site infiltration also attenuates downstream flooding, reduces erosion, and decreases the amount of sediment and other pollutants (trash, metals, nutrients, thermal, bacteria, and organics) transported to surface waters via runoff.

As demonstrated in this project, development of infiltration-based landscaping projects should begin with understanding site drainage characteristics, identifying problem areas, and targeting viable, higher priority areas. Potential funding assistance programs (e.g., cost share or storm water fee credits) should also be explored. As discovered during the UNICC project, financial incentives for implementing landscaping practices to reduce runoff may not exist at a municipality level even if properties are taxed to fund city MS4 permit requirements. In these cases, a push for policy change is clearly needed. Financially encouraging property owners to implement structural storm water BMPs, particularly in regard to retrofit projects, should be an integral part of any effective MS4 storm water management plan.

Other programs, similar to the cost sharing program offered through the Blackhawk County SWCD, may offer funding assistance opportunities for structural storm water BMPs. However, cost-share eligibility will likely require an interested organization to meet certain design requirements and provide up-front funding, terms that may or may not be a good fit for a desired project. For example, rain garden funding assistance offered by Black Hawk County SWCD required property owners to size and construct rain gardens according to specifications outlined in the Iowa Rain Garden Design and Installation Manual (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_007154.pdf). As discovered during the UNICC project, these funding requirements were cost and design prohibitive for addressing runoff from large impermeable surface areas.

In any event, lack of external funding or overly restrictive requirements should not be a barrier to BMP development. It may prove more time and cost effective to simply self-fund
small, affordable sustainability projects using volunteers and donations. Although small scale projects may not address a problem in its entirety (e.g., runoff from a large parking lot), incremental improvement is the objective. This approach also lays the foundation for future sustainability efforts.

- The growing use of the recycling bins during the UNICC project suggests church staff and attendees are supportive of recycling. However, to become a sustainable routine, OHC will need to commit resources to the effort. The following should be considered if OHC elects to pursue a sustainable recycling program that builds upon the UNICC pilot program:

  ☑️ OHC would need to determine if recycling efforts are best served by: 1) relying on staff/volunteers to routinely collect and haul recyclables to a city station; or 2) contracting the services of a curbside vendor. Employing a curbside vendor would cost approximately $25 per month for weekly pickup of a 50-gallon container. No sorting would be required as vendors allow recyclables to be commingled. Use of a curbside vendor, however, would limit the type of materials recycled as glass and styrofoam are not accepted.

  In-house recycling efforts would best be served by sorting recyclables at the source. Additionally, relying on staff or volunteers to carry on this effort would likely run into variability/continuity problems.

  ☑️ Additional recycling bins should be acquired by OHC and placed in high use areas alongside trash receptacles. Additionally, because of the tendency to discard returnable beverage containers in the trash, OHC is encouraged to obtain containers specifically for collecting deposit-return beverage containers.

  ☑️ Because of the high volume of styrofoam (expanded polystyrene) going to the landfill, OHC should investigate alternatives to the traditional 16oz Styrofoam cups. Potential alternatives include compostable paper cups or making 12oz Styrofoam cups available to reduce landfill volumes and/or improve cup biodegradability characteristics.

  ☑️ To address the additional expense of using a recycling service, OHC should evaluate the possibility of switching to a larger capacity front-load dumpster near to the kitchen area. Currently, OHC is limited to a two cubic yard container at this location since it needs to be wheeled from its enclosure to be emptied and it’s the largest wheeled front-load unit available.

  If the enclosure could be re-oriented to allow direct front-load vehicle access (e.g., from 90° to 30°-45° to the driveway), use of a larger capacity skid-mounted container may be a possibility. A larger container would better accommodate the amount of trash taken to this location (the existing container is frequently overwhelmed) and may reduce OHC’s landfill hauling costs by eliminating the need for the remotely located large parking lot dumpster.

ACKNOWLEDGEMENTS
Special thanks to the Roy J. Carver Charitable Trust for funding this project. Funds made available for project implementation were an effective catalyst for project implementation and inspiring continued sustainability work at OHC. Funds provided a refreshing and constructive opportunity to put recommendations into practice – we need more of this.

Also thanks to…

- Bryant Campbell (UNICC student), Eric Giddens (UNICC Coordinator) and the IWRC.
- Erik Blanchard and the rest of OHC’s staff – for agreeing to participate in the project, supporting our efforts, and putting up with our numerous requests.
- Cedar Falls Utilities and Black Hawk SWCD – for their contributions and input to UNICC’s energy conservation and storm water efforts.
- The Green Iowa AmeriCorps - what a great program! GIA volunteer assistance with prepping and planting the prairie strip was a much appreciated community service.

*Green Iowa Americorps (GIA) crew prepping for prairie planting.*

*GIA planting plugs of native plants.*