

# **BUILDING A FIRM FOUNDATION**

A Creation-Friendly Building Guide for Churches

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The National Council of Churches is comprised of 35 member denominations including mainline protestant denominations, historic Black Church denominations, and Orthodox communions. The Council serves as both a convener and voice for a faith constituency of almost 50 million people and 100,000 congregations across the United States. The Council's environmental program has built a denominational and congregational base over a span of nearly 25 years and has helped the faith-based environmental movement grow in voice, vision, and capacity. The program identifies issues and spreads worship and mission materials that carry the message of protecting God's creation. The Eco-Justice Program office works in cooperation with the NCC Eco-Justice Working Group to provide an opportunity for the national bodies of member Protestant and Orthodox denominations to work together to protect and restore God's Creation.

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Unless the Lord builds  
the house, those who  
build it labor in vain  
(Psalm 127:1).

## Why Go “Green”?

The capital campaign has been challenging to say the least. Church members have been generous, but the cost of the building renovation is growing by the day. Just getting the Church Council to approve the building plan was tough. Why, in the midst of all the complications and contentiousness of a building campaign, would one want to add the greater complexities, seemingly greater costs, and possible delays of building in an ecologically friendly manner?

Consider for a moment Jesus’ parable about the two builders. Like so much of Scripture, it can be interpreted literally or metaphorically. Jesus is frustrated because people keep coming up to him and calling him Lord but then conduct their lives in such a way that is contrary to his teachings. Jesus compares these people to a man who builds a house without a foundation. When bad weather comes, the house is ruined. In contrast, Jesus says: “I will show you what someone is like who comes to me, hears my words, and acts on them. That one is like a man building a house, who dug deeply and laid the foundation on rock.” (Luke 6:46-49).

Building, rebuilding, or maintaining our own physical houses of worship requires us to think, quite literally, as well as figuratively, about the foundation upon which they are laid. Is our foundation deep and strong and re-enforced by its commitment to God’s purposes in the world?

**God’s purposes for the created world.** Genesis teaches us that before humans were created, God saw the created world as good. Day after day, God created. After creating plants, “fruit trees of every kind of earth,” the stars, the birds, wild animals and even great sea monsters, God declared that it was good.

Humans were created to “image” or represent God in the created world, much as one would represent an earthly King. We are to do God’s bidding in the world and obediently carry out God’s wishes for it. We are given special responsibility towards creation, not for our own exploitation, but in helping to carry out God’s purposes for creation. Psalm 104 tells us that God’s intent is to provide grass for the cattle, water for the trees, nests for the birds, and high mountains for the wild goats. In other words, the Scriptures tell us that God wants life for all of God’s beloved creatures and wants us to participate in sustaining that life.

Our church buildings reflect who we are as a community of faith. Buildings that are built sustainably or “green” outwardly reflect our concern for and responsibility of God’s beloved creation including those human communities that can be disproportionately impacted by unsustainable building practices. “Green” buildings also inwardly reflect this concern to congregants, reminding us of our responsibilities to live in loving community with all of God’s creatures.

While building using environmentally friendly practices and materials might not seem as interesting or romantic as protecting wilderness or saving endangered species, the manner in which we build and manage our buildings has a dramatic effect on the creation's health. Our building practices also have an impact on human communities as well. When we choose to power our houses of worship using energy efficient or clean energy, we eliminate the harmful effects of air pollution, which are disproportionately felt in low-income communities, with children, the elderly, and often in communities of color. When we use "green" building materials, we eliminate the adverse effects of water, soil, and air pollution that is, again, disproportionately felt in vulnerable communities, especially communities who live near manufacturing plants.

We are increasingly aware that buildings affect our human health as well. The EPA says that Americans generally spend over 90 percent of their time indoors, where levels of pollutants can be two to five times higher, and in some cases, 100 times higher than outdoor levels. According to the EPA, a number of respiratory illnesses, in particular asthma, have been directly traced to indoor air quality. Other, less specific symptoms have also been linked to buildings, such as runny or stuffy nose, fatigue, headaches, lethargy, nausea, dizziness, and others. Populations that spend large amounts of time indoors, such as the elderly and the disabled, are particularly susceptible to indoor air quality illnesses.

Here are just a few things that building "green" churches can do:

1. reduce energy use
2. protect open space and valuable natural habitats
3. reduce our churches' contributions to global warming
4. keep our churches safe and healthy
5. reduce the use of toxic substances
6. lessen pressure on the local water supply
7. reduce runoff into local waterways
8. reduce mining and timber harvesting
9. address environmental justice issues
10. connect the congregation with the created world

And, importantly, building "green" does not have to break the bank. It is not only economically viable, but will actually save money in the long run. Many energy investments can pay for themselves in one to 10 years. Given the long lives of many of our church buildings, those investments keep paying off well into the future.

## About This Guide

This guide is meant to get you started using environmentally friendly and sustainable building practices whether you are involved in a new building project, a renovation, or repairs. It is intentionally not overly technical nor does it cover all the possible ways to build. Instead, it is meant to get churches thinking and talking about building sustainably.

Trying to build in a creation-sensitive or sustainable way can seem overwhelming. Much of this information might seem new and strange at first. If it is helpful to get started, pick a few ideas that seem practical for your church. Then, keep adding other elements as your church is able.

Each chapter discusses why a particular aspect of green building is important, both from a theological and an ecological standpoint. Then, a quick checklist of a very specific suggestions is provided. More information on each of these suggestions is also included. Lists of organizations, websites, and additional materials are included in the Appendix.

## Getting Started: Influencing the Building Process

Influencing a church building process requires the patience of Job and the wisdom of Solomon. Building campaigns can be lengthy, complex, and contentious. Pressure mounts with increasing costs and delays. A number of different players are involved, each seemingly with a different point of view. Those involved in the planning stages are sometimes not those involved in the implementation.

Renovating or building a church, however, can be a wonderful, creative process for church members and provides a chance to grow in fellowship and ministry. Creating a new worship space, for instance, forces a congregation to come together to determine who it is as a community of faith.

1. **Get involved as early as possible.** Decisions are made, and minds are made up, a long time before the first stone is laid.
2. **Identify the decision-makers.** Clergy are most often involved, but often laypeople on key committees exercise equal, if not more, authority.
3. **Get to know the individuals and committees involved.** Understand their concerns. Undoubtedly, there will be those decision-makers who are more open to green building ideas. Utilize their support whenever you can.

4. **Find out what your denomination is doing ecologically.** Many denominations have creation care ministries and employ a person responsible for ecological concerns. That person can give you information as well as provide examples of churches that have successfully navigated a greening process.
5. **Meet the needs of key individuals and constituencies.** If the finance committee is concerned about costs, show the financial payback for energy investments. If the elderly worry about cold drafts coming through old windows, talk about how warm the new, well-insulated windows will be.
6. **Early in the building process make a few well-planned, highly visible, inexpensive green improvements to the church.** Publicize and celebrate these successes. This step could be as easy as moving office furniture around to take advantage of the natural daylight. These early first steps acquaint the congregation with green building and start developing a broad constituency within the church for other improvements.
7. **Help locate funds and financing for sustainable building projects.** Many denominations offer building loans. Check also with local, state, and federal agencies. For more information, visit [www.nccecojustice.org](http://www.nccecojustice.org) and click on “Green Building Initiative” under Campaigns and Initiatives.
8. **Educate the congregation on ecological concerns and the church’s responsibility for taking care of its little corner of God’s creation.** Check the Appendix for ideas on where to get curriculum for both adult and children’s educational programs.
9. **Start a Creation Care group** that supports the green building effort as well as other ideas for congregational involvement in caring for the Earth. For example, church youth groups can plant native species on the lawn. Men’s and women’s groups can put up rain barrels, build a meditation garden, or simply change out energy-inefficient lighting fixtures.

As you attempt to influence the building process, aim high but be patient when the gains are slow. You will not be able to do everything, so strategically pick your battles. Find the aspects of the building process where you can make the biggest environmental impact with the least financial investment and political controversy. And remember, Rome was not built in a day, and neither are “green” churches!

## Why is it Important?

The churches that we build should not be built to “make a name for ourselves,” but strive, as 1 Timothy 3:15 tells us, to be churches of the living God, built for God’s purposes, not our own. From the earliest stages of the building or renovation process, care needs to be taken that the design, size, placement, and materials used in the building express God’s purposes in the created world. Sensitivity to the Earth early in the building planning will set the tone for the entire building process and will assure that creation care will be integrated into all aspects of the building or renovation. Furthermore, design, placement, and construction of our churches with sensitivity to the existing human and non-human community send a powerful message.

## LEED Program

The United States Green Building Council (USGBC), a coalition of leaders in the building industry, has developed a program to guide design and planning. USGBC promotes environmentally responsible, economically viable, and healthy buildings and has developed a voluntary building rating system based on 34 ecological criteria. The criteria within this Leadership in Energy and Environmental Design (LEED) program offer a good overview of the many specific ways to make a church building “green.” More information on the LEED program can be found in the Appendix, and many of the LEED suggestions are included in this guide.

LEED emphasizes state of the art strategies for:

- Sustainable site development
- Water savings
- Energy efficiency
- Materials selection
- Indoor environmental quality

For more information on the LEED program, visit [www.usgbc.org](http://www.usgbc.org)

## Design

A well-planned, integrated design is essential to making your church building or renovation creation-friendly. It is much easier to think about energy use, water, ventilation, and building materials at the design stage rather than try to retrofit well-meaning alterations later in the process. A good place to start is to quickly scan the checklists provided in this guide to get a sense of the range of Earth-friendly opportunities available. You might pick one aspect, for example energy use, that will be of particular importance to your design.

### QUICK CHECKLIST

- Tailor the size and shape of your building to meet congregational needs.
- Employ a “green” architect.
- Design a building that can be used all week long.

**Consider the impacts of creation in decisions regarding building size and shape.** The overall size and shape of the church building or renovation will significantly affect the amount of energy needed to run the building. It will also influence the construction impacts on the surrounding human and non-human community. Rooms with high ceilings, for example, need a lot of energy to heat and cool. Vestibules (discussed in more detail in the Energy section) can save energy by acting as a transition zone from the outdoors to the indoors.

Keep the overall size of your building project as small as possible. Large construction projects can adversely affect water quality as well as the health of nearby forests, streams, and wetlands. They are also disruptive to the local human community. Fitting the size of the church to the specific needs of your congregation is a great way to keep costs down as well. (For additional information, check out “More Information” at the end of this section.)

**Employ a green architect.** Employing a “green” architect right from the start of your project will allow you to take advantage of the many Earth-friendly opportunities available and ensure that you have an ecologically integrated design, rather than a number of piecemeal improvements. Increasingly, architects are available who specialize in Earth-friendly buildings, and even those who do not, have some familiarity with ecologically sensitive building practices. If a specialist is not available, encourage your architect to think “green” whenever possible.

While Earth-friendly products and opportunities are numerous, not all architects, contractors, and sub-contractors have kept up with them. Expect a learning curve from building professionals. You might even use this guide to help educate those in the field to the many ways that they can easily make the building process more sensitive to creation. (For additional information, check out “More Information” at the end of this section.)

**Design a building that can be used all week long.** A fully occupied and busy building not only assists the local community but also keeps other buildings from having to be constructed. Many church buildings are used only sparingly during the week and then have to accommodate large crowds on Sundays. Sharing building space is energy efficient and can quite possibly result in shared costs as well. Churches can be used for senior, or children’s day care centers, meeting and office space for community organizations, soup kitchens, homeless shelters, or rental space to local businesses. (For additional information, check out “More Information” at the end of this section.)

Whether your building project is large or small, be sure to check federal, state, and local building codes. If you have questions about building codes, check with your local building inspector’s office.

## MORE INFORMATION

For more information on designing and getting started on a creation-friendly building, check out:

**Environmental Protection Agency**

[www.epa.gov/greenbuilding](http://www.epa.gov/greenbuilding)

**GreenBiz**

[www.greenerbuildings.com](http://www.greenerbuildings.com)

**U.S. Green Building Council**

[www.usgbc.org](http://www.usgbc.org)

**Washington D.C. Energy Office’s Green Faith guide to churches**

[www.energy.dc.org](http://www.energy.dc.org)

## QUICK CHECKLIST

- If possible, build on a site that has already been developed so that no natural areas will have to be disturbed, and disruption to the local community can be limited.
- Minimize the size of your building and the ecological “footprint” of your property.
- Minimize impervious surfaces that cannot absorb rainwater.
- Site the building so that it takes advantage of natural ventilation, solar power, and natural shading from trees.
- If possible, find a site that is easy to access by walking, bicycling, or public transportation.
- Use creation-friendly construction practices that reduce water runoff and waste from the construction site.

## Site Selection and Construction

With new construction or church additions, the selection of the building site and the construction techniques are important aspects of keeping the projects Earth-friendly. In addition, construction can significantly disrupt human neighborhoods as well as non-human habitat and water quality. With some foresight and planning, however, much of the construction impact can be mitigated by choosing a site and building in a manner that respects existing land uses.

### **Build on an already developed site**

The best possible site for new construction is on an already-developed piece of land. Natural open spaces are disappearing quickly, particularly in urban and suburban areas. Keeping natural places—whether wetlands, woodlands, or prairies—intact provide habitat to a variety of animals and can improve water and air quality. (For additional information on siting your building, check out “More Information” at the end of this section.)

### **Minimize your footprint**

Limit the amount of land your church building and parking lot occupies. This maximizes the amount of natural area on the property. In particular, limit the amount of surface area that does not absorb water. These “impervious” surfaces increase the amount of storm water runoff, which can cause erosion and bring harmful chemicals into nearby creeks and streams. Consider using non-impervious surfaces for parking lots (see the Transportation and Parking section) (For additional information, check out “More Information” at the end of this section.)

### **Take advantage of natural ventilation, solar power, and natural shading**

The time to start thinking about heating, ventilation, and air conditioning is when you site the building. Your siting decision will vary a great deal depending on your climate, geography, and topography. Take advantage of natural ventilation coming down slopes or off water bodies. Face your building to take advantage of solar energy. Trees make wonderful natural air conditioners in the summer as they block heat. In the winter, deciduous trees conveniently lose their leaves to allow the heat of the sun to penetrate. (For additional information, check out “More Information” at the end of this section.)

# Building a Good Foundation

## **Locate a site accessible by walking, bicycling, or public transportation.**

Automobile-dependent churches increase the use of gasoline, a fossil fuel, which in turn contributes to air pollution, oil extraction (which can be harmful to public lands) and global warming. Furthermore, large parking lots eliminate much-needed open space and exacerbate storm water runoff. By choosing a site conducive to Earth-healthy transportation, your church demonstrates its commitment to protecting all of creation. (For additional information, check out “More Information” at the end of this section.)

## **Use creation-friendly construction practices that reduce storm water runoff and waste.**

Construction can greatly increase storm water runoff problems in local rivers and streams. Hire a contractor and construction firm that will minimize runoff and erosion, protect adjacent trees, and reduce the use of toxic substances. (For additional information, check out “More Information” at the end of this section.)

## **Avoid construction waste.**

According to David Johnston, author of Green Remodeling, U.S. construction and demolition accounts for 20 percent of all landfill waste. And, 85 to 90 percent of construction disposal is recyclable. Encourage your contractor to work efficiently with materials, use recycled materials when possible, give away materials which they cannot use and dispose of other waste properly. (For additional information, check out “More Information” at the end of this section.)

## **Building Materials**

Choosing environmentally friendly materials in the construction of the building will make a substantial difference to the Earth as well as to the building’s overall health. According to the U.S. Green Building Council, buildings use 60 percent of the raw materials used in the U.S. Using recycled and reclaimed products not only eliminates the extraction of valuable materials from the Earth and the energy needed to process them, but also provides a much-needed market for recycled products as well as eliminating waste and landfill usage. In addition, using Earth-friendly products can improve the health of the building’s occupants by eliminating toxic substances that can contribute to upper respiratory problems and other serious ailments.

## **Use local materials and products**

In our global economy, products are routinely manufactured in far away places and then shipped enormous distances, using large amounts of energy. Purchasing local materials and products whenever possible not only minimizes the energy used in shipping, but also ensures that the products meet domestic environmental regulations. Buying locally provides needed employment and supports your local economy. (For more information on creation-friendly building products, check out [www.greenerbuildings.com](http://www.greenerbuildings.com) and [www.usgbc.org](http://www.usgbc.org).)

Consider building on a “brownfield,” an abandoned or idled industrial or commercial site. While care must be taken to assure that these brownfield sites are free from unhealthy chemicals, they can offer a low-cost alternative to expensive building sites as well as providing “redemption” for an otherwise unusable piece of land.

## **MORE INFORMATION**

For more information on designing and getting started on a creation-friendly building, check out:

**Environmental Protection Agency**

[www.epa.gov/greenbuilding](http://www.epa.gov/greenbuilding)

**GreenBiz**

[www.greenerbuildings.com](http://www.greenerbuildings.com)

**U.S. Green Building Council**

[www.usgbc.org](http://www.usgbc.org)

**Washington D.C. Energy Office’s Green Faith guide to churches**

[www.energy.dc.org](http://www.energy.dc.org)

## **Use reclaimed wood or wood grown or harvested in an environmentally friendly manner**

There is some debate over the use of wood as a building material. There is legitimate concern over deforestation and the destruction of habitat and water quality, particularly when old-growth forests are harvested. Use wood sparingly and strive for wood that is harvested and processed in an environmentally friendly manner. Reclaimed wood from barns, warehouses, etc. is an excellent source of lumber for exposed areas of the church, such as flooring. If using new wood, use wood that is FSC (Forest Stewardship Council) certified to ensure that it is grown in well-managed forests and harvested and processed in a manner that respects creation. (For more information on FSC certification, check out [www.fsc.org](http://www.fsc.org).)

## **Use formaldehyde-free materials**

Formaldehyde is often used as an adhesive in particleboard and plywood for cabinets, counter tops, and shelving and can produce gasses that are suspected to cause respiratory and other ailments, particularly for sensitive populations such as children and the elderly. Tell your contractor to limit or eliminate all products that use formaldehyde. (For additional information, check out “More Information” at the end of this section.)

## **Use paints and stains with low VOCs (volatile organic compounds)**

Volatile organic compounds (VOCs) are found in many paints, stains, and sealants. VOCs release dangerous gases into the air, which remain for several years. VOCs have been linked to a number of health problems, including eye, nose, and throat irritation; headaches; nausea; liver, kidney and central nervous system disorders; and some cancers. VOCs continue to cause problems after they are discarded by polluting waterways and contributing to air pollution.

Many traditional vendors now offer low-VOC paints in a variety of colors for about the same cost as traditional paint. Low-VOC stains and finishes are also available but are more difficult to find. Instruct your builder to purchase and use low-VOC paints or purchase them directly from a paint supplier or home improvement store. (For additional information, check out “More Information” at the end of this section.)

### **QUICK CHECKLIST**

- Use local materials and products.
- Use reclaimed wood or wood grown and harvested in an Earth-friendly manner.
- Use formaldehyde-free materials.
- Use paints and stains with low VOCs (volatile organic compounds).
- Use recycled materials or natural products for flooring.
- Avoid synthetic materials (“laminates”) in countertops in favor of recycled materials.

## **Use recycled materials or natural products for flooring**

Choosing flooring is a surprisingly important aspect of healthy, Earth-friendly building. For example, traditional vinyl flooring can emit carcinogenic fumes and promote mold growth in humid areas. Fortunately a number of natural linoleum products are available that are easy to use and maintain and are much healthier for people and the Earth. Natural linoleum is made from linseed oil, cork dust, wood flour, tree resins, and ground limestone.

Cork and bamboo are good natural alternatives for flooring. They are attractive, readily available, reasonably priced, and are grown and processed in a manner that is generally less destructive than conventional flooring. Bamboo comes from fast-growing, renewable bamboo plants. Cork is taken from tree bark, which the tree can then regenerate. Cork is now available in easy-to-install planks that simply click together.

Ceramic tile, especially that which contains recycled material, is also a good alternative in bathrooms and kitchens since it is durable, easy to clean, and is completely inert, which means it emits no fumes.

If using wood flooring, consider reclaimed wood that has minimal treatment. Stains and polyurethane placed on wood floors often contain dangerous VOCs, volatile organic compounds, which are associated with both health risks and pollution (see paints and stains above).

Carpeting can be used in areas where noise and comfort are an issue. Carpeting also can reduce heating and cooling costs. But, synthetic fibers found in carpeting are often made from petroleum products and carpets can contain dust, mold, and toxics. In addition, carpets can include a whole host of chemicals to make them stain resistant, fire retardant, and antistatic. Consider carpet that is made from recycled materials and limits chemical use. (For additional information, check out “More Information” at the end of this section.)

### **Avoid synthetic materials (“laminates”) in countertops in favor of recycled materials**

Traditional countertops are made from synthetic material that often come from petrochemical products that are not renewable and do not break down in landfills after use. A number of attractive, Earth-friendly products are available. Manufacturers offer a variety of countertops that are made from recycled ceramic and glass tiles. Another popular product is the “composite” countertop, which has the smooth look and feel of a traditional countertop but is made from scraps of recycled material and held together with cement. (For additional information, check out “More Information” at the end of this section.)

### **MORE INFORMATION**

#### **GreenBiz**

[www.greenerbuildings.com](http://www.greenerbuildings.com)

#### **Creation-friendly building materials**

[www.epa.gov/greenbuilding](http://www.epa.gov/greenbuilding)

#### **US Green Building Council**

[www.usgbc.org](http://www.usgbc.org)

#### **Sustainable Buildings**

#### **Industry Council**

[www.sbicouncil.org](http://www.sbicouncil.org)

**Green Remodeling, by David Johnston and Kim Master,** (see Appendix for full site), has very good material on sustainable wood products, paints, stains, countertops, carpeting, indoor air quality issues, formaldehyde, and VOCs.

#### **Indoor air quality information**

[www.epa.gov/iaq](http://www.epa.gov/iaq) or  
[www.webofcreation.org](http://www.webofcreation.org)

Note: an Internet search on “green building materials” or “green products” will produce a number of sites that offer creation-friendly products commercially.

According to a report released by the National Council of Churches, an average congregation can save \$8,000 to \$17,500 per year by employing energy efficient products.

—from *Bottom Line Ministries that Matter*

## Why is it Important?

Focusing on reducing the church's energy use is one of the most significant ways to be a good steward of creation. How we light, heat, and cool our churches has a profound impact on creation. When we use energy, we start a chain of events that generally begins with the extraction of precious materials from the Earth and continues through the production of energy by power plants.

Power plants, particularly older ones, are predominantly powered by coal and release a large proportion of the nation's nitrogen oxide, sulfur oxide, mercury, and carbon dioxide, which in turn cause pollution and a variety of significant respiratory and neurological health problems. Decreased lung function, asthma, coughing, wheezing, and shortness of breath, have all been linked to power plant emissions.

Mercury released from power plants can cause serious neurological problems affecting attention, fine motor functioning, and language skills. Furthermore, mercury can cause dementia and organ failure. Young children are particularly vulnerable.

Exodus tells the story of the Israelites' anxiety while traveling through the wilderness after their escape from Egypt. The people were so hungry and fearful that they wished they had died in Egypt where at least they had their fleshpots and bread (Exodus 16:3). Hearing the complaints of the people, God provided enough manna and quails to satisfy the hunger of the entire community with only one condition given: "Gather as much of it as each of you needs... (but) let no one leave any of it over until morning" (Exodus 16:13-19). Of course, some of the Israelites did not trust that God would provide again and hoarded some of the manna to use the next day. The inevitable happened; the manna stored overnight bred worms and was inedible (16:20).

Throughout the Hebrew Bible and the New Testament, the message is the same: we are commanded to take only our share. But, according to the Population Reference Bureau, North Americans use eight times the amount of energy per capita than do our Latin American neighbors. Clearly, per capita, we are using more than is rightly ours of the great gift of creation.

Relatively cheap, readily accessible energy, primarily from fossil fuels, has resulted in wasteful use of oil and coal as well as negatively impacting the Earth's ecological systems. We are using fossil fuels—oil, gas and coal—at an unsustainable rate. In a single day, we use what nature took thousands of years to create.

Power plants are also responsible for a large proportion of the nation's carbon dioxide output, the major cause of global climate change. Scientists now agree that the temperature of the Earth is increasing because of human-caused carbon emissions

and at a rate that cannot be explained by gradual, historic changes in weather patterns. Global climate change is caused primarily by large levels of carbon dioxide, water vapor, and other gasses being trapped near the Earth's surface. This "greenhouse" effect warms the earth and therefore disrupts weather patterns, melts polar ice caps, displaces birds and wildlife, raises ocean levels, increases drought, and causes an increase in violent storms.

Reducing the amount of energy used by churches can significantly decrease the amount of carbon dioxide that is released into the atmosphere by power plants and therefore help reduce the effects of global warming. Reducing energy use will also decrease other dangerous power plant pollutants such as mercury, nitrogen oxide, and sulfur oxide. The Environmental Protection Agency (EPA) estimates that if the over 300,000 religious worship buildings cut their energy use by 25 percent, over 13.5 billion kilowatt hours of electricity would be saved, and over 5 million tons of carbon dioxide emissions would not be expended into the air. This savings is the equivalent of taking a million cars off the road.

The good news for churches is that doing the right thing for creation can also result in significant cost savings. The EPA estimates that congregations that commit to energy savings can cut costs of utilities by as much as 25 to 30 percent.

The EPA has also made it easier for churches, business, and individuals to evaluate different products for their energy efficiency. The EPA started Energy Star in 1992 as a volunteer labeling program to identify and promote energy-efficient products. Energy Star products must meet specific, strict criteria set by EPA. There is some variability even within EnergyStar products. So, first look for the EnergyStar label, then compare those appliances and machinery. Look for the machine that uses the smallest number of kilowatt/hours of energy.

## Lighting

Lighting is a great place to start when "greening" a church building. It has a high return on investment and improves the comfort of a building. The EPA estimates that \$17 billion can be saved by U.S. building owners and tenants each year with lighting upgrades.

### Tailor lighting needs to specific purposes and spaces

In lighting decisions it is important to choose lighting that saves energy and money as well as creates pleasant work, study, or worship environments. The Illuminating Engineering Society (IES) has made specific recommendations for lighting various activities. For example, IES's recommended light level for worship is a third of that needed for a kitchen or a classroom. If a room is used for a variety of purposes dim-

In West Virginia, mountain tops are leveled to extract coal that will be burned to generate power for much of Washington, D.C.

### QUICK CHECK LIST

- Tailor lighting needs to specific purposes.
- Use lighting fixtures that can use compact fluorescent bulbs or tubular fluorescents.
- Use light-emitting diodes (LED) where appropriate.
- Install occupancy sensors in rooms.
- Turn off lights and other equipment when not in use.
- Minimize lighting outside the church.

mers or a variety of lights can be used. For instance, if there is one corner of a room that requires higher illumination, light that space and allow the rest of the room to be dimmer or to use lower lighting. Don't forget to take advantage of natural daylight. Turn off the lights when you can and place activities that require lighting by windows. (For additional information, check out "More Information" at the end of this section.)

### **Use lighting fixtures that can use compact fluorescent bulbs or tubular fluorescents**

EPA studies show that less than 5 percent of the electricity consumed by a traditional incandescent lamp is turned into usable light. According to the Washington, D.C., Energy Office, compact fluorescent bulbs (CFLs) will use up to 75 percent less energy and last 4 to 10 times longer than conventional light bulbs. They are a little more expensive, but they will quickly pay for themselves. The older clunkier versions of CFLs have been replaced with smaller, more versatile bulbs that can screw into traditional sockets, offer warm colors, and light up more quickly. They are also easily available through suppliers as well as your local hardware store and can be used in a variety of different settings, even floodlights. Many grocery stores are carrying them now as well. (For additional information, check out "More Information" at the end of this section.)

Tubular fluorescent lamps are particularly efficient and easy to maintain. Like CFLs, they are now available in warmer colors. The EPA estimates that changing from incandescent lamps to tubular fluorescent lamps can decrease energy and maintenance costs by 75 percent. (For additional information, check out "More Information" at the end of this section.)

### **Use light-emitting diodes (LEDs) where appropriate**

Low-energy LEDs, common in many electronic devices today, are an easy and inexpensive way to save energy and money. Using them in exit signs, emergency walkways, or in other lighting that is used consistently will save energy and money. For example, LEDs in exit signs use approximately 5 percent of energy of traditional incandescent exit lamps. The EPA estimates that the combined operating and energy cost of a traditional exit sign is six times that of a 4-watt LED exit sign. (For additional information, check out "More Information" at the end of this section.)

### **Install occupancy sensors in rooms**

Another easy and cheap way to save energy and expenses is to install occupancy sensors in rooms that are inconsistently used such as bathrooms. A sensor will recognize whether someone is in a particular room, and turn the lights on or off accordingly. Many devices come with an on/off switch that can override the sensor. In addition, automatic dimmers can adjust lights depending on how much natural

Calculate the environmental and financial savings of using CFLs (from [www.energystar.gov/ia/business/bulk\\_purchasing/bpsavings\\_calc/Calc\\_CFLs.xls](http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/Calc_CFLs.xls)):

CFLs x 240 =  pounds of carbon dioxide saved each year.

CFLs x \$44 =  saved over the life of the bulbs.

sunlight is available. Similarly, motion detectors can be added to outside lighting for greater security while reducing energy costs. (For additional information, check out “More Information” at the end of this section.)

### **Turn off lights and other equipment when not in use**

Of course, the simplest and cheapest way to save energy is to do it the old-fashioned way: turn off the lights. Remind congregants and church staff to turn off lights, machinery, computers, copiers, and appliances. Change settings on computers and office machinery so that they shut down temporarily if not used. (For additional information, check out “More Information” at the end of this section.)

### **Minimize lighting outside the church**

An easy way to save energy and to be a good neighbor is to eliminate, to the extent possible, harsh, glaring outside light. Lights disturb human neighbors as well as disrupt the feeding, mating, and nesting of non-human creatures in the neighborhood. “Dark-skies” lighting targets outside lighting to specific needs, uses only the minimum amount of light necessary, and allows the rest of the grounds to be dark. Outside light fixtures with canisters, readily available, can focus outside lights on entrances and areas in need of high security. A dark-skies environment is also more peaceful and restful. Most lighting and home improvement stores will be familiar with dark skies lighting and will be able to help you purchase appropriate fixtures. (For more information, visit [www.darksky.org](http://www.darksky.org) and check out “More Information” at the end of this section.)

## **Heating, Ventilation, and Air Conditioning**

Heating and cooling account for at least 40 percent of a building’s entire energy cost. When building or renovating, the HVAC (heating, ventilation, air conditioning) systems are a good place to concentrate efforts for energy and financial savings. A congregation’s approach to HVAC depends a great deal on climate, geography, and building size. Cooling a church in Minneapolis is very different than cooling one in Florida. The following suggestions should be tailored to the conditions of your particular church. Focus your efforts on the areas where you can get the most energy savings.

### **Tailor heating and air conditioning to fit the needs and timing of specific spaces.**

Large energy savings can be achieved by tailoring heating and cooling to specific times, spaces, and needs. Churches commonly have large spaces that go unused for much of the week. Heating and cooling these spaces in non-use times is very wasteful. Programmable thermostats allow heating and cooling to be adjusted by room and time. Override switches allow you to override the program if needs change.

### **MORE INFORMATION**

EPA has an excellent site on energy conservation, including lighting choices, at [www.energystar.gov](http://www.energystar.gov) and a specific site for energy conservation for churches at [www.energystar.gov/congregations](http://www.energystar.gov/congregations). From this site, you can download the excellent resource, *Putting Energy Into Stewardship: EnergyStar for Congregations Guide*. These sites will also give you guidance on buying EnergyStar products.

Also, check out Interfaith Power and Light’s [www.theregenerationproject.org](http://www.theregenerationproject.org). It gives churches specific guidance on conserving energy in your particular state. The Washington, D.C., Energy Office’s Green Faith Guide, available at [www.energy.dc.org](http://www.energy.dc.org), has a good section on energy use in churches. (More information on this text is available in the Appendix.) Increasingly, lighting and home improvement stores also have information on low-energy lighting alternatives and products.

Turning down the temperature during the cooler months and turning it up in the warmer months can also result in a considerable energy savings. Change the temperature a degree or two each month so that the congregation can adjust slowly.

If you plan to have a large central heating and cooling system, consider an Energy Management System (EMS). An EMS is a central control system that monitors energy usage in a building and adjusts energy for maximize efficiency while also providing for the comfort of its occupants. (For additional information, check out “More Information” at the end of this section.)

### **Use Low-E, double-paned, energy efficient windows when possible; Ensure that they are caulked and enclosed properly**

Windows play an important role in any energy-efficient building plan. Summer heat can pour into a building through the windows. In the winter, leaky windows allow much needed heat to escape. According to David Johnston, the author of *Green Remodeling*, windows allow about 25 percent of a building’s heat loss in winter and can cost \$20 billion in electricity nationwide each year.

Whenever possible, use low E-value double-paned windows. Double-paned windows provide twice as much insulation compared to single-paned windows. New, low emissivity, “low E,” windows contain a thin, transparent coating of silver or tin oxide that prevents heat loss in cooler months by reflecting the room’s heat back into the building while allowing solar heat to penetrate. Specialized low E windows have been tailored to specific climates and applications, with Southern and Northern low E windows now available.

If you are not planning to replace the windows, consider adding storm windows to cut down on energy loss. It is also important to make sure windows are sealed properly. Caulking and weather-stripping are inexpensive and easy ways to gain higher energy-efficiency. According to EPA, a 1/8-inch air gap along the opening of a pair of 6-feet, 8-inch doors is the same as having a 10-square-inch hole in your wall. You can also use transparent window films to cut down on energy loss. (For additional information, check out “More Information” at the end of this section.)

### **Insulate walls and roof**

Insulation needs vary dramatically depending on climate and building design. Insulation is a relatively inexpensive way to save on heating and cooling costs as well as to lower energy use. For spaces that are not heated or cooled or used consistently, lighter insulation might be adequate. For high use areas, exposed to the outdoors, insulation levels should be higher.

Add extra roof insulation, particularly if you plan to have an attic space or live in a warm climate. Consider adding a radiant barrier underneath your roof decking if you live in a warm climate. A radiant barrier blocks the heat from the roof that

### **QUICK CHECKLIST**

- Tailor heating and air conditioning to fit the needs and timing of specific spaces.
- Use Low-E, double-paned windows whenever possible. Ensure that they are caulked and enclosed properly.
- Insulate walls and roof.
- Maintain, upgrade, or replace your heating/air conditioning.
- Include a vestibule or air-lock doors.
- Use passive measures for energy conservation, such as draperies and shades, awnings, and strategically planted trees
- Add an air exchanger for ventilation and better energy exchange.

would otherwise be directed down to your attic. Both roof insulation and radiant barriers keep attic spaces cooler and affect the comfort and cooling of the upper floors of your building. Attic vents and fans can also be used to keep upper floors cooler.

An R-value measures the effectiveness of insulation. For new construction, the EPA recommends using insulation rated R-19 to R-38 depending on local weather conditions. State and local building codes require increasingly better insulation, and you might see far greater energy savings by exceeding the minimum requirements. When looking at insulation, consider recycled materials, such as blown cellulose, or denim batts, or those materials that are produced more naturally, such as soy-based foam insulation. Blown insulation is particularly effective since it can get into cracks and crevices that more traditional batting cannot. (For additional information, check out “More Information” at the end of this section.)

### Maintain, upgrade or replace your heating/air conditioning

Whether you plan to renovate or build, consistent maintenance of your HVAC system is a cost-effective way to save energy and increase the life of your equipment. Regular check-ups by a licensed contractor are a good place to start. Replace air filters regularly, clean heat-transfer coils in heat pumps, air conditioners, and chillers, inspect ducts and piping for leakage, and have your boiler or furnace checked out annually.

If you can afford new equipment, consider replacing your HVAC system, particularly if it is old, in favor of a newer, highly-efficient model. Often, even expensive investments such as these will pay for themselves over time. Look for EnergyStar equipment for smaller models. Pay particular attention to sizing. An HVAC system with too much capacity will be wasteful and inefficient; too little capacity will leave parishioners uncomfortable and encourage over-use. When making a purchase, look for rebates, loans, and local incentives. If you have a large system, consider variable-speed drives on blowers and pumps. For those churches using forced air heating and cooling systems, buy high-efficiency motors. (For additional information, check out “More Information” at the end of this section.)

### Include a vestibule or air-lock doors

Often churches have large doors that allow heat or cold air into the building. Having a distinct enclosed entrance-way in high-traffic areas catches the unwanted air in a small space before it has a chance to dissipate out into the larger space. This area does not need to be heated or air-conditioned. You can create this space by adding a vestibule or just installing an extra set of doors inside the building. (For additional information, check out “More Information” at the end of this section.)

Expect some confusion regarding newer products. One churchgoer, who was building an Earth-friendly home in the mountains, asked her contractor to consider denim insulation, a highly efficient insulator made from old denim or scraps from denim processing plants. Her contractor scratched his head and said: “Let me get this straight now. You want me to put blue jeans in your walls?” That same contractor, however, liked the tankless hot water heater the woman had installed so much that he bought one for his own home and is recommending them to everyone he sees.

## MORE INFORMATION

EPA has an excellent site on energy conservation, including information on HVAC, at [www.energystar.gov](http://www.energystar.gov) and a specific site for energy conservation for churches at [www.energystar.gov/congregations](http://www.energystar.gov/congregations). From this site, you can download the excellent resource, *Putting Energy Into Stewardship: EnergyStar for Congregations Guide*. These sites will also give you guidance on buying EnergyStar products.

Note: An internet search on specific products, such as "air exchanger" will provide you with commercial suppliers.

Also, check out Interfaith Power and Light's [www.theregenerationproject.org](http://www.theregenerationproject.org). It gives churches specific guidance on conserving energy in your particular state. The Washington, D.C., Energy Office's Green Faith Guide, available at [www.energy.dc.org](http://www.energy.dc.org), has a good section on energy use in churches. (More information on this text is available in the Appendix.)

### **Use passive measures for energy conservation, such as draperies and shades, awnings, and strategically planted trees**

A very inexpensive way of decreasing energy use is by regulating the temperature of your building with shades, awnings, and trees. In order to better regulate inside temperatures, make sure blinds and draperies are installed on all windows. In the cooler months, open blinds and draperies during the daytime to allow the warmth of the sun to enter the building. Then close the blinds when the sun is not present to keep warm air in and cool air out. Conversely, in the warmer months, close the blinds to the sun, especially during the warmer periods of the day, and open them at night to let in cooler outside air. If your church is small, you can actually follow the sun around the building, closing and opening the blinds during different times of the day. Use awnings on the south, east, and west sides of the building to keep summer heat out. Similarly, plant trees on the east and west sides of the building. Deciduous trees are particularly helpful since they block sun in the summer, and in the cooler months, drop their leaves to allow the sun in. (For additional information, check out "More Information" at the end of this section.)

### **Add an air exchanger for ventilation and better energy exchange**

Unfortunately, in well-insulated buildings indoor air pollutants can get trapped inside, and indoor air quality can be adversely affected. To remedy this situation, it is advisable to add an air exchanger. This devise brings fresh air into the church through a mechanism which allows it to be heated (or cooled, as appropriate) by the air that is being exhausted from the building. Air exchangers greatly increase the quality of the inside air while at the same time reducing the cost of heating or cooling. (For additional information, check out "More Information" at the end of this section.)

## Hot Water Heaters

Traditional hot water heaters are notorious energy wasters, particularly in churches where use is inconsistent or infrequent. Heating water can account for as much as 25 percent of total energy costs, so it represents an opportunity to reduce energy use.

### **Insulate hot water tanks and pipes to eliminate heat escape**

An easy and inexpensive way to reduce heat loss from wasteful hot water heaters is to ensure that the tank and associated pipes are insulated. Use a hot water blanket to cover the tank. Locate your hot water heater as close as possible to where the water enters the system to minimize heat loss from pipes carrying the water. (For additional information, check out "More Information" at the end of this section.)

### Keep the hot water temperature on the hot water heater as low as possible, and tailor hot water to specific needs

Heating water is very energy-intensive, and over-heating is prevalent in large buildings. In general, the temperature on your hot water heater should be kept as low as possible. In addition, heating water only as high as necessary for specific uses is an easy and inexpensive way to save energy. The necessary temperature for hot water varies quite a bit by need. The water temperature needed for hand washing in lavatories is far less than that required for dishwashers.

The plumbing system can be reconfigured to take the hottest water most directly and efficiently from the tank to the high-temperature tasks. Hot water for other tasks would then go through a “blending valve” that would add cooler water to reduce the temperature for lower-temperature tasks. Separate heaters can also be added for specific sets of like-temperature tasks. (For additional information, check out “More Information” at the end of this section.)

### Turn off your hot water heater when it is not in use

The easiest and cheapest way to save energy with a hot water heater is to turn it off when it is not in use. Turning your hot water heater off is a particularly good idea for church buildings that are unoccupied for large periods of time. With the use of an inexpensive timer, you can keep your hot water heater off during times that it will not be used and warm it up in plenty of time for when it is needed. (For additional information, check out “More Information” at the end of this section.)

### Consider installing a tankless hot water heater

Conventional hot water heaters use a great deal of energy to heat water all day long, every day of the year. Tankless, on-demand, hot water heaters eliminate the need for large storage tanks by heating water as it comes into the building only when you need it, and only for as long as you need it. Cold water is fed into a small appliance, about the size of a briefcase, which instantly heats the water as you need it. Tankless hot water heaters can easily tie into your existing plumbing system and can cut hot water heating costs in half. (For additional information, check out “More Information” at the end of this section.)

### QUICK CHECKLIST

- Insulate hot water tanks and pipes to eliminate heat escape.
- Keep the hot water temperature on the hot water heater as low as possible, and tailor hot water to specific needs.
- Turn off your hot water heater when it is not in use.
- Consider installing a tankless hot water heater.

### MORE INFORMATION

EPA has an excellent site on energy conservation, including hot water heaters, at [www.energystar.gov](http://www.energystar.gov) and a specific site for energy conservation for churches at [www.energystar.gov/congregations](http://www.energystar.gov/congregations). From this site, you can download the excellent resource, *Putting Energy Into Stewardship: EnergyStar for Congregations Guide*. These sites will also give you guidance on buying EnergyStar products. An Internet search on specific products, such as “tankless hot water heater” will provide you with commercial suppliers.

Also, check out Interfaith Power and Light’s [www.theregenerationproject.org](http://www.theregenerationproject.org). It gives churches specific guidance on conserving energy in your particular state.

### QUICK CHECKLIST

- Talk to your architect, utility company, and builder about the possibility of using green energy for part or all of your energy needs.

### MORE INFORMATION

Check with your local utility on the availability of green power in your area. Also, check out Interfaith Power and Light's [www.theregenerationproject.org](http://www.theregenerationproject.org). It gives churches easy-to-understand information on procuring green energy and very specific guidance on green energy options in your particular state.

EPA has an excellent site on energy conservation, including a small section on green energy, at [www.energystar.gov](http://www.energystar.gov) and a specific site for energy conservation for churches at [www.energystar.gov/congregations](http://www.energystar.gov/congregations). From this site, you can download the excellent resource, *Putting Energy Into Stewardship: EnergyStar for Congregations Guide*.

Check EPA for funding sources for clean energy at [www.epa.gov/cleanenergy/pdf/eere\\_fun.pdf](http://www.epa.gov/cleanenergy/pdf/eere_fun.pdf)

## Green Energy

Alternative energy, or “green energy,” is becoming increasingly available and could be used to meet all or at least part of your church’s energy needs. Green energy typically comes from energy sources that are renewable and are produced in a manner that has little impact on the Earth. They include solar, wind, geothermal, low-impact hydroelectric, and even landfall gases. However, some sources that claim to be “green” actually have ecological impacts. Low-head hydroelectric power, for example, can be safe and harmless, while larger hydroelectric facilities can be very disruptive to river ecosystems and their inhabitants.

You can use some clean, green energy sources, particular solar power, by adding the green energy source directly on the church’s building or grounds. Another way of utilizing alternative energy sources indirectly is to contact your utility and ask that part or all of the amount of energy your church is currently using can come from green sources. The utility will then purchase from green sources the equivalent of the amount of power you use and bring it on to the power grid. (For additional information, check out “More Information” at the end of this section.)

**Solar energy.** Depending on your climate and location, solar energy can be an affordable, reliable source of part or all of your energy needs. According to *Green Remodeling*, the amount of the sun’s energy coming into the earth is 7,000 times the amount of the world’s energy consumption. The potential for harnessing the sun’s energy, which has heretofore been largely untapped, is expected to expand greatly as energy prices soar and other energy sources are depleted.

“Passive” solar requires no equipment or mechanical infrastructure and is virtually free. Passive solar design orients a building in the most optimal direction to take advantage of the sun’s energy. It also places windows and key work spaces to utilize natural lighting for many tasks as possible and uses fans to distribute the heat and cool the building.

Solar cells, which are typically placed on the roof of a building, can also be used to collect the sun’s energy. Each four-square-inch cell typically produces about half a volt of electricity, and can be used in small or large bundles. An inverter is needed to convert solar energy into the alternating current required by most electric devices. Rapid advances in design are resulting in dramatic decreases in the cost of solar technology. Coupled with rising energy costs, solar energy is an increasingly viable source of energy in many areas of the country.

**Wind energy** has become an economically viable, clean energy alternative in many locations. Wind generators usually contain three large blades on each of series of large towers. Wind turns the blades, which in turn spin a shaft, which is connected to a generator that makes electricity. Electricity is sent to homes, businesses, and churches through distribution and transmission lines.

According to the Department of Energy, wind power is the fastest growing energy source in the country. *Green Remodeling* says that North Dakota, Kansas, and Texas are believed to have enough harnessable wind to meet all of our nation's energy needs. Local farmers can also benefit economically by "double-cropping"—growing crops and producing wind power on the same land.

Wind power can be somewhat contentious because of the potential unsightliness and noise associated with rows of large wind towers. Birds also can be harmed by the blades. Efforts are underway to construct blades that are "bird-friendly" and to make the towers more aesthetically conducive to the local environment.

Other relatively clean energy sources are available as well. Geothermal energy, from underground hot water or stream, can either be used to directly heat a building or to drive turbines, which in turn run generators. Landfill gas is created when bacteria breaks down trash rotting in landfills. The gas can then be burned to create electricity.

**FIGURE 2. STATE-BY-STATE SOLAR SAVINGS AND INVESTMENTS**

|                | Size Solar System (kW) | Initial Payment | Rate of Return | Payback (years) |
|----------------|------------------------|-----------------|----------------|-----------------|
| New Jersey     | 133                    | \$69,119        | 26.10%         | 4.5             |
| Connecticut    | 133                    | \$77,382        | 19.30%         | 5.8             |
| Hawaii         | 133                    | \$266,575       | 16.50%         | 6.6             |
| Texas          | 25                     | \$19,808        | 14.10%         | 7.5             |
| New York       | 133                    | \$155,094       | 12.30%         | 8.3             |
| California     | 133                    | \$299,417       | 11.00%         | 9               |
| Massachusetts  | 133                    | \$195,641       | 9.60%          | 9.9             |
| North Carolina | 133                    | \$140,622       | 8.50%          | 10.6            |
| Montana        | 133                    | \$154,007       | 7.50%          | 11.5            |
| Oregon         | 800                    | \$771,529       | 5.90%          | 10.3            |

Source: SunEdison 2006

### Saving Money with Solar: Reviewing Rates and Using Smaller Systems

Utility companies often employ various rate structures so that a congregation may be charged multiple rates depending upon usage (time of day and volume). These varying rates can impact whether solar power is cost effective for congregations. Congregations may be able to install smaller solar systems to offset energy used at higher electric rates and thereby reducing their overall bill while lowering the solar installation capital costs. Analyzing the congregation's overall utility bill will help determine whether a solar system—whether small or large—is cost effective.

## Why is it Important?

Throughout the Bible, water plays a very significant role in our understanding the nature of God and our relationship with the Earth. The Bible contains over 500 references to the word “water” alone and countless other references to watery subjects like rain, storms, rivers, and floods. In the Bible, water is used to illustrate the importance of God to our physical survival and our spiritual sustenance. Water images in the Bible such as Jesus’ baptism in the Jordan remind us that water is a sacred gift from God.

The availability of clean water is essential to the survival of every species on Earth. Yet, a billion people worldwide lack access to clean drinking water and water-related disease is a major killer of children worldwide. Even in the United States, antiquated sewage systems often cannot keep up for the demand for clean drinking water. The news for non-human species is bleak as well, with at least 20 percent of freshwater fish species either extinct or at risk of extinction. Church buildings use substantial amounts of water and discharge equally substantial amounts of water back in the ground or in nearby streams and rivers. According to the U.S. Green Building Council, water efficiency measures in commercial buildings can reduce water usage by one third or more and reduce costs accordingly.

The Building a Good Foundation section discusses opportunities for protecting water during the construction process, in particular minimizing storm water runoff and protecting nearby wetlands. Other important ways can be employed to protect water quality, including limiting the use of pesticides and fertilizers, managing storm water runoff, and capturing rainwater in rain barrels.

### QUICK CHECKLIST

- Replace old showerheads, toilets, and faucets with low-flow devices.
- Explore the possibility of re-using “gray water.” .
- Use laundry appliances that minimize water use.

### Replace old showerheads, toilets and faucets with low-flow devices

Newer showerheads, toilets, and sinks, by law, must use less water than traditional fixtures. For example, older toilets use 4 to 8 gallons of water per flush, while newer toilets typically have a maximum flush volume of 1.6 gallons. Many of the problems with earlier low-flow toilet models have been eliminated, and they now work quite well. Several products are now on the market which exceed the minimum standards. In addition to replacing older units, try to find the units that use the least amount of water possible. Consider waterless urinals, dual-flush and composting toilets, and sensors on sinks and flushing toilets which limit water use. (For additional information, check out “More Information” at the end of this section.)

### Explore the possibility of re-using “gray water”

“Gray” water, makes up 50 percent to 80 percent of total waste water and is produced from bathroom sinks, washing machines, and other activities that do not involve human sewage or food processing. Much of this water can be captured and used for other purposes, such as landscaping and irrigation. Cheaper than treated water, gray water lessens the pressure on scarce fresh water supplies, eases the strain on overloaded water treatment plants, and protects fresh water aquatic species. Indoor plumbing can be configured to isolate gray water from other wastewater. Gray water is then pumped outside.

Many drought-prone areas are encouraging, or even requiring, the use of gray water. St. Petersburg, Florida, has developed a comprehensive system that provides gray water to 7,000 homes and businesses. (For additional information, check out “More Information” at the end of this section.)

### Use laundry appliances that minimize water use.

When replacing laundry appliances, choose models that use the least amount of water. Front-loading washing machines typically use less water for the same amount of laundry than top-loading machines. The appliance information should include water usage figures for comparison. And remember to choose EnergyStar appliances. (For additional information, check out “More Information” at the end of this section.)

### MORE INFORMATION

Check out [www.epa.gov/owm/water-efficiency](http://www.epa.gov/owm/water-efficiency) for ideas on water conservation and maintaining water quality. Washington, D.C., Energy Office’s *Green Faith Guide*, which includes a section on water conservation, can be purchased at [www.energy.dc.org](http://www.energy.dc.org) (Check the Appendix for more information on this text.) Download the Water Use Backgrounder at [www.greenerbuildings.com](http://greenerbuildings.com).

## Why is it Important?

As children we were taught the story of the great flood that occurred when humans were disobedient. Noah, the only righteous human left on the earth, bundled up his family and set forth on an ark to wait out the storm. But Noah and his family were not alone, for God instructed Noah to bring two of every kind of bird, animal, and creeping thing on Earth along with them (Genesis 6:19-20). After the flood waters subsided, God commanded Noah to leave the ark and take with him his family and every living thing so that they might abound on the Earth, be fruitful and multiply (Genesis 8:16).

Most of us know that God then set a rainbow in the sky and made a covenant with Noah to honor life and not to destroy the Earth again. But few of us remember that God made his covenant not only with Noah but also with “every living creature that is with you, for all generations: I have set my bow in the clouds, and it shall be a sign of the covenant between me and the earth” (Genesis 9:12-13). As God’s special guardian agents in the world, humans are called upon to participate in this covenantal relationship with creation, just as Noah did.

An important way to honor that covenant is to think about the land around the church as that small piece of earth that the congregational community is called upon to protect. How we manage the grounds outside our churches has a decided impact on how we live in our home ecosystem as well as how we present ourselves to the neighboring community. We can best glorify God by caring for the piece of God’s Earth entrusted to us.

### QUICK CHECKLIST

- Use trees, shrubs, grasses, and flowers that are native to the area.
- Limit the use of pesticides and fertilizers.
- Manage storm water runoff.
- Save water by minimizing watering and capturing rainwater.
- Plant gardens that connect parishioners to creation.

## Church Grounds

In thinking about landscaping, try to mimic the natural landscape as much as possible. Remember that the church resides in a watershed, and anything you do affects the entire watershed, particularly any part downstream of you. Chemicals that you place on the lawn will wash down to rivers, streams, and bays. Seeds of plants that are not native to the area will be carried and assert themselves in other parts of the ecosystem. Parking lots will speed the flow of water across the land and increase the water’s scouring effect on the local landscape. In arid areas, water used for landscaping often comes from precious underground aquifers, essential to the lives of other humans and non-humans in the area.

### **Use trees, shrubs, grasses and flowers that are native to the area**

Native flowers and shrubs offer attractive, low-chemical, low-cost alternatives to non-native species. They also provide important habitat for wildlife, birds, insects, and butterflies. Native landscaping tends to be drought-resistant and needs much less watering than landscaping with non-native species.

The explosion of non-native plant species is crippling many important ecosystems. Many non-native species do not have natural predators so they take over habitat and crowd out native species. In addition, because they are not ecologically suited to the area, non-native plants often require more watering and extra fertilizer. They wreak havoc to the delicate balance within an ecosystem by disrupting the natural food chains that exist. For example, the West Virginia white butterfly normally lays its eggs on the native toothwort plant, which is being overwhelmed by the pervasive non-native garlic mustard plant. The West Virginia white butterfly mistakenly lays its eggs on the garlic mustard. When the eggs hatch, the caterpillars eat the garlic mustard and die.

Consider eliminating in part, or completely, a traditional lawn in favor of using attractive natural grasses, wildflowers, or natural woodlands. The EPA recommends “xeriscaping”—the use of native, hardy, low-maintenance plants for landscaping—as an important way to save the Earth and to save money on watering and maintenance. The group, Noah’s Notes, estimates that xeriscaping or “naturescaping” can reduce residential water bills by 40 percent, lawn maintenance costs by 50 percent, and energy bills by 15 percent, because of the savings in heating and cooling associated with well-placed trees. Imagine the economic benefits to churches, which typically have even larger lawns.

Bear in mind that many in your congregants might have an emotional attachment to the large church lawn and manicured gardens. You might begin slowly by transitioning part of the lawn to a wildflower or vegetable garden. Educate the church members to the ecological and economic benefits of more natural church grounds. Invite various church groups—men’s clubs, women’s clubs, youth, trustees—to participate in the grounds projects. (For additional information, check out “More Information” at the end of this section.)

### **Limit the use of pesticides and fertilizers**

According to the EPA, the nation uses over five billion pounds of pesticides annually. Pesticides travel easily through the food chain and are commonly found in locations far from where they were applied. Pesticides can create numerous health problems and have been linked to various cancers as well as neurological, psychological, and immune system disorders. Children are particularly sensitive to pesticide poisoning. Recent studies have linked pesticides to childhood asthma, neurological problems, and effects on sexual development.

Chemical pesticides should be used only when absolutely necessary. Non-chemical approaches to pest-management include using more pest-resistant native plants, using screens and netting to keep pests out, maintaining good soil, and purchasing non-chemical pest management products. Natural landscape professionals and the EPA recommend an Integrated Pest Management (IPM) approach to dealing with outdoor pests. According to the EPA, IPM is an effective and environmentally sensitive coordinated pest control approach that takes into account all current

**Georgetown Gospel Chapel** is a small urban church in an industrial area of Seattle. Committed to help serve the neighboring community, the church eliminated its yard, along with its expensive sprinkling system, and replaced it with vegetable and flower gardens. The gardens not only serve as a source of free vegetables to local citizens but have also become a wonderful place of communal work and play for the congregation and the surrounding community. (From *Greening Congregations Handbook: Earth Ministry 2002*).

You might also investigate the possibility of including a “green” rooftop on part of your building. Gaining popularity, particularly in urban settings, these rooftop gardens usually contain a dense cover of native plants that slows rain waters and filters pollutants. Green roofs can also decrease energy costs by cooling the roof in summer and warming it in winter. (For additional information, check out “More Information” at the end of this section.)

information on the life cycles of pests and their interaction with the environment. IPM emphasizes managing pests with the least possible hazard to people, property, and the environment, and using chemicals as a last resort. For more information on pesticides and IPM, check out [www.epa.gov/pesticides](http://www.epa.gov/pesticides).

Similarly, the use of fertilizers, particularly for lawns, has created ecological problems, particularly for waterways and the surrounding communities. Nutrients from chemical fertilizers which do not get absorbed into the ground are quickly washed into nearby creeks, streams, and waterways. Once in the water, excess nutrients can cause excessive algal blooms that cut off the light and deplete the oxygen needed for other aquatic organisms. All aspects of the aquatic food chain are affected, from insects to fisheries, disrupting human and non-human food sources as well as local economies that depend on them. Ten percent of the once thriving Chesapeake Bay, located near Washington, D.C., is now considered an ecological dead zone, in part because of fertilizer runoff.

To minimize the use of chemical fertilizers, use native plants and grasses whenever possible. They generally require less fertilizer and water because they are more adapted to local weather and soil conditions. Composted material also makes a great natural fertilizer, which can be easily applied to gardens. Keeping the lawn mowed high will keep lawns naturally greener as will leaving clippings on the lawn. If you need to use chemical fertilizers, get a soil test first to determine the exact amount and kind of nutrients needed. Then, fertilize only when necessary, only as much as necessary, and only when your plants and lawn are growing and can take up nutrients. (For additional information, check out “More Information” at the end of this section.)

### **Minimize storm water runoff by diverting water onto vegetated surfaces**

During a storm, water washes away soil particles, nutrients, and toxics from the land, particularly in the first hour. Often, storm water is moving quickly and forcefully, and if it is not given the opportunity to seep into the ground, it can be very destructive to both human and non-human life. Storm water that is not absorbed into the land upstream can cause flooding and destruction to downstream communities. Unchecked storm water can also dump large quantities of soil particles, nutrients, and toxics into waterways, causing water quality problems that affect the entire aquatic food chain (see section on fertilizers and pesticides above.)

Good storm water management slows storm water coming through church grounds and maximizes the opportunity for that water to infiltrate into the ground slowly. A very simple way to help manage storm waters is to redirect the church’s down-spouts to pour out onto vegetated surfaces rather onto pavement. The soil filters pollutants and allows the rain water to gradually seep into the underground aquifer.

Developing on-site “rain gardens” can be a fun, church-wide project that can help absorb storm water. Rain gardens are special gardens that typically include native plants that can absorb high quantities of water, which are placed at low spots on church grounds. Rain gardens absorb storm water coming from the grounds and paved surfaces, capture nutrients and toxics before they can pollute waterways, and filter these pollutants through the soil. Another way to slow down storm waters is to minimize the amount of paved surface on the church grounds (see section on Parking and Transportation.) (For additional information, check out “More Information” at the end of this section.)

### **Save water by minimizing watering and capture rainwater**

You can also collect rain waters in rain barrels placed under your downspouts. After the storm ends, water from the rain barrels can then be released more slowly onto vegetated areas. The extra water can also be used for watering plants, grasses, and trees. (For additional information, check out “More Information” at the end of this section.)

### **Plant gardens that connect parishioners to creation**

Church grounds afford a terrific opportunity to begin connecting parishioners with creation and to get them thinking about protecting the Earth. Gardens can become a place of engagement in the natural process of growth, flowering, fruiting, and even death. Through gardening, children, who today are often estranged from the natural world, can begin to understand and appreciate the wonder of God’s creation. Vegetable gardens present an opportunity for providing for those who need food within the church or within the broader community. Memorial gardens can also be especially meaningful. St. Francis in the Fields Episcopal Church in Louisville, Kentucky, has set aside a garden where congregants can bury their cremated ashes. Also, meditation gardens give a chance for parishioners to enjoy some quiet time in a sacred space. (For additional information, check out “More Information” at the end of this section.)

## **Transportation and Parking**

As discussed in the Building a Good Foundation section of this text, finding a site for your church building that allows for public transportation can help eliminate one of the most significant causes of global warming and air pollution—fossil fuel use by automobiles. Most churches, however, do need to provide parking for its congregants. As you plan parking space, bear in mind that a large paved surface is quite harmful to the local ecology since it takes up natural space that would otherwise provide habitat area. It replaces that habitat with a solid surface that does not absorb moisture or filter pollutants the way vegetation does. In storms, water that would normally be absorbed by vegetation races across pavement, picking up oil, grime, and other pollutants on its way to local creeks, rivers, and streams. Recent studies also suggest that the sealant used on most paved surfaces contains dangerous pollutants.

### **MORE INFORMATION**

The *Good Neighbor Handbook* written by the Potomac Conservancy and the Nature Conservancy offers very good information on landscaping, grounds, pesticides, fertilizers, storm water runoff, native plants, rain barrels, green roofs, and general information on protecting watersheds and waterways (See Appendix for more information on this text). It is available at [www.potomac.org](http://www.potomac.org). The *Green Faith Guide*, by the Washington, D.C., Energy Office, has information on landscaping and pesticides. To purchase a copy, go to [www.energy.dc.org](http://www.energy.dc.org). (See Appendix for more information on this text.)

## QUICK CHECKLIST

- Encourage congregants to bicycle, walk, use alternative transportation, and to carpool.
- Consider multi-level parking to limit the footprint of the parking lot and minimize the dimensions of parking spaces.
- Consider sharing parking space with organizations in the area.
- Use pervious paving surfaces that absorb moisture, such as gravel, brick, natural stone, pervious concrete, and porous asphalt.

## MORE INFORMATION

On the EPA's website, [www.epa.gov](http://www.epa.gov), you will find a number of useful articles on practical alternatives to traditional impervious pavement. In particular, look at [www.epa.gov/own/mtb/porouspa.pdf](http://www.epa.gov/own/mtb/porouspa.pdf). Also, [www.epa.gov/epp/pubs/dodfct.pdf](http://www.epa.gov/epp/pubs/dodfct.pdf) contains an interesting article on the "greening" of the Pentagon's parking lots.

### **Encourage congregants to bicycle, walk, use alternative transportation, and carpool**

There is much a church can do to cut down on fossil fuel use by simply encouraging congregants to find alternative transportation or to carpool. Churches can create a culture where car use is a last resort by providing a place to safely secure bicycles, publicizing bus routes, and encouraging walking. If members must drive, organize a community carpool system. This not only cuts down on gas use and emissions, but saves congregants money and creates a sense of community. (For additional information, check out "More Information" at the end of this section.)

### **Consider multi-level parking to limit the footprint of the parking lot and minimize the dimensions of parking spaces**

The design of a church's parking structure and parking spaces can significantly reduce its negative impact on the local ecology. To minimize the impact on natural spaces, consider a structure that is multi-leveled rather than one that is spread out over a large space. In addition, minimize the dimensions of the spaces, so more cars can fit in a smaller space. Limiting parking also cuts the cost of maintaining a large lot. (For additional information, check out "More Information" at the end of this section.)

### **Consider sharing parking space with organizations in the area**

Church lots typically take up a large amount of space but are only fully utilized a few times a week. Many churches have found interesting and cost-effective ways of sharing parking space with nearby schools and office buildings that do not need parking when the church would need it. Sharing parking space is a cheap and effective way to eliminate large amounts of impervious surface that sit idle much of the week. (For additional information, check out "More Information" at the end of this section.)

### **Use pervious paving surfaces that absorb moisture, such as gravel, brick, natural stone, pervious concrete, and porous asphalt**

Paved surfaces typically do not absorb moisture, so storm waters can race freely over them, carrying grime, dirt, oils, and other pollutants from parking lots. As discussed in the Church Grounds section, it is important to slow down storm waters that can ravage nearby communities and carry dangerous pollutants to the surrounding waterways. Many alternatives to traditional asphalt are now available and are much friendlier to the local ecology. Gravel, brick, stone, pervious concrete, and porous asphalt allow storm waters to seep into the ground. (For additional information, check out "More Information" at the end of this section.)

## Why is it Important?

In the Bible, many important things happened in the wilderness. Abraham received his call. Jacob wrestled with God. Moses found his voice so that he might lead his people. Jesus was tempted by the devil in the wilderness, and ultimately withdrew to a deserted mountaintop so that he might teach his disciples far from the crowds.

Our Biblical tradition is rich with images of God coming to humans in natural settings. Unfortunately, in a world that is increasingly urbanized and developed, many of us have lost our deeply rooted connections with our Earth home. As you think about building or renovating your church, you might consider opportunities for reconnecting parishioners to God's great gift of creation.

An infinite number of opportunities are available for churches to make creation connections available, regardless of whether yours is a small rural church nestled in the mountains, or a large urban church in the middle of a large city. Adding a garden, a pond, or even a small butterfly bush can begin to connect church members and the local community with the created world. Sacred spaces on the grounds can be set aside for prayer and meditation.

Identify plants, trees, and other living things in and around church property. You might adopt part of a local creek or stream and commit to keeping it clean and healthy by using sound building practices on your site. Use the grounds, no matter how small, to educate the congregation about the wonders of the natural world. A church in Alexandria, Virginia, developed an interpretative trail through its wooded lot and encouraged parishioners as well as local school children to use it.

The interior of the church can be a place of celebration and connection with the natural world as well. Wall hangings, photographs, pictures, stained glass, and sculpture can bring the outside in as can small plants and gardens. Intimate, sacred space with natural surroundings can be set aside for contemplation and spiritual connection. Well-placed signs on green building features can educate church members and remind them of the connections between what they do inside and what happens outside.

As church communities begin to connect more with the created world, church members will be more inclined to respond in loving ways towards creation. As church behavior changes, individuals will take these changes into their homes and out into the world. And, the church will reflect out to the neighboring community as well what it means to be accountable for the small part of God's creation for which we are responsible.

## MORE INFORMATION

Earth Ministry's *Greening Congregations Handbook*, available for purchase at [www.earthministry.org](http://www.earthministry.org), has a wealth of information on making creation connections. (More information on this text is found in the Appendix.) The Unitarian Universalist Ministry for the Earth, [www.uuministryforearth.org](http://uuministryforearth.org), also has good information.

# Appendix: More Information

## **The Good Neighbor Handbook, by the Potomac Conservancy and the Nature Conservancy, 2005**

The Potomac Conservancy and the Nature Conservancy have joined forces to create a very useful guide on how to be a good neighbor to the Potomac River, near Washington, D.C. While it is oriented to the Potomac River, it gives a wide range of good, practical advice on how to manage your house and lawn in a manner that is protective of any nearby body of water. Specifically, it offers guidance on *maintaining earth-friendly grounds, green landscaping, and storm water management*. You can download a copy of this guide at [www.potomac.org](http://www.potomac.org)

## **Green Faith Guide, by the Washington D.C. Energy Office, 2004**

The Green Faith Guide offers guidance to the faith community on adopting sustainable, Earth-friendly practices for houses of worship. It gives practical information on a number of topics of interest, including *green building, landscaping, pesticides, and energy use*. It also includes a very good section on "How to Pay for Improvements." Contact the District of Columbia Energy Office in Washington, D.C., to purchase a copy at (202) 673-6700 or [www.energy.dc.org](http://www.energy.dc.org)

## **Green Remodeling: Changing the World One Room at a Time, by David Johnston and Kim Master, New Society Publishers, 2004**

This book is oriented towards residential building but is very informative and explains the basics of green building very well. In addition, it has very good chapters on *energy use, water, and landscaping*.

## **Greening Congregations Handbook, edited and compiled by Tanya Marcovna Barnett, published by Earth Ministry, 2002**

This encyclopedia of creation care has only a small section on green building but offers a broad range of information for churches on how to get a creation care program going and what to do with one once you have it. It includes readings, worship ideas, and education resources. It also offers ways to establish *creation connections* within your church. This handbook and other educational materials by Earth Ministry are available from [www.earthministry.org](http://www.earthministry.org)

## **Responsible Purchasing for Faith Communities, by Cassandra Carmichael, published by Center for a New American Dream, 2002**

This practical guide gives very specific information on how and where to buy a wide range of Earth-friendly products for churches. While not specifically a green building guide, it does offer advice on where to buy green products associated with church buildings.

## **[www.buildinggoodfaith.org](http://www.buildinggoodfaith.org) and [www.healthybuilding.net](http://www.healthybuilding.net)**

GreenFaith, a New Jersey based interfaith coalition, has partnered with the Healthy Building Network on a new project to offer very specific green building information for churches. This site is under development but should be very helpful as it evolves. For more information on GreenFaith's "Sustainable Sanctuaries" program, look at their website, [www.greenfaith.org](http://www.greenfaith.org)

# Appendix: More Information

## **[www.energystar.gov](http://www.energystar.gov) and [www.energystar.gov/congregations](http://www.energystar.gov/congregations)**

The Environmental Protection Agency (EPA) has put together these two sites which offer very comprehensive information on *energy conservation and energy use* for buildings, and for church buildings in particular. From the second site, you can download *Putting Energy Into Stewardship: EnergyStar for Congregations Guide*, a very practical and easy-to-understand guide to cost-effective energy improvements every congregation can make and the reasons they should make them. This site also gives examples of specific churches' experiences, with energy improvements.

## **[www.epa.gov/greenbuilding](http://www.epa.gov/greenbuilding)**

The EPA offers this helpful site, which gives guidance on a variety of topics related to green building. It is a good site to start with, as it gives a good overview of why going green is important and outlines the major components of Earth-friendly building.

## **[www.epa.gov/owm/water-efficiency](http://www.epa.gov/owm/water-efficiency)**

The EPA has put together a very comprehensive site on all aspects of *water use*. It explains the importance of water and also offers very specific suggestions for conserving water and protecting water quality.

## **[www.greenerbuildings.com](http://www.greenerbuildings.com)**

This very comprehensive and useful site is offered by GreenBiz and provides a wide range of easy-to-understand materials on green building as well as more technical information for architects and builders. This is a great site to start acquainting yourself to green building. The site includes useful backgrounders on a variety of subjects of interest, including *land use, architecture and design, energy use, building materials, water use, and waste management*, as well as case studies.

## **[www.nccecojustice.org](http://www.nccecojustice.org)**

For general information on making your church Earth-friendly, go to the National Council of Churches' Ecojustice site. The site has some good case studies of churches that have made specific changes to help care for creation.

## **[www.nwf.org](http://www.nwf.org)**

The National Wildlife Federation has lots of interesting and practical information on your yard Earth-friendly. While not specifically designed for churches, many of the suggestions can be adapted for church use. Go to the site and double-click on "Yard." You will also get information here on your church grounds can become "certified wildlife habitat."

# Appendix: More Information

## [www.sbicouncil.org](http://www.sbicouncil.org)

The Sustainable Buildings Industry Council is a not-for-profit organization whose mission is to “advance the design, affordability, energy performance, and environmental soundness of America’s buildings.” This website contains very technical information for those in the building community and would be worth recommending to your contractor or architect.

## [www.theregenerationproject.org](http://www.theregenerationproject.org)

The Regeneration Project, through its **Interfaith Power and Light Program**, is mobilizing a national interfaith effort to respond to global warming by promoting renewable *energy, energy efficiency, and conservation*. On this site, you can locate an Interfaith Power and Light program in your state, which in turn will give you guidance on energy use in your area, case studies, and practical ideas for conserving energy in churches.

## [www.usgbc.org](http://www.usgbc.org)

U.S. Green Building Council (USGBC) is a voluntary coalition of leaders in the building industry who have come together to promote environmentally responsible, economically viable and healthy buildings. USGBC has developed the Leadership in Energy and Environmental Design (LEED) program, a voluntary building rating system that rates buildings according to 34 ecological criteria. USGBC’s website provides more information on the LEED rating system and how a church can get certified. This site also includes technical information for green builders, so you might refer your contractor and architect to it.

## [www.uuministryforearth](http://www.uuministryforearth)

The Unitarian Universalist Ministry for the Earth offers this very comprehensive site that covers a number of aspects of making a congregational commitment to the earth. It includes worship, program, and educational information on the site as well as in downloadable documents. In its Green Sanctuary text, which is downloadable, it offers an *overview of green building (which includes site information)*, a chapter on *energy use* and particularly good information on *landscaping and gardening*. Throughout its site, there is information on *making creation connections*.

## [www.webofcreation.org](http://www.webofcreation.org)

This site is designed and maintained by a professor and students at the Lutheran School of Theology as a way to connect and educate people of faith around eco-justice issues. Check out the “Building and Grounds” section on many specific issues related to green building. They have particularly good information on *indoor air quality*.