

GREEN Building/Sustainable Living In the Hampton Roads, Virginia Area

The Future of Building is Here

Our Purpose

This paper presents information and local resources on sustainable building practices in the Hampton Roads area. **The goal of this paper is to promote sustainable living through environmental education.**

What is Green Building?

Green or sustainable building is the practice of creating healthier and more resource-efficient models of construction, renovation operation, and maintenance. The premise of green building is that when buildings are designed and operated with their lifecycle impacts in mind, they are more environmentally responsible, more profitable and economical, and healthier places to live and work.

What is sustainability?

Over the last three decades, sustainable development has been defined in literally hundreds of different ways. One of the most popular definitions from the 1987 Brundlant Report (from the UN World Commission on Environment and Development) states: **“Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.”**

Why is Green Building important?

“The statistics for the environmental impacts of buildings are staggering. **In the United States, buildings are responsible for over 65 percent of total electricity consumption, 30 percent of total greenhouse gas emissions, 136 million tons of construction and demolition waste (approximately 2.8 pounds per person per day) and 12 percent of potable water use. Globally, buildings use 40 percent (2 billion tons annually) of all raw materials.** Given the magnitude of the built environment, finding alternative building strategies that are in harmony with communities and ecosystems is imperative.”¹

Green Building Changing “Business as Usual”

The benefits of sustainable or green building practices extend beyond reducing environmental impacts. Green building strategies also make wise business sense by promoting economic savings through reduced operating costs, by improving the health and

Human subtlety will never devise an invention more beautiful, more simple or more direct than does Nature, because in her inventions, nothing is lacking and nothing is superfluous.

– Leonardo da Vinci

What is the good of having a nice house without a decent planet to put it on?

– Henry David Thoreau

CONTENTS

Green Building Fact Sheet/Elements of Green Building.....3

Green Building Terms/Definitions.....4-7

Green Building Standards.....8

Resources for Green Building.....9

Local Suppliers/Resources.....10-11

Financial Incentives for Green Building.....12

Local Green Building Projects.....13

Additional Resources.....14

*A note: This paper was compiled by the **Williamsburg Climate Action Network (WCAN)**, a chapter of the Chesapeake Climate Action Network (CCAN), an organization committed to educating and mobilizing citizens of our community in order to promote rapid change to clean energy and energy-efficient products, thus joining similar efforts worldwide to slow and perhaps halt the dangerous trend of global warming.*

GREEN BUILDING FACT SHEET

WHY GREEN BUILD?

Environmental Benefits

- Enhance and protect biodiversity and ecosystems
- Improve air and water quality
- Reduce waste streams
- Conserve and restore natural resources

Economic Benefits

- Reduce operating costs
- Create, expand and shape markets for green products and services
- Improve occupant productivity
- Optimize life-cycle economic performance

Social Benefits

- Enhance occupant comfort and health
- Heighten aesthetic qualities
- Minimize strain on local infrastructure
- Improve overall quality of life

HOW TO BEGIN GREEN BUILDING

As you begin to new project or renovation of a home, office, or other building talk to your builder and become informed about opportunities to incorporate green building practices. Contact local government officials and environmental organizations that can refer you to “green builders” and suggest sources for green building supplies. Ask about model green homes and buildings in your area and visit those sites to help you decide what to incorporate in your plans. Continue reading this handout for additional green building resources.

ELEMENTS OF GREEN BUILDING

There is not any one single technique for designing and building a green building, but green buildings often:

- Preserve natural vegetation;
- Contain non-toxic or recycled-content building materials;
- Maintain good indoor air-quality;
- Use water and energy efficiently;
- Conserve natural resources;
- Feature natural lighting;
- Include recycling facilities throughout;
- Include access to public transportation;
- Feature flexible interiors; and
- Recycle construction and demolition waste.

More developers are realizing the economic and environmental benefits of green buildings.

GREEN BUILDING TERMS/DEFINITIONS

As you begin to think about green building it is helpful to become familiar with some green building terms and definitions.

WHAT IS PASSIVE SOLAR DESIGN?

The conscious placement of a building and associated materials so the sun's direct energy is manipulated to affect the temperature in the building. Buildings with their longer walls and windows facing the winter noontime sun, and shorter walls and fewer windows facing the rising and setting sun are much easier to passively heat and cool than a building of the opposite orientation.

♦ *Every hour, more energy from sunlight strikes the earth than the entire human population uses in a whole year.*

WHAT IS PHOTOVOLTAICS?

The direct production of electrical current from solar radiant energy.

WHAT IS PHOTOVOLTAIC ARRAY?

A photovoltaic array is a linked collection of photovoltaic modules. Each photovoltaic (PV) module is made of multiple interconnected solar cells. The cells convert solar energy into direct current electricity. PV modules are sometimes, rather confusingly, called solar panels, although that term better applies to solar-thermal water or air heating panels. PV modules distinguish themselves from solar cells in that they are conveniently sized and packaged in weather-resistant housings for easy installation and deployment in residential, commercial, and industrial applications.

WHAT IS KWH?

The measure of electrical energy use, the rate is watts and the energy quantity is watts-hours.

♦ *A typical inefficient American home uses the energy equivalent of between 25,000 and 100,000 watt-hours (25-100 kWh) of electricity each day depending on its size, number of occupants, location, heat source etc.*

WHAT IS NET METERING?

A program that allows homes or businesses to offset grid electricity use with on-site, renewable energy-generated electricity at the same rate per KWH. Check www.dsireusa.org for details.

WHAT ARE COMPACT FLUORESCENT LIGHT BULBS (CF BULBS)?



A compact fluorescent lamp (CFL) is an energy saving lightbulb designed to fit into roughly the same space as an incandescent lamp, but with the advantages of a fluorescent lamp.

- ◆ *CF bulbs use one-quarter of the electricity of regular bulbs and last eight to ten times longer.*
- ◆ *A CFL can save over \$30 in electricity costs over the lamp's lifetime compared to an incandescent lamp and save 2000 times their own weight in greenhouse gases.*

WHAT ARE VOCs – VOLATILE ORGANIC COMPOUNDS?

Volatile organic compounds (VOCs) are organic chemical compounds that have high enough vapour pressures under normal conditions to significantly vaporize and enter the atmosphere. Many VOCs found around the house, such as paint strippers and wood preservatives, contribute to *sick building syndrome* because of their high vapour pressure. VOC's are often used in paint, carpet backing, plastics, and cosmetics. The United States Environmental Protection Agency (EPA) has found concentrations of VOCs in indoor air to be 2 to 5 times greater than in outdoor air. During certain activities indoor levels of VOCs may reach 1,000 times that of the outside air.

WHAT IS OUTGASSING/OFFGASSING?

Outgassing (sometimes called "Offgassing," particularly when in reference to indoor air quality) is the slow release of a gas that was trapped, frozen, absorbed or adsorbed in some material.

- ◆ *Three materials contribute significantly to home air toxicity – Paint, carpeting, and cabinets.*
- ◆ *Tip: Look on the label of the paint can for the paint's VOC level.*

WHAT IS RAINWATER HARVESTING?

Rainwater Harvesting is typically defined as capturing precipitation and using it as close as possible to where it falls. "The first step is to strive to harvest more rainfall in our landscapes than we use from municipal water sources or wells. This leads to more sustainable hierarchy in household and community management of our water resources in which:

- * Rainwater is our primary water source
- * Grey water is our secondary source
- * Municipal water or groundwater from private wells is strictly a supplemental sources used *only* in times of need."¹



- ◆ *One inch of rain captured from a 1000 square foot home can collect 625 gallons of water*

◆ *Water Scarcity is an increasing problem. The problem boils down to simple supply and demand. The Earth is a closed system, so freshwater supply is basically fixed. But rising populations and an increase in irrigated crops continue to drive up water demand. Indeed, agriculture consumes 70% of the water we use. In many regions we use more water than the natural rainwater system cycle provides. As a result nature's underground water supplies, called aquifers, are being drawn down. The giant Ogallala Aquifer, for instance, which lies under parts of eight US States and holds more water than Lake Huron, has been dramatically depleted.*

WHAT ARE ENERGY STAR APPLIANCES?

Products in more than 50 categories are eligible for the ENERGY STAR. They use less energy, save money, and help protect the environment. Ask for the ENERGY STAR. *For example, Energy Star dishwashers use 40% less water than conventional models.* Energy efficient choices can save families about *a third on their energy bill* with similar savings of greenhouse gas emissions, without sacrificing features, style or comfort. ENERGY STAR helps you make the energy efficient choice. Check out <http://www.energystar.gov/>.



◆ *Results are already adding up. Americans, with the help of ENERGY STAR, saved enough energy in 2006 alone to avoid greenhouse gas emissions equivalent to those from 25 million cars — all while saving \$14 billion on their utility bills.*

WHAT ARE LIVING (GREEN) ROOFS?

Green Roofs, are in short, vegetated roofs, or roofs with vegetated spaces. They are also referred to as eco-roofs and roof gardens.

Green roofs are quickly gaining popularity in North America, mostly because they provide environmental and economic benefits such as combating the urban “heat island” effect, detaining stormwater, reducing host building energy consumption and noise levels, and extending the life of the roof. Building owners also capitalize on the technology because green roofs enhance the urban landscape by adding beauty to the traditional drab concrete or stone rooftops we have always been used to. Check out www.greengridroofs.com or www.greenroofs.com.

WHAT ARE RADIANT BARRIERS?

A radiant barrier is a layer of aluminum placed in an airspace to block radiant heat transfer between a heat-radiating surface (such as a hot roof) and a heat-absorbing surface. They reduce building heating and cooling energy usage. A radiant barrier reflects radiant heat back towards its source, reflecting as much as 97%. They provide substantial energy savings in warm climates. When a radiant barrier is placed on the attic floor, much of the heat radiated from the hot roof is reflected back toward the roof. This keeps the top surface of the insulation cooler than it would have been without a radiant barrier and thus reduces the amount of heat that moves through the insulation into the rooms below the ceiling. Studies have shown that radiant barriers *can lower a cooling bill by between 5 and 10 percent* when used in warm, sunny climates. Check out http://www.ornl.gov/sci/roofs+walls/radiant/rb_01.html or <http://www.fsec.ucf.edu/en/publications/html/FSEC-EN-15/index.htm#cost>

WHAT IS SUSTAINABLE FORESTRY?

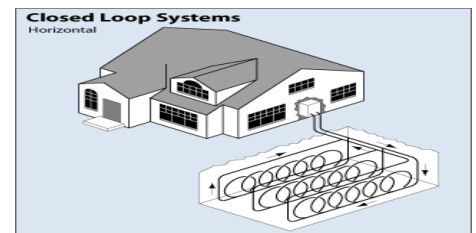
Sustainable forestry is a forest management practice. The basic tenet of sustainable forestry is that the amount of goods and services yielded from a forest should be at a level the forest is capable of producing without degradation of the soil, watershed features or seed source for the future.



FOREST STEWARDSHIP COUNCIL is an independent, not-for profit, non-government organization that provides standard setting, trade mark assurance and accreditation services for companies and organizations interested in responsible forestry practices. Check out www.fsc.org. ♦ *Look for the FSC label on wood products.*

WHAT ARE GEOTHERMAL HEATING AND COOLING SYSTEMS

A geothermal heat pump system is a heating and/or an air conditioning system that utilizes the Earth's ability to store heat in the ground and water thermal masses. This system will take advantage of a land mass as a heat exchanger to either heat or cool a building structure. These systems operate on a very simple premise; the ground, below the frost line, stays at approximately 50 °F (10 °C) year round and a water-source heat pump utilizes that available heat in the winter and puts heat back into the ground in the summer. A geothermal system differs from a conventional furnace or boiler by its ability to transfer heat versus the standard method of producing the heat.



♦ *When comparing a geothermal system to an ordinary system a homeowner can save anywhere from 30% to 70% annually on utilities.*

♦ *Even with the high initial costs of purchasing a geothermal system the payback period is relatively short, typically between three and five years.*

♦ *Geothermal systems are environmentally friendly; they are a renewable energy source, non-polluting, and recognized as one of the most efficient heating and cooling systems on the market.*

These green building terms/definitions represent a few of the growing trends in green buildings. *At its core "green or alternative building practices" are an acknowledgement that modern construction is out of sync with the ecosystems and the planet*"². Green building is a search for better choices from an environmental perspective. Other green building trends may include, but are not limited to the following:

- *Straw bale construction*
- *Cob and other Earth Mixes*
- *Cordwood Construction*
- *Concrete Masonry construction*

GREEN BUILDING STANDARDS

US AND WORLD GREEN BUILDING COUNCILS

An encouraging development in the green building movement is the establishment of the US Green Building Council in 1993 with its international counterpart, the World Green Building Council, and the LEED (Leadership in Energy and Environmental Design) Green Building Rating System.

WHAT IS LEED?

Leadership in Energy and Environmental Design (LEED) is a rating system devised by the United States Green Building Council (USGBC) to evaluate the environmental performance of a building and encourage market transformation towards sustainable design. The system is credit-based, allowing projects to earn points for environmentally friendly actions taken during construction and use of a building. LEED was launched in an effort to develop a “consensus-based, market-driven rating system to accelerate the development and implementation of green building practices.” The program is not rigidly structured; not every project must meet identical requirements to qualify.

Learn more about the U.S. Green Building Council's LEED Program on their website (<http://www.usgbc.org>).

Although LEED is an encouraging development in the green building movement: it does present significant challenges for the builder including complexity and cost associated with implementation. To review a critical analyses of the program go to <http://www.grist.org/comments/soapbox/2005/10/26/leed/index1.html>.

LEED is only one tool for implementing sustainable strategies in building projects, **it is not the only standard or framework for ecological design**. Some other frameworks include: William McDonough Architects' *Hannover Principles*, Sim Van der Ryn and Stuart Cowan's *Five Principles of Ecological Design*, and John and Nancy Jack Todd's *Principles of Ecological Design*.

Suggested Reading: Edwards Andres R. *The Sustainability Revolution – A Portrait of a Paradigm Shift*. New Society Publishers 2005.

WHAT IS THE BUILD AMERICA PROJECT?

Building America is a private/public partnership sponsored by the U.S. Department of Energy that conducts research to find energy-efficient solutions for new and existing housing that can be implemented on a production basis. Building America yielded more than 30,000 new houses, with a minimum of 30 percent reduction in energy for heating, cooling, and hot water at no net cost.

Check out: http://www.eere.energy.gov/buildings/building_america/about.html

RESOURCES FOR GREEN BUILDING

REGIONAL

Virginia Energy Savers Handbook

<http://www.dmme.virginia.gov/DE/ConsumerInfo/energysaverhandbook.shtml>

Sustainable Building Resource Directory

<http://www.sbrd.org/directory.html>

Virginia Sustainable Building Network

<http://www.vsbn.org/membership.shtml#whoswho>

James River Green Building Council

<http://www.jrgbc.org/>

Chesapeake Climate Action Network

<http://www.chesapeakeclimate.org/>

Virginia Department of Mines, Minerals and Energy (DMME)

<http://www.dmme.virginia.gov/>

NATIONAL

Green Building Pages

<http://www.greenbuildingpages.com/>

U.S. Green Building Council (USGBC)

<http://www.usgbc.org/>

U.S. Department of Energy

Energy Efficiency and Renewable Energy Program (EERE)

<http://www.eere.energy.gov/>

Tax Incentives Assistance Project (TIAP)

<http://www.energytaxincentives.org/>

U.S. Environmental Protection Agency

<http://www.epa.gov/greenbuilding/>

Global Green USA

<http://www.globalgreen.org/>

Ecological Building Network

<http://www.ecobuildnetwork.org/>

Smart Wood

www.rainforest-alliance.org/programs/forestry/smartwood/

Government PDF file listing green building projects

<https://www.usgbc.org/ShowFile.aspx?DocumentID=2314>

Restore in Newport News – recycled building supplies

LOCAL RESOURCES FOR GREEN BUILDING

<http://www.solarpowerdirectory.com/city/Virginia.html>

<http://www.enviroyellowpages.com/>

Solar Panels Plus, LLC
533 Byron Street, Suite E
Chesapeake VA 23320
757-549-1494

Solar Panels Plus LLC is an importer and distributor of Apricus advanced solar thermal systems for hot water. The company also works with solar electric and solar space heating and solar air conditioning applications. www.solarpanelsplus.com

Solar Services Inc.
1364 London Bridge Road, Suite 102
Virginia Beach, VA 23453
800-651-0083 (toll-free)
757-427-6300
757-468-3247 (fax)

All installations are carried out by their own personnel or licensed dealers, depending on geographic location. They install all types of solar heating and electrical systems plus conventional water heaters, provide materials and technical assistance for those who wish to install their own systems, and provide planned maintenance to all solar equipment installed by us. They are available on a 24 hour basis to service all solar equipment in South East Virginia and North East North Carolina, whether installed by us or not. Be sure to visit their online catalog with over 1000 products. www.solarservices.com

PV Energy Systems
3256 Reades Way
Williamsburg, VA 23185
757-345-5535

One of the oldest continuing advisors to the PV industry. Their experience enables them to provide advice at all levels of a PV client's corporate or product development requirements, from technology evaluation to product analysis. PV Energy Systems delivers the industry's most comprehensive financial advice and services, and also assists clients with key strategic and competitive analyses. Our Clients are worldwide, ranging from well-known corporate giants to entrepreneurial start-ups. www.pvenergy.com

E.T. Lawson
Bioheating/Cooling/Plumbing/Electrical/Solar
P.O. Box 249
Hampton, Virginia 23669
Peninsula: (757) 722-1928
Williamsburg: (757) 229-2877
Gloucester: (804) 642-2161
Norfolk: (757) 491-1928

Solar Heating is HOT!

Discover the HOTTEST new way to heat your home's water! E.T. Lawson now offers solar heating with the OVSOL System 5 from Oventrop. It's effective ... efficient ... and you'll benefit from top-quality performance of heating domestic hot water all year long!

ECO Supply Center

Richmond, VA

<http://www.ecosupplycenter.com/>

Web directories exist to search for regionally based businesses that offer green products and services. These businesses are helping to create healthy, energy efficient, and resource conserving buildings, in the residential, public, and commercial sectors.

Sustainable Building Resource Directory

<http://www.sbrd.org/directory.html>

Virginia Sustainable Building Network

Who's Who in Virginia Green Building

<http://www.vsbnet.org/membership.shtml#whoswho>

What you will find in these directories:

- Academic Programs
- Affordable Housing and Community Organizations
- Building Products
- Construction Companies
- Design Tools and Businesses
- Government and Financial Incentive Programs
- Public Sector and Local Government Contacts
- Real Estate and Development Companies
- Training and Education Programs
- Urban Planning Agencies
- Utilities and Energy Service Providers

FINANCIAL INCENTIVES FOR GREEN BUILDING

- ✓ **save in energy bills**
- ✓ **tax credits**
- ✓ **grants**
- ✓ **loans**

The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force, "finds that an upfront investment of less than two percent of construction costs yields life cycle savings of over ten times the initial investment."

Funding opportunities at National, State and Local Level:

Environmental Protection Agency:

<http://www.epa.gov/greenbuilding/tools/funding.htm#national2>

http://www.epa.gov/region2/sustainability/financial_incentives_greenbldg.html

Department of Energy:

<http://www1.eere.energy.gov/financing/>

http://www.eere.energy.gov/afdc/progs/state_summary.cgi?afdc/VA

DSIRE (Database for State Incentives for Renewables and Energy):

<http://www.dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=VA&RE=1&EE=1>

Tax Credits:

Tax Incentives Assistance Project (TIAP)

<http://www.energytaxincentives.org/>

Your resource for information on how to make use of the federal income tax incentives for energy efficient products and technologies.

Virginia Income Tax Credits on Energy Efficient Products

<http://www.dmme.virginia.gov/DE/taxcredit.shtml>

An amount equal to 20% of the sum paid, not to exceed \$500 in each taxable year.

Solar:

30% tax credit for solar energy installations up to \$2000 for both solar thermal and/or solar photovoltaic for residential installations, and 30% for commercial installations with no size limit. Solar Energy Industries

Association (<http://www.seia.org/manualdownload.php>)

LOCAL GREEN BUILDING PROJECTS

Project: Homes "Garden Atriums"

Location: Poquoson
Status: Completed Fall 2004

Green Project Features

- Heating by direct-gain passive solar means.
- A/C and back up heating provided by a geothermal unit.
- Photovoltaic panels and south-facing perimeter roof provide electricity for all functions.
- Underground cistern/Rainwater Harvesting
- Sustainably harvested lumber
- Zero-VOC paint
- Dye-free wool carpets, all-wood cabinetry

Project: Poquoson Elementary Schools

Location: Poquoson, VA
Status: Work-In-Progress

Green Project Features:

- Following LEED standards for energy efficiency and design
- Seeking Gold LEED certification
- Due to open in fall of 2008

Project: William and Mary Recreation Center

Location: Williamsburg, VA
Status: Completed

Green Project Features:

- LEED certified
- Access to alternative transportation
- Treatment systems to filter out sediments from water runoff
- Water efficient landscaping
- Use of low emitting adhesives, sealants, paint, carpet
- Water efficient plumbing fixtures
- Recycled 52% of project construction waste

Project: VDOT Rest Stop

Location: I-64 West Bound New Kent
Status: Completed

Green Project Features:

- Built Green with LEED design principles
- Preserved existing pavement which prevent unnecessary land-clearing and avoided emission from diesel-powered equipment to repave
- Efficient heating and a/c interior and exterior lighting keep energy costs down
- 70% of terrazzo flooring is made from recycled glass
- 46.7% water savings (over 1 million gallons) annually achieved through low-flow urinals and faucets
- urinals and toilets use approx 250,000 gallons of storm water from the roof for flushing – storm water is stored in under ground cistern
- And many more features

Project: Union Bankshares Corporation Operations Center

Location: Caroline County, VA
Status: Completed

Green Project Features:

- LEED Silver certified
- Capture and reduce storm water run-off with a 23,000 square foot vegetated roof
- Bioretention Parking Lot, and native plantings

Project:
 Project Owner:
 Location:
 Status:
 Green Project Features:

ADDITIONAL RESOURCES

WEBSITES

- [Alliance to Save Energy](#)
- [American Indoor Air Quality Council](#)
- [American Institute of Architects](#)
- [American Society for Testing and Materials \(ASTM\)](#)
- [American Society of Heating, Refrigeration and Air Conditioning Engineers](#)
- [American Solar Energy Society](#)
- [Architects, Designers and Planners for Social Responsibility \(ADPSR\)](#)
- [Association of General Contractors](#)
- [ATHENA Sustainable Materials Institute](#)
- [Building for Environmental and Economic Sustainability \(BEES 2.0\)](#)
- [Community Greenhouse Foundation](#)
- [Concrete Network](#)
- [Construction Materials Recycling Association](#)
- [Energy & Environmental Building Association](#)
- [Global Green USA](#)
- [Green Guard](#)
- [International Code Council](#)
- [National Association of Home Builders](#)
- [National Environmental Trust](#)
- [National Roofing Contractors Association](#)
- [North East Sustainable Energy Association- NESEA](#)
- [NW Energy Efficiency Alliance](#)
- [Partnership for Advancing Technology in Housing](#)
- [Portland Cement Assoc](#)
- [Rocky Mountain Institute](#)
- [Soil and Water Conservation Society \(SWCS\)](#)
- [Steel Framing Alliance](#)
- [Sustainable Buildings Industry Council \(SBIC\)](#)
- [Sustainable Energy Coalition](#)
- [The Energy Foundation](#)
- [The Structural Insulated Panel Association](#)
- [The Vinyl Institute](#)
- [The US Green Building Council](#)

MAGAZINES

- *Mother Earth News*
- *Natural Home*
- *Home Power* - www.homepower.com

BOOKS

Amy Vickers, *Handbook of Water Use and Conservation: Homes, Landscapes, Businesses, Industries, Farms*, Water Plow Press, Amherst Massachusetts 2002.

RS Means. *Green Building: Project Planning and Cost Estimating*, Kingston, Massachusetts, 2002.

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Alex Wilson and Mark Piepkorn. ***Green Building Products***, New Society Publisher, Gabriola Island, BC Canada, 2006.

Daniel D. Chiras. ***The New Ecological Home***, Chelsea Green Publishing Company, White River Junction Vermont, 2004.

Bill Steen, Athena Steen and Wayne J. Bingham, ***Small Strawbale Natural Homes Projects and Designs***, Gibbs Smith, Salt Lake City, 2005.

Angela M. Dean, ***Green By Design, Creating a Home for Sustainable Living***, Gibbs Smith, Salt Lake City, 2003.

FOOTNOTES

¹ Brad Lancaster. *Rainwater Harvesting for Drylands*. Rainsources Press, 2006 p. 1, 19.

² Clarke Snell and Time Callahan. *Building Green: A Complete How to Guide to Alternative Building Methods*. Lark Books, 2005, p. 7.

Rainwater Illustration used with permission from "Rainwater Harvesting for Drylands, Volume 1 by Brad Lancaster, www.HarvestingRainwater.com.

Edwards Andres R. *The Sustainability Revolution – A Portrait of a Paradigm Shift*. New Society Publishers 2005. (Edwards is credited with the first quote on the first page.)