

2012

Green Step Project



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ABSTRACT

As part of the Winter 2012 Credit for Product II course in the Ecosystem Management Technology program at Fleming College, our group worked with Leora Berman and the Land Between Project. Our project was labelled “The Green Step Project” and consists of information and links for homeowners who are interested in building or updating their homes in “The Land Between” which is an area separating the Canadian Shield and the St Lawrence Lowlands. Our final product is this portfolio that is composed of our research and information that is organized under Alternative Energy, Development and Building Materials, Permaculture, and Land Stewardship. This work will be placed on “The Land Between’s” website as an interactive database for residents in Haliburton and the surrounding area to learn about how to be a good steward in this unique area of Ontario with the simple act of homeownership.

During the introductory stages of the project, our team visited the Donald Building near Haliburton, Ontario to get a general overview of what the project would entail. Leora Berman gave our team a tour of the building and information about topography and specific ecosystem features of the land in “The Land Between.” These details formed the basis of the portfolio and associated recommendations for future homeowners. It is our goal that this information will be useful for future development in “The Land Between” and will prove to be a valuable resource for ecosystem sustainability in the delicate landscape.

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1.0 ALTERNATIVE ENERGY

Heating and cooling your home in a greener, more efficient way can be accomplished through some very simple changes to your system. Updating your old furnaces and air conditioners to more efficient units will use less energy and save you money. Updating your insulation, sealing your home completely, updating your windows, and incorporating passive solar systems will increase the efficiency of your traditional heating and cooling systems as it will require less effort to keep your home at its optimal temperature. The links in this guide will help you learn about the options available to you and help you incorporate them into your home.

1.1 Heating

Your home is a dynamic system, and most homes are unique. Your home requires the heating technique that is right for it, your family, and individual needs. There are many different styles of home heating and there are many minor changes a homeowner can make to be more efficient and save money.

1.1.1 Furnaces

If your furnace is more than 20 years old it made be time to update. Old oil furnaces are being reported to break down or be inefficient. Switching to an Energy Star rated furnace is a simple change. Remember that heat loss and energy waste can be from many avenues. There are also hybrid systems that heat your home and water in the same unit, saving space and often energy. Where can your home benefit from an upgrade? A well-ventilated home will use heat better, and a well-insulated home will use less energy to heat. Consider some of the new technologies and read about the other options for home heating..

Home Power Magazine gives a brief introduction to many home heating options:

http://homepower.com/view/?file=HP123_pg50_Thorne_Amann

This is a link to the Energy Star website on furnaces:

http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=FU

1.1.2 Natural Gas Furnaces

The choice of efficient furnaces used to be natural gas. This is due to the fact that gas was very affordable and local. With the current changes in fossil fuel prices, consumption rates, and economies, it is impossible to track which fossil fuel powered furnace will save you more. Natural gas furnaces are efficient, and when properly sized to your home can provide very affordable heat. However the cheapest long-term option cannot be determined between electric furnaces or gas, simply because the economic situations change too often. Non-fossil fuel furnace prices and operating costs do not fluctuate as much, and are more stable.

When replacing a furnace, be sure it is sized for your house. Many homes have furnaces that are too large and can never reach peak efficiency. There are new systems called “combo-systems” that heat your home, water, and provide ventilation. These units are very efficient and space saving. These hybrid

systems, if you desire a traditional furnace, can be a smart choice for your home. Talk to a contractor who can recommend what your residence requires.

An overview on furnaces and replacement options:

http://www.cmhc-schl.gc.ca/en/co/renoho/refash/refash_018.cfm

1.1.3 Radiant Heat

This is a heating technology that can be used throughout a home or in select rooms. The heat comes from tubing laid in the floor rather than through vents in the ceiling and walls as it would in a typical HVAC system. The system's installation cost is based on the square footage the customer desires, and therefore could be ideal for small cottages and other small spaces. Radiant heating is a long-lasting, quiet, and out of sight alternative. Due to the way heat radiates through the floors, heat loss is often reduced in comparison to conventional duct systems. Radiant heat is compatible with solar options and if used properly can be very efficient. There are three kinds available: electric, water, and air: water and electric are the most common types of radiant floor heating. Pipes are installed in the floor in concrete slabs and carry hot water throughout the pipes. The cooler water returns to an area where it is reheated, forming a closed loop system. In an electric system, the tubes are typically copper or nichrome, which are metals with a high electrical resistance. This does not look like an electric heating element in your floor, but rather an electric blanket with no fabric. The best flooring for compatibility with radiant heat is ceramic tile, hardwood floors a close second, and carpeting as the least compatible. Carpet does not conduct heat well, however choosing an under mat that is flat (not waffled or ribbed) will make this flooring choice more compatible with your system.

A water radiant heat in-depth explanation:

http://www.cmhc-schl.gc.ca/en/co/renoho/refash/refash_010.cfm

An electric Radiant heat explanation with installation and home heating tips:

<http://home.howstuffworks.com/home-improvement/construction/materials/radiant-floor-heating2.htm>

1.1.4 Alternative Wood

Many cottages still retain a wood-burning stove for heat, or have updated to pellet burners. If you have a small home or space and want a natural look and feel, this option might be for you. Wood burners are often viewed as being very sustainable if you have an ample supply of waste wood on your property. It is also attractive because it does not use fossil fuels and is quite renewable. Pellets are also renewable, and the prices are very competitive with fossil fuel-based energies. Pellet stoves are electric or natural gas burning, so consider this when purchasing. They do not require constant refuelling as they have a "hopper" that stores the pellets for up to 24 hours of heat production, depending on your heating requirements. You will need a cool dry place to store your pellets, or they become unusable. This can take up space however firewood often has the same encumbrance. Both of these options are very sustainable for the right home.

An overview on pellet stoves:

<http://www.alternative-heating.com/pellet-stoves.html>

Some facts about different pellet burners:

<http://www.naturalheat.ca/html/freestanding-fireplace.html>

An overview on wood-burning stoves:

http://www.cmhc.ca/en/co/maho/enefcosa/enefcosa_001.cfm

1.2 Cooling

When one thinks of cooling their home you might think of an air conditioner, which can be updated if your unit is old or failing into disrepair. However there are many options available that are cheaper and greener to consider. Coolant technology is not the only option, while it is usually the first solution we think of today. Adding awnings and other shade-inducing items to decks and outdoors areas near doors and windows can reduce heat pathways in the summer. Consider exploring the Permaculture section of this webpage to see how a naturalized yard using trees and shade can save you money on your heating and cooling bills.

A green home link on cooling your home:

<http://www.sierraclubgreenhome.com/go-green/heating-ventilation-air-conditioning-hvac/efficient-air-conditioning/>

1.2.1 Air Conditioning

Most issues surrounding air conditioners and their sustainability arise from their overuse or use in a poor setting. A well insulated home with good windows, good shade and proper ventilation in the summertime should only require a small energy star air conditioner for good comfort. An upgrade on an old unit can often help, but so can moving the unit away from the hot driveway and into the shade of a tree. This will increase its efficiency because it will not have to cool itself down. An air-tight, shaded, ventilated house will require less air conditioning, and could use only a window air conditioner. Larger, built-in air conditioning systems require certain maintenance to ensure it continues to operate at its maximum efficiency. Try to find ways to increase the natural cooling and ventilation of your home before you turn on your AC, and you will find that you require much less energy to cool your home.

Energy Star window air conditioners:

<http://www.canadiantire.ca/AST/browse/3/HouseHome/1/HeatingAirConditioning/AirConditioners.jsp>

Maintenance tips:

<http://www.advantageairtech.com/air-conditioning/air-conditioning-tips>

1.2.2 Ventilation

Heating and cooling your home in all seasons will be more effective with proper and controllable ventilation. Close off unused rooms and install sealable vents or use proper vent covers to moderate air into those rooms. To increase circulation, consider using fans before adjusting the thermostat: this will help your home control its temperate using a smaller energy source than the furnace or air conditioner. They are also portable and can be placed in optimal locations for best comfort.

Ventilation also refers to air movement throughout your home. This is how your home filters excess heat and retrieves fresh air. Many homes have air ducts and vents installed when they are built, for example in the attic, eaves, and basement, however older homes and cottages may not have these systems. Do you find your house stuffy or humid in certain seasons? Is one floor of your home warmer than another? Consider inspecting your ventilation system, and making some minor tweaks to increase your comfort and save energy.

An article on ventilation within the home:

http://www.cmhc-schl.gc.ca/en/co/maho/yohoyohe/inaiqu/inaiqu_009.cfm

Some ventilation/heating/cooling technology, available in Canada:

<http://www.nu-airventilation.com/>

See Cross Ventilation

1.3 Energy

Energy costs are on the rise, and most energy today comes from fossil fuels. Your energy comes from your local energy supplier, and may not be the greenest option available in your area.

Adding alternative energy to your home can be a good investment into your homes property value. You can also cover the costs of installing the system by selling your power back to the main power grid in some areas. However most often homeowners use alternative and green energy to offset the costs of buying electricity from your supplier. Your local conditions dictate what might work well with your home, and some technologies may be better suited than others.

1.3.1 Solar

If you are considering adding solar to your home, it is a good idea to get assessed by a professional and do your research first. The best place for solar panels is a south facing roof-top. This area of your home needs to be in full sun and properly angled for proper conduction. Look for incentives in your area to help offset the start up costs, as they can be quite large. If you can get an incentive or are simply looking to add value to your home and be more environmentally friendly, solar is a good choice for the right home.

Other options are solar pool heating, radiant heat, and solar water heating, which also require roof-top technology. Many of these technologies are very affordable as they are smaller than full home heating and can offset electricity costs.

Solar heating in Canada:

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

Home Depot's information site:

<http://www.homedepot.ca/know-how/buying-guides/solar-energy-systems>

1.3.2 Wind Technology

Wind technology can produce energy for your home and offset your electricity requirements from your municipality. There are many requirements to have a wind turbine in a residential area, however, and these are enforced by the Canadian government, but you must also be up to regulation for most companies to install your product. You must have an adequate wind source on your property, your property must be larger than an acre, and the turbine must be 250-300 metres away from your neighbours. There are more requirements you must meet, as seen in the link below. If the area you are in is ideal and you can add this technology to your home it is a good option for residents whose electricity demands are very high and for those who wish to be environmentally-friendly. There are also many different sizes of wind technology to suit homeowners' properties and needs. In close residential areas however, this technology is not recommended.

Canadian residents and wind turbines (Factsheet):

<http://www.omafra.gov.on.ca/english/engineer/facts/03-047.htm>

Frequently asked Questions on Wind technology:

<http://www.canwea.ca/swe/faq.php?id=6>

2.0 BUILDING MATERIALS

2.1 Walls

2.1.1 Insulated Concrete Forms (ICF)

Insulated concrete forms are made from recycled Expanded Polystyrene (EPS). Blocks fill the walls with a staggered stacking pattern, rebar is added in-between for stability, and the forms are then filled with concrete. These forms are permanent and stay part of the structure unlike the conventional form that is removed after concrete is set and dry. The forms are prefabricated for installing drywall on the interior and many mediums can be used for the exterior, including bricks, stucco, vinyl and metal siding.

For more information and technical specifications check out:

<http://www.nudura.com/en/insulatedconcreteforms.aspx>

For Insulated Concrete Form information check out:

<http://www.greenformsystems.com/icf.html>

For supplier, design and product information check out:

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

2.1.2 Rammed Earth

Rammed Earth consists of mounted wooden or steel forms in the foundation then filled with a mix of soil, aggregate, clay and sometimes Portland cement. This mix is compressed with a pneumatic stamping device, creating a layer of hard-packed material; more of the mix is added and the process repeats until completion when the forms are removed leaving a solid wall of stratified layers from each pneumatic

pressing. Rammed Earth homes are appropriate for a variety of climates and are well-suited for passive solar heating and cooling.

For more information on Rammed Earth check out Greenspec:

<http://www.greenspec.co.uk/rammed-earth.php>

See Canadian Architect for more information:

<http://www.canadianarchitect.com/news/terra-firma/1000211872/>

For an article on Rammed Earth building:

<http://www.motherearthnews.com/Green-Homes/2002-04-01/Natural-Earthen-Homes.aspx>

2.1.3 Earthbag

Earthbag building fills new or recycled grain sacks with local, natural materials. The fill material can be on-site soil from a dug foundation or brought in from a local source. Earthbags are then stacked in a staggered pattern and covered in a concrete plaster to form the walls.

For more information on Earthbag building:

<http://www.earthbagbuilding.com/index.htm>

2.1.4 Straw bale

Straw is highlighted as one of the finest renewable building materials available because it is abundant around the world. Construction is simple and low cost. Building with straw bale consists of a basic post and beam wood-frame construction. Stacking straw bales in a staggered pattern form the walls and steel wire mesh for reinforcement is attached to the inside and outside walls. Finally, the inside and outside walls are covered with cement-lime plaster to seal and lock-out moisture.

For more information on straw bale construction:

<http://harvesthomes.ca/>

Copy and paste link for straw bale building information:

http://harvesthomes.ca/building/straw_bale_primer.pdf

The access the Ontario straw bale building coalition:

<http://www.osbbc.ca/>

2.1.5 Adobe Block Walls

Adobe Blocks or pressed earth blocks are a simple building alternative. The basic components are soil mixed with a measure of water and a portion of cement. This raw material is put into an Earth Press, where the mixture is pressed until it adheres into a block almost as hard as concrete.

For more information about Adobe blocks:

<http://www.earthuprising.com/index.html>

2.1.6 Cob Walls

Cob walls are made from a mixture of sand, clay, straw and water; no concrete or mortar is used. It is generally mixed by foot but can also be mixed by machine. Once dry the cob material is hardened.

For more information:

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

2.1.7 Cordwood Walls

Cordwood masonry comprises of softwood cut to length. The pieces of wood are then layered on top of each other and held in place with mortar between each piece. The void between the two mortar joints is filled with sawdust mixed with lime. This building material is designed for breathability letting the air circulate naturally from inside the house to outside.

For more information on Cordwood building:

<http://cradlerockhomestead.com/cordwoodconstruction.aspx>

2.2 Pathways and Driveways

2.2.1 Permeable Pavers

Permeable pavers are honeycomb shaped grid pavers that can be used in pathways, overflow parking, emergency access lanes, boat launches, and driveways. Permeable pavers contribute to storm water runoff control, soil stabilization, and act as an erosion control on slopes and hills.

For more information:

<http://www.idealconcreteblock.com/pdf/Turfstone.pdf>

To see Turstone Technical sheet:

http://www.mutualmaterials.com/sites/default/files/docs/products/US_TurfStone_11-08.pdf

For technical information:

<http://www.unilock.com/files/documents/Install-spec-Turfstone.pdf>

2.2.2 Recycled Rubber Pavers

Recycled rubber tires create a great alternative for a paving material. Rubber sidewalk pavers, durable driveways and patio pavers are some of the solutions for reusing Canada's old automotive tires and giving them a new purpose.

For suppliers and more information:

<http://eco-flex.com/>

2.3 Roofing

2.3.1 Recycled Rubber Roofing

Used rubber tires have taken a new turn as an environmentally conscious roofing material. LEED certified and made from 85% recycled post-consumer recycled tires, this roofing system is long-lasting and expected to last 40 years or more with a 50 year warranty.

2.3.2 Metal Roofing

Metal roofing is built to last with Teflon coating and a lifetime limited warranty. Aluminum roofing is Energy Star rated and comes in slate, shingle shake, panel and even solar options and a large variety of colours.

For more information on metal roofing and one of the leading manufacturers:

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

2.4 Synthetic Lumber for Decks and Docks

2.4.1 Bale Board

Bale board is a plastic lumber product made from 100% solid polyethylene. The plastic medium used to manufacture this plastic lumber is recycled from white agricultural bale wraps and green house films. This is not a composite material mixed with wood fibres or fillers and is 100% recyclable. The benefits to this wood alternative include being mould and mildew resistant, not slippery when wet, gas and oil resistant, and it's resistant to moisture and insect damage.

For more information on Bale board and the manufacturer:

<http://www.baleboard.ca/product.html>

2.4.2 Trex

Trex is a wood plastic composite wood-alternative for decking, railing and fencing products and manufactured from recycled and reclaimed plastic and waste wood.

For more information on Trex products and the manufacturer:

<http://www.trex.com/index.html>

2.5 Paints and Plasters

2.5.1 American Clay

Clay based plasters are a natural way to finish any interior. Non-toxic and made in North America, plasters are a healthy alternative to paint, wallpaper, cement, acrylic and gypsum plasters. Clay plaster offers thousands of colors and unlimited textures with depth not found in other finishes. Clay plasters help regulate humid air inside buildings by absorbing and releasing moisture naturally.

For more information:

<http://flash.americanclay.com/>

2.5.2 VOC Free Paints

Premium interior paints with zero volatile organic compounds and a durable washable finish to reflect the purity of earth's color palette. This paint does not contain phenols, formaldehyde, heavy metals, crystalline silica, ammonia, chlorine, butyl ethers, corrosive cleaning agents, or odour-masking chemicals and fragrances, which may be found in other paints.

For further information:

<http://www.greenpaint.ca/>

2.6 Insulation

Good insulation in any home or cottage is the key to energy efficiency and saving money on utility bills. In poorly insulated buildings energy is wasted and subject to heat loss in the winter and inadequate cooling in the summer. Insulating the home or cottage saves money, making the building more comfortable by maintaining a uniform temperature throughout the house and makes walls, ceilings and floors warmer in the winter and cooler in summer.

2.6.1 Hempcrete

Hempcrete is a unique, highly sustainable construction product for the building of insulating walls, and is also useful for insulating floors and roofs. Hempcrete is a blend of hemp and a lime-based binding agent. Together these products form a bio-composite building material that can be used both for the creation of buildings that have excellent thermal properties as well as creating a healthy living environment.

For more information:

<http://www.lhoist.co.uk/tradical/hemp-lime.html>

For additional product information:

<http://inhabitat.com/hempcrete-carbon-negative-hemp-walls-7x-stronger-than-concrete/>

For a factsheet on Hempcrete:

<http://www.limecrete.co.uk/docs/Hempcrete-Factsheet.pdf>

2.6.2 Cellulose Insulation

Cellulose is a highly cost-efficient insulation material made with 85% post-consumer recycled newspaper. It will help conserve energy while promoting environmental responsibility. Cellulose insulation remains fire-resistant and acts as an effective noise barrier.

For more information:

<http://www.cellulose.com/homeowners.html>

For more information:

<http://www.climatizerinsulation.com/CelluloseInsulation/Overview.aspx>

2.6.3 Cotton Insulation

Cotton insulation is made from high-quality natural fibres and recycled denim fibres. These fibres contain great thermal and sound absorption qualities. Cotton insulation contains no fibreglass and is easy to install. This insulation contains no chemical irritants and there are no VOC concerns when using cotton insulation, as it is safe for human handling and the environment.

For more information check out:

<http://www.bondedlogic.com/construction-products/ultratouch-denim-insulation>

2.6.4 Ecovative Insulation: Structural Insulating Pane

From stir-fry to home building and renovation the mushroom has come a long way. Ecovative insulation is actually grown from agricultural by-products and mycelium, a fungal formation of threadlike cells (like the roots of a mushroom). The result from the manufacturing process is Ecovative insulation sandwiched between engineered wood panels to create the eco-friendly, energy-efficient insulation that is highly insulating and also structurally sound for roofs in the home or at the cottage.

For information on this alternative insulation:

<http://www.ecovatedesign.com/applications/building-products-greensulate/>

2.7 Flooring

2.7.1 Reclaimed Lumber

Hardwood and softwood plank flooring, harvested from reclaimed timber, barn boards and old beams is a sustainable and beautiful flooring choice.

For more information and catalogue:

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

2.8 Lighting

2.8.1 Solatube Lighting

Solatube provides a unique lighting option for the home, capturing daylight through the rooftop dome and directing it through a reflective tube and into the interior of the home, providing daylight inside from sunrise to sunset.

For more information:

<http://www.solatube.com/residential/index.php>

2.9 Interior

2.9.1 Purepanel- Shelving, tables, bookcases and cabinetry

Purepanel Plus is a lightweight, structural panel. Its engineered honeycomb core is VOC-free and comprised of 100% post-consumer recycled paper waste. The result is an environmentally friendly, lightweight but structurally sound composite panel.

For more information:

<http://www.paragonpanels.com/purepanel.php>

For images and information on the uses of Purepanel:

http://www.paragonpanels.com/files/Updated_Purepanel_Print_Introduction_E_sized_4-15-10.pdf

2.10 Windows

2.10.1 Why use Energy Star windows?

Energy Star windows are single, double or triple-glazed, referring to the thickness or panes of glass. The benefit of multiple panes of glass is the insulating layer of air trapped and sealed between each pane. You can also look for windows with a low-e or low emissivity coating. A thin invisible metallic layer is directly applied to the glass surface. This low-e coating allows heat energy from the sun to enter the home while reflecting existing heat in the home. In summer months the coating prevents heat that emanates from pavement or buildings from escaping to help keep the home cooler.

For more information on Energy Star rating and products:

<http://www.energystar.gov/>

To see Energy Star labels and zoning maps:

<http://oee.nrcan.gc.ca/equipment/windows-doors/11126>

For a list of Energy Star rated manufacturers:

<http://oee.nrcan.gc.ca/equipment/manufacturers/1263>

For more information on window glazing:

<http://oee.nrcan.gc.ca/equipment/windows-doors/17238>

2.10.2 Argon Gas Windows

Dual pane glass windows with Argon Gas in between are an excellent option for extra energy efficiency. Argon gas is inexpensive, non-toxic, non-reactive, clear and odourless. Argon gas windows have a lower tendency to collect frost in those cold winter months.

For more information check out:

<http://www.allweatherwindows.com/index.php>

2.11 Doors

Exterior doors are often a point source where energy efficiency is lost from the home, installing a more efficient door will reduce the amount of energy escaping the home.

2.12 Damp Proofing

When it comes to damp-proofing your foundation or even your kitchen floor, plastic membrane made from 60% post consumer material, High Density Polyethylene (HDPE) is a great option for your home.

For more information on damp proofing and Delta products check out:

<http://www.deltams.ca/>

2.13 Weather Proofing and Protection

Exterior weatherproofing acts as a barrier to exterior water and air, preventing it from entering the home while allowing moisture vapour from inside the home to escape, overall improving the energy efficiency of the home.

For more information check out:

<http://typar.com/homeowner/index.html>

For more information and manufacturer check out:

http://www2.dupont.com/Building_and_Construction/en_CA/weatherization_systems/HomeWrap.html

3.0 PERMACULTURE

Permaculture is an approach to design that uses the placement of things and objects to best benefit the efficiency of buildings. Everything has a purpose, place, and can be beneficial. Designing a home with permaculture in mind will reduce waste, save on energy, and cut back on water consumption. The following information provides design ideas that incorporate the principles of permaculture and being user friendly.

3.1 Passive Solar Heating

Passive solar heating or passive solar design is the collection of heat created by the sun. The goal is to achieve the highest efficiency with the maximum amount of exposed sunlight. South-facing windows are a great way to allow solar rays to heat up a room naturally and at a relatively low cost. The heat from the sun can also be stored in something called “thermal mass” which is concrete slabs, brick walls, and tile floors. These can all be building materials from the building. Passive solar heating does not have a high initial cost but has increased user comfort and allows for better temperature stabilization. If properly designed, buildings that incorporate passive solar into their layout have more natural light and appear to be sunnier and bright, allowing the inhabitants to feel more connected with nature.

Link to information on passive solar heating and how it works:

<http://www.ontarioarchitecture.com/passivesolar.htm>

Link to information on passive solar heating:

<http://www.wbdg.org/resources/psheating.php>

Link to what is passive solar design and information:

<http://passivesolar.sustainablesources.com/>

3.2 Passive Cooling

Passive cooling is the use of natural elements to cool an area of living space. By combining different techniques together such as ensuring that the building is in the shade and that there is proper ventilation throughout the building, energy costs can be relatively low for cooling needs.

3.2.1 Cross Ventilation

Operable windows (windows that open) and wing walls are great ways to enhance ventilation in a building. Wing walls are vertical exterior wall partitions placed perpendicular to adjoining windows. Their main purpose is to increase ventilation in a building or room that only has one exterior wall. They are only effective on the windward side of a building. Proper ventilation reduces the need for refrigerated coolants and reduces energy costs.

3.2.2 Shade

Another way to ensure a cooler living space is to have trees on the property for shade. Shade trees can help to reduce the impact the sun’s rays will have on a building by up to 6°C. Not only are shade trees beneficial to the environment, they are beneficial to human health as well because they take in carbon dioxide and emit oxygen into the air, creating better air quality. By not cutting trees down or by planting native species of trees, therefore ensuring that there is shade on a building, the energy needs for cooling the building are reduced. Along with cooling the building, protecting humans from the dangerous sun’s rays is also an important role for shade trees. Due to the location in Ontario, houses built in the Haliburton area or in “The Land Between” should avoid planting trees on the south facing wall of the building. Doing so would obstruct the sunlight and take away from the passive heating method.

Link to a PDF of heating, cooling, and ventilation:

<http://www.eng.mcmaster.ca/civil/sustain/building/Heating,%20Cooling,%20and%20Ventilation.pdf>

Link to information on proper cross-ventilation:

http://learn.greenlux.org/packages/clear/thermal/buildings/passive_system/passive_cooling/natural_ventilation/design.html

Link to environmental and health benefits of shade:

<http://www.sunsafeyork.org/shade-benefits-issues.htm>

3.3 Native Plants and Lawn Care

Planting native vegetation is very important to environmentally-friendly lawn and garden maintenance. Introducing invasive or non-native species can actually do damage to the surrounding ecosystem. There are many great native species that can be found in “The Land Between” that are easily affordable and attractive.

3.3.1 Lawn Care

Something to consider for any property is the lawn. The plant hardiness zone is 4a or 4b in “The Land Between” with little soil cover, and grass may not always grow well or look appealing. An alternative to grass cover for a lawn could be clover. This alternative method uses less energy and maintenance and is easy to manage. Low-maintenance lawns (clover lawns) cost less and do not use fertilizers or need much water. They are very hardy and can withstand a higher amount of traffic. Although these lawns do not have a homogenous appearance they save money, effort, and the environment. Clover lawns also absorb more water, alleviating the run-off and sedimentation that may happen with traditional grass lawns. It is also very important to take into consideration lawn care on the property if residing on a water front. Planting grass right down to the water is not the best move for the environment and can attract geese and water fowl, making for an unsanitary mess left on the shoreline. Making a more natural shoreline is more beneficial because it prevents erosion, increases habitat for fish and wildlife, and can help filter pollution and contaminants that may potentially wash into the lake or river. Keeping the shoreline natural is important because the native vegetation anchors the soil down and it helps to reduce the impact of downstream erosion. Aquatic and semi-aquatic plants provide habitat for frogs, dragonflies, and insect-eating birds.

Link to low-maintenance lawns:

http://www.cmhc-schl.gc.ca/en/co/maho/la/la_004.cfm

Link to water-loving native plants:

<http://www.canadiangardening.com/gardens/water-gardening/water-loving-native-plants/a/1573>

Link to Natural Shorelines:

http://www.severnsound.ca/ssea_NatShore.htm

Link to preserving and restoring natural shorelines:

http://www.lrconline.com/Extension_Notes_English/pdf/shrlns.pdf

Link for restoring healthy shorelines:

<http://www.waterwaywildlife.com/pdfs/Restoring%20Healthy%20Shorelines.pdf>

Link to pdf of “A Shoreline Owner’s Guide to Lakeland Living”:

http://www.ontariostewardship.org/councils/haliburton/files/3357_Lakeland_Living_Guide_final.pdf

Also see Shoreline design

3.3.2 Gardens

Another big attraction to some property owners are gardens whether they are flower gardens or vegetable gardens. This feature on many properties is where trouble may be introduced in the form of invasive species. Although most vegetables we grow are not native to our environment in Canada it is important to be careful with other ornamental plants that you may want to grow. Being aware of what species you are planting and whether or not they are native to the Haliburton area is important and something that should be taken into consideration. To check what species are invasive and how you can help stop the spread, check out the Ministry of Natural Resources website. By providing habitat with native species of vegetation, one can also help establish populations of wildlife that feed off of the native vegetation or use it as habitat.

Link to the Atlas of Canada to find plant hardiness zones:

<http://atlas.nrcan.gc.ca/site/english/maps/environment/forest/forestcanada/planthardi>

Link to the Old Farmer’s Almanac:

<http://www.almanac.com/plants/hardiness-zone/4?page=1>

Link to the Ministry of Natural Resources, invasive species website:

http://www.mnr.gov.on.ca/en/Business/Biodiversity/2ColumnSubPage/STDPROD_069027.html

Link to Haliburton County website and invasive species information:

<http://www.haliburtoncounty.ca/main.asp?function=municipal&subfunction=municipal§ion=ForestConservation&subsection=ForestPests>

3.4 List of Trees

American Mountain Ash

Balsam Fir

Black Cherry

Black Spruce

Bur Oak

Eastern Hemlock

Eastern White Cedar

Eastern White Pine

Jack Pine

Peachleaf Willow

Pin Cherry

Red Maple

Red Oak

Red Pine

Silver Maple
Sugar Maple
Tamarack

Trembling Aspen
White Birch
White Spruce

Link to Ministry of Natural Resources website for trees that grow in the Haliburton region:

http://www.mnr.gov.on.ca/en/Business/ClimateChange/2ColumnSubPage/STDPROD_085782.html?region=nativeSpecies

Link to Ministry of Natural Resources website for tree planting tips:

http://www.mnr.gov.on.ca/en/Business/ClimateChange/2ColumnSubPage/STEL02_200809.html

3.5 Rain Harvesting Systems

Harvesting rain water is a great way to conserve water and help with rainwater management on residential property. With many different systems available on the market such as DIY or commercial systems, installation is easy. With proper equipment and technology, the rain water can be recycled back into the house and used for everyday activities such as laundry, flushing toilets, and even drinking. These systems capture rainwater or roof runoff water which is then plumbed into the house and put through a treatment system. If desired, the collected water can also be used for outdoor water irrigation. Regular maintenance and inspection is required for these systems to ensure the quality of the water. Additional testing does need to be completed for drinking water. Potential benefits include reducing energy costs, reducing erosion on property, and conserving water.

Link for information on rainwater harvesting systems:

<http://www.rainharvestingsystems.com/Default.aspx>

Link to rainwater harvesting:

http://www.riversides.org/rainguide/riversides_hgr.php?cat=2&page=50&subpage=97

Link to the Ontario Guidelines for Residential Rainwater Harvesting Systems 2010 Handbook:

http://www.sustainabletechnologies.ca/Portals/_Rainbow/Documents/ONTARIO_RWH_HANDBOOK_2010.pdf

Link to how to build a rainwater collection system yourself:

<http://www.wikihow.com/Build-a-Rainwater-Collection-System>

3.6 Grey Water Treatment

There are many ways to treat grey water and some of the more eco-friendly versions do not include adding chemicals to the water to purify it, making it more appealing to people for consumption. These methods include Reverse Osmosis (RO) and Ultraviolet Sterilizers (UV) which can be installed in the home and can purify the water for the whole house. Something that should also be considered is

installing a Brita water filter right onto your kitchen tap for quick access to drinkable water or simply using a Brita water filter pitcher that stores away in your fridge for cool, clean, drinkable water.

3.6.1 (UV) Water Treatment

Although ultraviolet light sterilization inactivates harmful bacteria, it is not intended to treat heavily contaminated water or water that is chemically contaminated. UV treatment does not remove any metals or minerals from the water and when the bacteria or viruses are inactivated, they are not removed either. This is why UV sterilization should be used in partnership with another treatment method.

3.6.2 (RO) Water Treatment

Reverse osmosis water treatment does remove sand, silt, minerals, and most metals from the water by passing highly pressurized water through a semi-permeable membrane. Using this method and UV sterilization together can provide clean water. It is still recommended that water be tested on a regular basis to ensure there is no contamination and that the units are working effectively. Each house has different water needs and each source of water is different from the next. Professional advice and service is recommended when it comes to drinking water. Although RO systems can be effective, they can be considered not eco-friendly due to the amount of water it takes to back-flush them to clean them.

Link to eco-friendly water treatment methods:

<http://www.aquaclearwater.ca/eco.php>

Link to UV water treatment:

http://www.cmhc-schl.gc.ca/en/co/maho/wawa/wawa_002.cfm

Link to Reverse Osmosis:

http://www.cmhc-schl.gc.ca/en/co/maho/wawa/wawa_001.cfm

3.7 Shoreline Permits

In Ontario, a work permit is required for any work that is to be completed on or near a shoreline. On the Ministry of Natural Resources website there is information on work permits and when one is required.

Link for the Ministry of Natural Resources website:

http://www.mnr.gov.on.ca/en/Business/CrownLand/2ColumnSubPage/STEL02_165788.html

4.0 LAND STEWARDSHIP

4.1 Composting

Composting is a natural process that can help homeowners save money, reduce pollution, reduce

organic waste, and fertilize the soil. It is a simple process that requires little effort and maintenance, and it can be used in just about every development setting from commercial to residential environments. Composting is the biological process of naturally breaking down organic food wastes back into the soil form from which they came, which can then be used as future, healthy fertilizer. The following links will describe several methods in which the composting process can easily be implemented in various locations.

4.1.1 Aerobic Composting

A popular method of composting, aerobic composting does not emit any foul odours and the process may only take up to two weeks to complete. Aerobic composting uses oxygen in a controlled environment until the soil is ready to be used as fertilizer. Materials used, temperature, moisture content, and aeration are all factors that can affect the aerobic process. The process begins by digging a pit, and taking an organic material such as dead leaves and wait for them to break-down into their basic form. Water may be added if the material is too dry. Over time, small piles of organic food materials are put onto the pile and the soil is turned as often as possible using a shovel (once a day works best for aeration). Eventually, the materials will turn into healthy fertilizer. Aerobic composting is beneficial because it reduces waste, is cost-effective, and reduces human impact on the environment.

This link contains step-by-step guides to aerobic composting, including the benefits of the technique and in comparison with other forms of composting.

Eco-Evaluator: Aerobic Composting. <http://www.ecoevaluator.com/lifestyle/gardening/aerobic-composting.html>.

This link provides information on all forms of composting but offers suggestions on the best types of composting for the immediate environment.

Food and Agriculture Organization (FAO). Composting process and techniques: <http://www.fao.org/docrep/007/y5104e/y5104e05.htm>.

4.1.2 Anaerobic Composting

Anaerobic composting is the process of using bacteria or other living organisms to break-down organic materials in an oxygen-free environment. Anaerobic composting is done in a well-saturated environment as it requires about 70 per cent moisture levels to be effective. This water level helps remove oxygen from the compost pile which will allow for this type of composting. A longer process than aerobic composting, anaerobic processes also allow for a low-odour process. Large bags or sealed containers are the most recognizable forms of this composting. At the end of the process, a good-size amount of humus (organic material fertilizer) will have accumulated and can be used for future planting. The resulting gas that is emitted from the natural process can also be harnessed as an environmentally-

friendly biofuel.

This link discusses the science behind the anaerobic process including all the benefits of the process. It also includes a description of how the gas emitted from the process can be harnessed, which is an interesting point to consider in green building design.

Advanced Waste Management: Anaerobic Digestion and Composting for a Greener Environment:
http://www.brownfieldsnet.org/anaerobic_digestion.html.

A link offering several suggestions about anaerobic composting methods and which works best for each location and environment. Composting Tips: Anaerobic Composting:

<http://compostingtips.info/anaerobic-composting/>.

4.1.3 Vermiculture

Vermiculture, or worm composting, uses worms to break-down food scraps and other household wastes into healthy black soil that can be used as a fertilizer. Red wigglers, manure worms, tiger worms, blue worms and red hybrid worms are used in the vermicompost process and depending on the local environment; the worms do not pose a threat as an invasive species in the area. After organic wastes have been ingested by worms, the excrement releases ten times the nutrients back into the soil than what was originally in the material. The process can be undertaken in small containers left inside buildings, or in sealed locations on the outdoors made of wood or plastic.

A well-written report about the science behind vermiculture. A good reference for benefits and processes behind why worms are a good option.

Vermiculture – Composting with Worms:

<http://www.ccathsu.com/files/handouts/Vermiculture%20%20Composting%20With%20Worms.pdf>.

This link provides excellent information on how to build vermiculture containers and the many benefits of using worms. It is important to consider the local environment before bringing in new worms, however, and make sure it is done in a controlled location.

Worm Farming: Vermiculture Composting:

<http://www.worm-farming.org/vermiculture/vermiculture-composting/>.

4.2 Recycling

Recycling helps reduce the number of materials that end up in landfills. It also reduces the need to use more natural resources, and protects natural habitats for the future. Recycling materials uses less energy to reuse than to make new products, and reduces the need for extracting new resources and transportation costs.

4.2.1 Electronics

Many electronics contain precious finite metals that are in short supply. By recycling these metals, they can be reused in new products. Changing market trends mean that new products containing these metals are being used and disposed of on a regular basis. This includes recycling batteries in properly labelled containers. These metals may also be released into the ground if left in landfills, poisoning the area around in proximity.

This link provides useful information on how to recycle electronics and locations around Ontario where the products can be distributed for new use.

Recycle Now: Waste Electronics.

http://www.recyclenow.com/why_recycling_matters/electricals/did_you_know.html.

4.2.2 Glass

Glass recycling reuses resources, saves energy, and reduces the amount of waste in landfills. A glass bottle that is sent to a landfill can take up to a million years to break-down. However, it takes as little as 30 days for a recycled glass bottle to appear on a store shelf as a new glass container.

A comprehensive, user-friendly source for the importance of glass recycling and how it can be reused for other purposes.

Environmental Issues: Benefits of Glass Recycling.

http://environment.about.com/od/recycling/a/benefits_of_glass_recycling.htm.

4.2.3 Metal

Metal deposits are non-renewable resources and are very important materials to recycle. Metals can be recycled without losing their important properties, and reduces pressure on landfills. Metals should also be recycled because of the metallic products leaked into the nearby ecosystems.

This is a good source because it goes further than just describing metal recycling – it discusses types of metals that can be used for recycling.

Benefits of Recycling: Recycling Metals:

<http://www.benefits-of-recycling.com/recyclingmetals.html>.

4.2.4 Paper

One of the easiest products to recycle, paper is used in many products that also incorporate plastic and other materials. The average individual uses about 680 pounds of paper per year. Each ton of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4000 kilowatts of energy, and 7000 gallons of water. This represents a 64% energy savings, a 58% water savings, and 60 pounds less of air pollution.

A great website for recycling in general, with good statistical data based on Canadian and American information. Also includes data on the different types of recycling, not just paper.

A Recycling Revolution:

<http://www.recycling-revolution.com/recycling-facts.html>.

4.2.5 Plastic

Plastic products are toxic and non-biodegradable, and end up in landfills. Recycling one ton of plastic saves 7.4 cubic yards of waste and almost 2000 pounds of oil. One drawback of plastic recycling is that it requires greater processing in order to be recycled. Also, the dyes, fillers and other additives that are present in plastic goods can't be removed easily during plastic recycling. Therefore, the purchasing of plastics in the first place should be chosen with care.

A good resource about the importance of recycling plastic and includes much statistical information.

Plastic Recycling Facts:

<http://www.buzzle.com/articles/plastic-recycling-facts.html>.

4.3 Human Waste

The main goal of finding alternative human sanitation systems is to limit the amount of damage to the natural environment in the construction of new septic or sewage systems. The following are suggestions for systems that can be incorporated in "The Land Between" based on the area's location and topography.

4.3.1 The Composting Toilet

A composting toilet is one that is not attached to a septic tank or county sewer line. By using peat moss to decompose waste, liquids and solids may be separated (depending on the toilet model) and this reduces foul odours. Some models contain vent pipes that allow moisture in the waste to evaporate and decompose naturally. It is a great suggestion for communities situated on solid rock (such as in the Canadian Shield) and in communities with limited infrastructure.

4.3.2 Wastewater Reuse (Blackwater)

Blackwater is toilet waste that has the potential to be reused for other purposes such as turf irrigation, industrial, agricultural irrigation, and drinking water. Wastewater is reclaimed by centralized wastewater treatment plants, decentralized smaller scale plants, or by satellite plants. They can be located upstream from the central plant to intercept certain amounts of wastewater before entering the sewer system. This is a good method for residential areas as this water can be used for outdoor, agricultural, and irrigation purposes without using valuable potable water. The main costs involved would be in relation to drinking water, which would need further treatment before it is safe for consumption.

This link provides valuable information on the above alternative sanitation systems as well as other methods that are effective but not quite as suitable based on the 'Land Between.'

Alternative sanitation options for households and communities:

<http://www.iwaterwiki.org/xwiki/bin/view/Articles/Alternativesanitationoptions>.

This link provides incredible detail and description of the various types of compostable toilets, including which model is best based on the local environment.

Inspectapedia: A Buyer's Guide to Composting Toilets:

<http://inspectapedia.com/septic/altcompost.htm>.

This is a great link that describes the various methods for reusing blackwater, as well as listed benefits and potential problems of the process. It also provides good case studies for areas that currently incorporate the method. The Environment Writer:

<http://www.environmentwriter.com/archives/tag/blackwater>.

4.3.3 Waterloo Biofilter

The core of the Waterloo Biofilter is a synthetic, absorbent filter medium that is configured as a free-draining, attached growth, biological trickling filter to treat sewage, process wastewaters, landfill leachate, and polish sewage lagoon discharge. It is designed for off-sewer developments such as single-dwelling households and cottages. The biofilters can be scaled to fit the design of the individual dwelling, and protects the environment and ecosystems from pollutants such as *E. coli*, BOD, TSS, nitrogen, and viruses. Some of the benefits of this biofilter include low-power consumption, low

maintenance, and an extended warranty.

Waterloo Biofilter Systems Inc:

<http://www.waterloo-biofilter.com>

4.4 Shoreline Design

Shoreline environments are often composed of many interdependent biological and physical components necessary for the health of ecosystems. All of these components combine to make an ecosystem function normally, and when one aspect of the system is affected, a definite impact is felt on the ability of that system to maintain its normal function. This is why it is integral that construction along shorelines is completed in a manner that places the least amount of stress possible on the surrounding environment. The factors that should be taken into account are size and footprint, materials, location, and roughness. “The Land Between” is in an area where shoreline construction is a definite possibility for many new homeowners.

4.4.1 Foreshore Structures

These structures are classified into two categories: those that are supported by anchors and piles, and those that incorporate fills, revetments, and slabs. They are most often constructed with wood, concrete, or steel, and this ensures that human tread in the shoreline area is restricted to a bridge or boardwalk structure beginning with the mainland and extending into or along the shoreline. Anchor and pile supported structures put less of an environmental footprint on the area than fills, as long as the wood used as support structures are natural and lack much chemical treatment.

4.4.2 Floating Docks

These docks ensure that little human tread will occur along shorelines. However, some of the materials that are traditionally used in floating dock construction are not always sustainable. By using recycled materials such as plastic jugs and reusing Styrofoam, the impact of creating new materials from valuable natural resources is lessened. Floating docks are also very cost-effective.

4.4.3 Rip Rap (Artificial Reefs)

This method involves creating shorelines on areas that have existing structural systems in the hopes to make the shorelines more like their original states. This involves placing large rocks along the shore with large voids between each to allow for natural reef inhabitants to make use of the area. Placing grooves in existing concrete slabs allow protection for organisms from excessive scour. Low elevation benches allow for the development of submergent vegetation and high elevation benches help enable a community of shrubs and trees.

This is a good Government of Ontario link that involves the importance of maintaining natural shorelines and how to develop along them.

Preserving and Restoring Natural Shorelines:

http://www.lrconline.com/Extension_Notes_English/pdf/shrlns.pdf.

This is a great Canadian guide to developing sustainably along estuaries and river systems. Shoreline Structures, Environmental Design:

<http://files.greenshores.ca/Resources/ShorelineStructures.pdf>

4.5 Bear-Resistant Garbage/Recycling/Composting Bins

4.5.1 TyeDee Bins

TyeDee bins are designed to keep bears, raccoons, coyotes, skunks, birds, or household pets out of garbage bins. These bins are used for residential and public use, and can be used in all climates. They have been tested on black bears, grizzly bears, and polar bears. In rural areas such as “The Land Between”, these bins are used to store garbage until the homeowner drops off the garbage at landfills. These bins are made of steel and can be ordered and shipped directly to the home.

4.5.2 Rollins Bear Cart

These bins are used residentially with manual, semi-automated, and fully-automated collection systems. They safely secure garbage, food, and scents that attract bears and other wildlife. They come in many different styles and the homeowner can choose what design they prefer. They come with wheels for easy maneuverability. This product is also manufactured in Canada.

4.5.3 UnBearable Bins

UnBearable Bins safely secure garbage, livestock and pet food from bears and other wildlife and are designed for residential homes, farms and acreages. They are ideal for safely securing feed and garbage for homeowners without much storage capability. They are a cost-effective solution for “The Land Between” as bears are a reality in the area. They were tested on grizzly bears, and are available in two sizes: 64 Gallon (242 litres) and 95 Gallon (360 litres).

4.5.4 Critter Guard Lock Systems

These systems work on routes that currently have roll-out garbage collection in place. They are low maintenance, easy-to-use, and cost-efficient. They were tested on grizzly bears and black bears. Another plus is that this product is Canadian manufactured.

Links:

This is a great link for an overview of all bear-resistant bins and includes ordering information.

Bear Aware: Bear Resistant Bins:

<http://www.bearaware.bc.ca/conflict-prevention/bear-resistant-bins>.

This is a link showing 'how-to' store garbage properly and also includes further product information.

Bear Saver:

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

APPENDIX

Team 6 – The Central Highlands Green Step Project

Project Title	The Central Highlands Green Step Project
Project Management Team (ie. Student Team)	Sarah Carruthers – Ecosystem Management Technology Program, Fleming College, Frost Glen Gallinger – Ecosystem Management Technology Program, Fleming College, Frost

	<p>Kate Hewitt – Ecosystem Management Technology Program, Fleming College, Frost</p> <p>Lyndsay Shular – Ecosystem Management Technology Program, Fleming College, Frost</p>
Faculty	Sara Kelly, Course Coordinator, Credit for Product II, Fleming College, Frost
Project Sponsor(s)	Leora Berman, Project Coordinator
Purpose	The purpose of this project is to gather stewardship and green development groups, technologies, and information and apply these to land development and land stewardship plans for future landowners in the Central Highlands.
Issue	The specific issue being addressed is that future development in the Central Highlands area should consider the area’s ecological importance and planning practices should incorporate environmentally-sustainable solutions that will reduce negative impacts on the area.
<p>Deliverables</p> <p>**Deliverables are the tangible “things” that you will hand over to your mentor at project end (eg. maps, reports, etc.)</p>	<p>The key deliverables are:</p> <ol style="list-style-type: none"> 1. A portfolio of summaries of best planning practices in the area of development, permaculture, and land stewardship to be used in consideration of Green Step’s future development plans 2. A bibliography of references for the required academic due dates and delivered to Leora Berman, the Project Coordinator 3. To complete all academic requirements in accordance with their due dates including a progress report, webpage, final product, and an article
Exclusions	Team 6 is not responsible for a renovation plan of the Donald Building in Haliburton although it will be used as a model for environmentally-sound development
Stakeholders	<ul style="list-style-type: none"> • The clients who will benefit from this project include the Green Step project, future homeowners, and the general public who will have the opportunity to visit an environmental, interpretive building

	<ul style="list-style-type: none"> • Those to be consulted are Leora Berman, Project Coordinator, Sara Kelly, Course Coordinator, field professionals whom Laura Berman will suggest in future meetings, and the Architectural Conservancy of Ontario, Haliburton Highlands Stewardship Council, The Land Between, the Haliburton Highlands Home Builders Association, and the Haliburton Highlands Outdoors Association • The cooperation of all of those listed above and the Haliburton community are requested • The stakeholder organizations are in constant contact with Laura Berman about development plans, budget allowances, and land-use stewardship, and she then relays this information to Team 6. Sara Kelly will provide academic support and feedback <p>There is no political sensitivity involved with this project because it is supportive of the general community of Haliburton's desire to develop a sustainable plan for the area.</p>
<p>Scope</p> <p>State what you have (eg. \$500.00, 11 Mondays 8 hrs/day etc.) not what you don't have</p>	<p>All costs associated with this project will be documented for final reimbursement. The team is given a mileage allowance of \$0.40 per kilometre for travel to and from Haliburton. Mondays during the semester are dedicated to this project, and meetings with Laura Berman may be scheduled on other days of the week to ensure team success. These Mondays will be full 8-hour days and other time during the week for team project work may also be necessary.</p> <p>Success in this project will be measured by the team's ability to complete all academic tasks, follow guidelines for teamwork as described in the charter, and maintain integrity and good rapport with Laura Berman. The team has been given many opportunities to be creative and work independently from Laura Berman, and we believe it is important to maintain the trust relationship and provide a solid final product.</p>
<p>Project Tasks and Timelines (attach this Gantt Chart document as an Appendix to your Project Plan)</p>	<p>Provide Gantt Chart listing all deliverables and all tasks related to achieving the deliverables.</p> <p><u>Use</u> both your <u>Project Proposal</u> from the mentor(s) <u>AND</u> your <u>course outline</u> for curriculum-related deliverables.</p>

	<p>Use the phases of project management as your main Gantt Chart task headings to help you logically organize the deliverables.</p> <p>**Be sure to take what you learned from creating and using your Gantt Chart in Credit for Product I and apply it here to make as effective a Gantt Chart as possible for this Credit for Product II project!</p>																								
<p>Health and Safety Plan (attach this H&S Plan as an Appendix to your Project Plan)</p>																									
<p>Background</p>	<p>Provide other pertinent background information that has not already been captured above.</p>																								
<p>Sign-off - To be completed AFTER your Project Plan has been marked/approved.</p> <p>Must be completed by Tuesday January 31, 2012.</p> <p>(Your completed Project Plan must be "signed-off" in the following sequence:</p> <ul style="list-style-type: none"> • first by all student team members • second by your Project Mentor • third by your 	<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-top: 1px solid black; width: 33%;"></td> <td style="border-top: 1px solid black; width: 33%;"></td> <td style="border-top: 1px solid black; width: 33%;"></td> </tr> <tr> <td style="text-align: center;">(Signature)</td> <td style="text-align: center;">(Print name)</td> <td style="text-align: center;">(dd/mm/yr)</td> </tr> <tr> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> </tr> <tr> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> </tr> <tr> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> </tr> <tr> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> </tr> <tr> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> </tr> <tr> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> <td style="border-top: 1px solid black;"></td> </tr> </table>				(Signature)	(Print name)	(dd/mm/yr)																		
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<p>course Faculty member</p> <p>Once all have signed, please copy the signed document and insure that each student team member, your mentor, and your faculty member has a signed copy.</p>	
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Glen Gallinger Annotated Bibliography

INTRODUCTION-

Today the home building industry thrives on new technologies and modern architecture in homes; for the wealthy population, size matters and keeping up with the Joneses is a common attitude among homeowners. In suburbia our homes all look the same and rules apply to keep them that way; quantity is the focus, how can we squeeze the largest amount of single detached homes into the smallest amount of space. Both approaches are unsustainable, costly and have negative environmental consequences. Alternatively, new homes, renovations and additions should be built with sustainability in mind and the resources to do so are readily available. The public just needs to be educated and

information about these resources needs to be easily accessible. An online resource that will include green technology, reused, recycled and reclaimed building materials and best management practices should be a very beneficial resource for the people living and building in the Haliburton Highlands area.

THESIS-

This research focuses on the recycled, reclaimed, sustainable and green building material options available for the cottage owner and general consumer for renovations, additions or for building a new home in the Haliburton Highlands area. Materials including straw bale, rammed earth, roofing alternatives, exterior cladding, insulation and more will be investigated.

CITED ANNOTATED BIBLYOGRAPHY-

1. Adams and Kennedy. (2012). The Wood Source. [online]. Retrieved February 12, 2012, from <http://www.wood-source.com/>

Barns and other old wood building usually demolished or burned, are now being salvaged. Much of it recycled while some wood can be re-purposed. This particular company takes great pride in creating quality material from the salvage of these old barn and frame structures. Carrying a large inventory The wood Source has common wood species such as ash, elm, beech, hemlock and pine. Reclaimed products listed on the site are board products and timber products that could be transformed into any array of furniture and hardwood flooring. The company offers a variety of custom sawmilling, planing and other milling services. The source is good because it is a Forest Stewardship Council certified Canadian company based in Ottawa, which specializes in the reclaimed and vintage woods products but also a variety of new lumber and wood products, which are Rainforest Alliance certified. The site gives a brief intro to what reclaimed lumber and wood products are and some appropriate uses for the board and timber products they salvage from old structures. However the source could be more detailed into the process of harvesting old lumber and the processing steps for a final product. (Adams and Kennedy, 2012)

2. Apex Block. (2011) Apex Block: The Block. [online] Retrieved February 6, 2012, from <http://apexblock.com/block/>

In this source described in detail is a composite poly concrete building block material called the Apex Block, this block replaces the traditional stick frame or aluminum farm work, instead the walls are built by stacking the Apex blocks. Blocks can easily be cut to accommodate windows, doorways, plumbing

and electrical. Apex blocks are manufactured from recycled Expanded Polystyrene (EPS) the blocks thermal insulating properties can save the homeowner up to 50% on their energy bills. The block also features a 3+ hour fire rating. This source is very informative and helpful to the consumer interested in the Apex building material, the site give tutorials and a building manual, it gives important information about the block and how its manufactured, the site gives the consumer specifications, charts on testing and analysis of the construction product. The site even gives the option for an estimate base on your homes square footage.(Apex Block, 2011)

****3.** Chiras, D. (2008). All About Insulation, 56-61(6). Retrieved January 25, 2012, from EBSCOhost Environment complete. Mother Earth News. Item 34882568

The article titled: All about insulation. Gives insight into the purpose of insulation in the home and the conventional insulation options. However the article also offers alternative insulation such as the more environmentally friendly Cellulose insulation made from recycled newspaper and small amounts of cardboard shredded into a fluffy mass, which is sprayed or blown dry into wall and ceiling cavities. Cotton insulation is safer to handle without fiberglass and formaldehyde binders. Cotton is a chemical intensive crop so the recommended alternative is recycled cotton insulation, made from up to 85% post consumer and industrial recycled cotton giving a new life for your old denim jeans. Straw and a clay-stray mixture are also acknowledged as natural insulation options.

****4.** Chiras, D. (2002). Building With Earth 28-35(8). Retrieved January 25, 2012, from EBSCOhost Environment complete. Mother Earth News. Item 6329529

The article titled: Building with earth. Discusses the benefits of an earthen home. Earthen homes are appropriate for a variety of climates, well suited for passive solar heating and cooling. Constructed mostly from soil onsite; rammed earth construction requires substantially less fossil fuel energy to build than the conventional wood frame. Reduced energy consumption has environmental benefits reducing pressure on softwood lumber and green house gas emissions. Wooden or steel forms mounted in the foundation are filled with a mix of soil, aggregate, clay and sometimes Portland cement subsequently this mix is compressed with a pneumatic tamping device, creating a layer of hard packed material, more of the mix is added the process repeats. Until completion when the forms are removed leaving a solid wall of stratified layers from each pneumatic pressing.

- **5. Evolve Builders Group. (2010). Harvest homes: Straw Bale Building Premier. [online]. Retrieved January 26, 2012, from http://harvesthomes.ca/building/straw_bale_primer.pdf.

In this report titled: Straw bale building primer. Straw is highlighted as one of the finest renewable building materials available because it is found so abundant around the world. Considering two building styles, load bearing and post and beam, general building practice is staggering blocks of straw, mesh reinforcement is attached to the inside and outside wall and covered with a thin plaster skin. Common concerns such as height limitations, rot, structural strength, and pests are addressed. Overall straw bales make a beautiful, strong, energy efficient and ecologically sound house.

6. Global Environmental Manufacturing. (2009). Euroshield. [online]. Retrieved February 8, 2012, from <http://www.euroshieldroofing.com/>

Global Environmental Manufacturing (G.E.M.) is a Canadian company that specializes in green materials. Euroshieldroofing, a product of G.E.M. has taken the old rubber tire and pumped life back into it as an environmentally friendly roofing product made from 85% post consumer recycled tires making it Leadership in Energy and Environmental Design (LEED) certified. As a no waste system the average size home Euroshield roof comes from 600- 1000 rubber tires and the scrap material generated will all be recycled again. The long lasting material has a 50-year warranty and is 100% recyclable. The Euroshield site is complete with some background of the material, understand the roofing product and its benefits, what makes this material green, there are technical specifications and customer testimonials. This source makes it easy for a homebuilder or contractor to learn about and use this material.(GEM,2009)

7. Ideal Concrete Block Company. (2005) Turfstone Grid Pavers: Stones with Style. [online]. Retrieved February 8, 2012, from <http://www.idealconcreteblock.com/pdf/Turfstone.pdf>

This article reviews the use of Turfstone concrete grid pavers for use in pathways, overflow parking, emergency access lanes, boat launches, with geotextile material and dense graded aggregate base Turfstones could be a great alternative for a driveway. Turfstone blocks measure $23\frac{5}{8}''$ x $15\frac{3}{4}''$ and 8 centimeters thick; the Turfstone honeycomb design can provide storm water runoff control, soil stabilization and acts as an erosion control on slopes and hills. Diagrams of two different installment patterns, running bond $\frac{3}{4}$ offset and stack bond illustrate the pattern and another diagram illustrates the

cross section and layers of construction. This source could be more comprehensive, it is a more general information guide however with the diagram included and the great examples of how this building material can be used I think it's still a valuable resource. (Ideal Concrete Block Company, 2005)

8. Think Plastic. (2012) Bale board: The environmental alternative. [online]. Retrieved February 13, 2012, from <http://www.baleboard.ca/product.html>

Bale board a product produced by a Canadian company called Think Plastics. Bale board is a plastic lumber product made from 100% solid polyethylene. The plastic medium to manufacture this plastic lumber is recycled from the white agricultural bale wraps and green house films. This is not a composite material mixed with wood fibers or fillers and is 100% recyclable. The benefits to this wood alternative include being mold and mildew resistant, not slippery when wet, gas and oil resistant, and its resistant to moisture and insect damage. Bale board outlines the environmental aspects of the material, why its sustainable and how Think Plastic collects bale wrap and manufactures it into Bale board. This site is perfect for a builder or contractor looking at alternative lumber products this source goes into detail about Bale board and its benefits, applications, the reduction of environmental impact, gives technical specifications and a list of retailers. (Think Plastic, 2012)

9. Portland Cement Association. (2012) Concrete homes: Insulation Concrete Forms. [online]. Retrieved February 13, 2012, from http://www.cement.org/homes/ch_bs_icf.asp

Insulated concrete forms from companies like Logix and Nudura are renowned for a concrete form product with high-energy efficiency and insulation qualities. The forms made from Expanded Polystyrene form the walls with a staggered stacking pattern, rebar is added in-between for stability and durability of the building, the forms are then filled with concrete. These forms are permanent and stay part of the structure; unlike the conventional form that is removed after concrete is set and dry. The forms are pre engineered for installing drywall on the interior and many mediums can be used for the exterior, ie bricks, stucco, vinyl or metal siding, wood and clay based plaster. With an R-value of this insulated form of about 20 and being 10 to 30% more air tight than other wall and insulation materials, some company's estimate as much as 20% or more savings on your energy bill. The source for insulated concrete forms is very informative on the topic, however more details are manufacturer specific and not

included in this site. Though the source does cover topics such as the history, advantages, size, components and configurations, installation, sustainability and energy, and building codes.

CONCLUSION-

From my research into the alternative, sustainable and recycled materials available in the market for home builders and contractors. It is clear that a large variety of materials exist which can be applied to any home renovation, expansion, retrofits or even for building a new home or cottage from the ground up. The resources are there and green/ sustainable building seems to be gaining momentum in the industry, however educating people about the options is an important aspect to drive green building to the next level and an online resource that will include green technology, reused, recycled and reclaimed building materials and best management practices should be a very beneficial resource for the people living and building in the Haliburton Highlands area.

Kate Hewitt Annotated Bibliography

Introduction: The 'Land Between' is an environmentally-sensitive area that forms a band across parts of southern Ontario, particularly in the Haliburton Highlands region. The area has become especially popular for residential development as individuals often have to move farther away from their places of work. However, the 'Land Between' is a beautiful stretch of land and has a very specific landscape. It is important that future development in the area incorporates important land stewardship principles to ensure less of a human impact on the natural world. The following literature reviews are based on land stewardship design in the 'Land Between' for new residential development, and also for future plans of the Donald Building, which will be turned into an environmentally-conscious interpretive centre. This project is related to the overall goal of the

Credit for Product course by linking students with an environmental-based organization and mentor, and it allows students to have a direct impact on design planning in an important stretch of Ontario.

Thesis: Green building design and integrative planning has become an integral part of resource sustainability and land stewardship, and the Donald Building in Donald, Ontario can be used as a model for future sustainable residential building development in the 'Land Between.'

Annotations:

****7group, and Bill Reed. 2009. *The Integrative Design Guide to Green Building*. Hoboken, New Jersey: John Wiley & Sons Inc.**

This book is based on integrating new, environmentally-sustainable methods in commercial and residential building design. Land stewardship is a section in this book and it describes the importance of incorporating the local environment in planning design. The main subject or purpose of this book is to develop new, sustainable building plans in hopes to decrease the use of finite natural resources. It builds on the concept of "green design." There is no specific method or study; it states that the immediate natural surroundings, depending on what they are, should be a primary focus in initial design plans. Case studies are included about various places in the United States, such as New Jersey, that incorporated recommendations made by environmental scholars saying that evaluations of the local environment before building construction affected many aspects of the design. This included water flow and collection, soil characteristics for building location, and biodiversity loss as a result of long-term environmental ill-health. These factors were taken into consideration, and it was discovered that these evaluations should be completed prior to construction as they can avoid long-term building problems such as basement flooding or a shifting foundation. Knowing these factors at an early stage will also allow contractors to take advantage of the environment's help and natural usefulness instead of considering it a nuisance. The author tries to inform the lay person as the book is easy to comprehend. The author provides an interesting report of the extent to which non-sustainable resources are being exploited and it was convincing based on the large amount of research and the number of academics involved with the project. I will use the information gained from this article and make careful observations about the natural environment during fieldwork expeditions so that future design plans will take the land into account.

****Bauer, Michael, Peter Mosle, and Michael Schwarz. 2010. *Green Building: Guidebook for Sustainable Architecture*. Berlin, Germany: Springer-Verlag.**

The reason this book was written was because it is expected that the most pressing environmental problems of the future will be lack of clean drinking water and the world's energy supply. This book attempts to find ways to design buildings, both commercial and residential, to deal with these problems without reducing our current standard of living. It describes how buildings are major users of energy and much water is wasted through temperature regulation and human use. It is written for a slightly more academic audience than *The Integrative Design Guide to Green Building*, but it is still very accessible. There are interviews and data presented to help support the project, but mostly it is a guidebook for individuals to incorporate "green design" into their current and future building plans. Future recommendations are for commercial and residential building designers and

developers. It is hoped that more sustainable design plans will be included in development. I will use this article to help me evaluate how much water and energy use could be saved by using smart technologies when I am doing fieldwork.

****Conner, Nancy. 2009. *Living Green: The Missing Manual*. Sebastopol, California: O'Reilly Media Inc.**

This book was written as a result of new interest in the health of the environment. The book describes how the planet has come to be ridden with environmental problems, and how people can do their part in their everyday lives, including home design in pre-existing homes. This book describes the LEED program, and how some Canadian provinces are now becoming members. The LEED is a guide to how to make one's home more energy efficient through alternative energies and water conservation. It also discusses speaking with Canada's Green Energy Council for suggestions of contractors who are licensed to develop sustainable buildings. There is no study, as it is also a guidebook, but it makes good reference to various locations across Canada and other parts of the world. The whole book provides suggestions for further actions and it was very much written for the lay person based on the language presented. The argument is convincing because the author uses a very sound case for sustainable building design. I will use this book as a general reference guide during research for the final portfolio.

Johnston, Jacklyn, and John Newton. 2004. *Building Green: A guide for using plants on roofs, walls, and pavements*. London, England: Greater London Authority.

This source will prove itself very useful to me because it specifically discusses land stewardship. It discusses green walls and window positions which are useful for my group members, but it also describes how local bird, bat, and other animal populations can be incorporated into green building design. I appreciate that it incorporates case studies from London and Denmark about how green buildings are important in sustainable design. It is meant for the lay-person as it is very approachable, and I will definitely use this as a reference in my land stewardship suggestions. I appreciate how this source lists items I have not considered in my studies such as courtyard and balcony gardens, which can definitely be used in designs for new integrative housing in the 'Land Between.'

Keeler, Marian, and Bill Burke. 2009. *Fundamentals of Integrative Design for Sustainable Building*. Hoboken, New Jersey: John Wiley & Sons Inc.

The main topic that caught my eye in this book was that it discusses the life cycle assessment of homes in an environmental context, which is not covered in the other sources. It also discusses both residential and commercial buildings. It also covers an issue not found in the other sources – rated occupant health based on green building design. The diagrams based on seasonality and heat sources are amazing, and provide the lay person and academics with good information on land stewardship, green building design, and permaculture. I will use this book more as a scientific reference for other group members, but it still contains valuable information for this project.

Kibert, Charles J. 2008. *Sustainable construction: green building design and delivery*. Hoboken, New Jersey: John Wiley & Sons Inc.

This book is based on the necessity to change current trends if humans hope to continue living in the same manner to which they are accustomed. The book attempts to mediate the problems of the environment by changing human habits and appealing to the economic benefits behind green design if environmental reasons are not enough. The book describes how using new designs for environmental residents can be used as models for other sectors of the economy. This book very much tries to persuade individuals to help the environment by helping themselves economically. There is no study presented in this book, as it is written in an essay format – describing the problem, what can be done about it, and future outlooks. It provides good suggestions about how incorporating these environmental changes will save money overall, which is a good point to keep in mind as the Donald Building is in need of more funding. The argument was convincing as many individuals have a profit-driven mind-set in current times and it appeals to all levels of academia as well. This book will come in useful if there are opinions that environmentally-sound design practices are economically unfeasible.

Pressman, Andy. 2007. *Architectural graphic standards*. Hoboken, New Jersey: John Wiley & Sons Inc.

This book has a smaller section on land stewardship, but it is still a useful guide for this project. I appreciate the fact that there are environmental design features based on the type of building itself, not just its purpose (commercial or residential). This will be useful because homes will be of varying type in the 'Land Between.' It includes several international case studies about architectural design in general and also those of green integrative planning. Some graphs are found detailing the design process as well as blueprints of buildings that have been erected in the past based on the design principles. The book was written for a more academic audience as there are features of architectural and environmental design included that are written for those with an experienced background.

Thompson, J. William, and Kim Sorvig. 2008. *Sustainable landscape construction: a guide to green building outdoors*. Washington, D.C.: Island Press.

I was very pleased to find this book because it is a rare find – a source completely on land stewardship in green building design and what can be done *outdoors* instead of inside the buildings. I very much like how water is incorporated into the book because in the 'Land Between,' residences built on the edges of water bodies is a reality and a major part of land stewardship. The book goes on to describe erosion control along these water bodies which is a section I will definitely refer to in the final portfolio for this project. It is written for the lay person because it provides diagrams and simple explanations of how to go about making changes to one's home, but it also credited by its thorough way of describing what can be done in each specific home design based on landscape type.

Yudelson, Jerry. 2008. *The green building revolution*. Washington, D.C: Island Press.

The purpose of this book is to fundamentally change building design to create energy-efficient, healthy, productive buildings that reduce impact on the environment. It contains a full description of the LEED (Leadership in Energy and Environmental Design) protocol and the USGBC (United States Green Building Council) to find a common way to measure and define green buildings. This book will be my main reference for the portfolio if questions about environmental standards and attributes are being met within the residential development. It is written for individuals with a background in the environment and energy use, but it is still accessible based on its graphs and diagrams which give the reader a good grasp of the topic. The case studies are based on cities all over North America and they are compared based on the LEED and USGBC standards.

Conclusion:

The above literature sources have provided ample information to help put together a portfolio which will be given to contractors and other land developers in the 'Land Between.' From the above sources it can be concluded that the most important land stewardship design principles that should be included in the final project are water use, shorelines, erosion, and waste/composting. These features are directly connected to the topics of my fellow group members, so much discussion is necessary in order to determine the best solutions. It is my hope that the sensitive area will be protected from much unnecessary human pressure, as environmentally-sound design principles and integrative planning will be incorporated into future residential development.

Lyndsay Shular Annotated Bibliography

INTRODUCTION

The use of permaculture in designing a building or a new home can be very useful and beneficial to the land owner. It can save money by cutting back cooling and heating costs and can also help to reduce the impact new building can have on the land. By taking the placement of windows, doors, lights, and walls into consideration, the home owner can use the heat of the sun, the direction of wind, and even the topography of the land to their benefit when building a home. **The application of this practice, permaculture, is very important and can aid in sustainable development and help land owners/building owners in the long run save money and the environment.**

**Hirsch-Tauber, E. (2011). Permaculture as a tool for ecological community design. *Communities*, (153), 50-53. Retrieved January 12, 2012, from:
<http://ehis.ebscohost.com.rap.ocls.ca/ehost/pdfviewer/pdfviewer?vid=3&hid=23&sid=2fedd6c3-82e5-4665-a9f4-90489b535f1f%40sessionmgr11>

This article, published in *Communities* journal, is a summary of different permaculture principles that can be applied to communities and individual homes as sustainable practices. The author, after spending time in an intentional ecologically sustainable community and participating in a permaculture design course, gathered and condensed the knowledge and practices observed into an article that also interprets methods and principles from other ecologists. The article discusses how existing communities and Ecovillages use the “permaculture principles” and how they are both adaptable to today’s constantly changing atmosphere. The author’s use of permaculture in this context does not mean “permanent culture” but instead focuses more on adaptable settlements that are dynamic and changeable when they need to be. Observations were made by the author about the communities which they visited and how the principles of permaculture created by Bill Mollison and David Holmgren, two innovators of permaculture. The article clearly identifies how these principles can be put into use and that permaculture can be applied effectively.

**Mollison, B. R.S. Slay. (n.d.). *Introduction to Permaculture*. Tasmania: Tagari Publications.

Chapter one of the book called *Introduction to Permaculture*, explains eleven different principles of permaculture and how each can be associated with practical techniques depending on climate conditions and on multiple different scales. Some of the different principles in this chapter are relative location: every element is placed in relationship to another element; each element performs many functions; each important function is supported by many elements; energy recycling on site; use of edge and natural patterns for best effect. These principles apply to the Green Step Project by providing useful knowledge and information that can be used in the practical application of construction and green technologies to the Donald Building in an effective and sustainable manner. The author wrote the book for application in another part of the world other than Canada but the principles can be used globally because they are based on the premise of sustainable living.

**Santamouris, M., D. Asimakopoulos. (1996). *Passive cooling of buildings*. James & James (Science Publishers) Ltd. Retrieved January 30, 2012, from:
http://books.google.ca/books?hl=en&lr=&id=tLHsJ0-vEkYC&oi=fnd&pg=PR9&dq=passive+heating+in+buildings&ots=MW_FZptvNk&sig=TYHhB5BGMhoLENVsH9SnJw233Xg#v=onepage&q=passive%20heating%20in%20buildings&f=false

In the book *Passive Cooling of Buildings*, the author mentions the alternative techniques used to cool buildings instead of the traditional HVAC air conditioning method that have increased environmental benefits, financial benefits, and operational and qualitative benefits. It is a multidisciplinary process and

alternative techniques should be considered during construction along with other aspects of the architectural design. The book covers three main topics such as basic knowledge that has been developed up to date and the tools used progress in the field that has been achieved through research, and future priorities for passive cooling. This is an important and useful piece of literature for the Green Step Project because the Donald Building will be looking into and using different alternative techniques for heating and cooling the building. Passive heating/cooling methods can vary but in the case of the Donald Building, the building itself is constructed with cement and many windows to allow the suns energy to warm the building naturally. As for cooling and air flow, four large bay doors located on the east and west aspects of the building will allow for natural air flow through the building on active days.

Bhatnagar, A., Vilar, V. P., Botelho, C. S., & Boaventura, R. R. (2010). Coconut-based biosorbents for water treatment — A review of the recent literature. *Advances In Colloid & Interface Science*, 160(1/2), 1-15. doi:10.1016/j.cis.2010.06.011

The authors of this article are compiling different research into one article on the benefits of using coconut by-products and various parts of the tree as a biological absorption agent in the treatment of waste water. The reason that coconut being used as a biosorbent is a good idea is because it is cost effective and has a significant absorption potential for the removal of several different aquatic pollutants. This technology can be considered as an experimental alternative to waste water treatment and waste remediation and is more economical than traditional methods. Although this article is a review of all literature presented on the topic, it states that this process does need to be improved to implement on a large, commercial scale operation. The use would work for single dwellings or multiple single dwellings but nothing larger than that at this time.

Reed, S C., Crites RW., Middlebrooks EJ. (1995). *Natural Systems for Waste Management and Treatment*. 2nd ed. McGraw-Hill, Inc. Retrieved from: http://books.google.ca/books?hl=en&lr=&id=3NMCKrWsKo8C&oi=fnd&pg=PA1&dq=alternative+waste+water+management&ots=hdXwzOg2bg&sig=_FNFRDxxpsXC1pWTM1CKIB0jqyl#v=onepage&q=alternative%20waste%20water%20management&f=false. Accessed: 10 February 2012

In this book, the authors describe methods of natural alternative treatments for waste water and waste water management. These methods would be ideal for cottage builders or new land owners because the systems cost less to build and operate, and require less energy than mechanical treatment systems. The book thoroughly gives information on many different types of treatment systems such as wetland systems, sludge management and treatment systems, and land treatment systems. Each chapter describes different systems and methods of treating waste and waste water. This is a beneficial piece of literature and can be very helpful to people who are interested in creating an alternative waste treatment system.

Lazarova V, Levine B, Sack J, Cirelli G, Jeffrey P, Muntau H, Salgot M, Brissaud F. (2001). Role of water reuse for enhancing integrated water management in Europe and Mediterranean countries. *Water Science and Technology*. 43(10), pp25-33. Retrieved from: http://www.lmd.polytechnique.fr/climatekicedu/images/9/9c/4._Lazarova_Role_Reuse_2001.pdf. Accessed: 11 February 2012

This paper focuses on the reuse of water for an enhanced integrated water management system. Although the research is based in Europe and Mediterranean countries, the principles behind the system can be used in the summer months for cottagers and land owners in “the Land Between”. With this method, the reclaimed water can be used for gardening water, irrigation water, or for non-potable purposes and will decrease the demand on the water supply. Although an investment must be put into the sewage treatment or grey water treatment system for the reuse of this type of water, the money saved in the long run will be worth the initial investment and the land owner is helping to save the environment by using less water. This method needs to have a strong plan in place for the integration of clean water and reused water in one system and strict rules and regulations need to be implemented and followed for this system to work.

Jowett, E.C. (1997). Sewage and leachate wastewater treatment using the absorbent waterloo biofilter. *Site Characterization and Design of On-Site Septic Systems, ASTM STP 1324*. Retrieved from: http://books.google.ca/books?hl=en&lr=&id=2PCAAQ_EnjQC&oi=fnd&pg=PA261&dq=waterloo+biofilter&ots=L_lwmCucPF&sig=ki1JoM7l6HF-MzJvwvPd5Bg7Q20#v=onepage&q=waterloo%20biofilter&f=false Accessed: 13 February 2012.

This article explains the purpose of the “Waterloo Biofilter” which is a free-draining aerobic biofilter that treats domestic septic effluent. The system uses a medium of light-weight, plastic foam that combines high retention time with high surface area for microbial attachment that simultaneously allows for loading and aeration. This system is similar to a tile bed but is not buried underground and is good for areas with minimal soil profile, dominated by bedrock. It can handle domestic use and can also be used for grey water and is an efficient replacement for recirculating sand filters. This is a beneficial system for land owners to install because they will get more use of the system for their money. Sand and soil filters require replacements many more times than the Waterloo Biofilter because of the potential for blockages to happen due to small pore space and surface area. Although these systems are above ground, there are control methods for odour prevention such as charcoal filters and the minimal use of disinfectants.

Lai, P., & Lyons, K. (2011). Place-meaning and Sustainable Land Management: Motivations of Texas Hill Country Landowners. *Tourism Geographies*, 13(3), 360-380. Retrieved from: <http://ehis.ebscohost.com.rap.ocls.ca/ehost/detail?vid=7&hid=101&sid=f6e547c2-647a-44b9-a6e9->

2ce8160f7339%40sessionmgr110&bdata=JnNpdGU9ZWZWhvc3QtbGl2ZQ%3d%3d#db=aph&AN=64133886 Accessed: 13 February 2012.

This article on land management explains the important role that private lands have on ecosystems and how landowners working together can decrease fragmentation. These areas are especially important where increasing urban sprawl is happening. Although the study focuses on an area in Texas, the principles of place meaning and the connection that land owners have with their land are the same. This theory applies to land owners in the Haliburton and Land Between areas because the land available is extremely sensitive and has rich species diversity. Land stewardship can be applied through sustainable land management practices and also through the planning of the land. Planning of the land deals with place meaning and how every object or subject can benefit another. Also, with maintaining sustainable land management practices, the value of the land can also increase over a period of time.

Kotey, N. A., Wright, J. L., Barnaby, C. S., & Collins, M. R. (2009). Solar Gain through Windows with Shading Devices: Simulation Versus Measurement. *ASHRAE Transactions*, 115(2), 18-30.

Retrieved from:

<http://ehis.ebscohost.com.rap.ocls.ca/ehost/pdfviewer/pdfviewer?sid=bf4c385e-8484-44eb-b98a-13ffdc983a9%40sessionmgr115&vid=6&hid=101>. Accessed: 13 February 2012.

This paper explains the use of shading devices on windows and how they can help to mitigate heating and cooling. It is proven that the use of blinds and shading devices can decrease solar gain and reduce the amount of cooling needed for buildings and in warmer conditions, the amount of cooling needed for a building. This study looks at certain types of shading devices such as venetian blinds, roller blinds, and pleated drapes. For the purpose of the Donald centre and the land owners the type and style of shading device does not seem significant but the use of any type can have a beneficial effect on their house. White seems to be particularly effective on keeping solar rays out due to its high reflectance level. The lighter the shade of colour the blinds are, the more sunlight they will keep out when in the "closed" position. This information is very helpful to land owners who are looking for methods to reduce heating costs and cut back on energy consumption.

CONCLUSION

In conclusion, the principles around permaculture and how they can be applied to houses being developed or worked on in The Land Between should all be taken into consideration. Permaculture in itself has to do with the use of things and how they can benefit from others and benefit others. Everything should be integrated with other objects, such as the layout of the house and having more windows facing south because that is where more sunlight will hit, creating passive solar heating. That in turn reduces heating costs and reduces energy consumption because the solar rays are doing part of the work. These reviews of literature have to do with alternative methods and how they can be applied in a sustainably manageable way. How one thing will interact with another and what can result from the

relationship. The planning of the land is also a very important aspect that needs to be considered if someone were to take the initiative to build green. All green methods of building are a good idea, some more than others and a lot of research needs to be done before hand to ensure best quality outcomes.

	Week 1 Jan. 8-14	Week 2 Jan. 15-21	Week 3 Jan. 22-28	Week 4 Jan. 29-Feb. 4	Week 5 Feb. 5-11	Week6 Feb. 12-18	Week7 Feb. 19-25	Week8 Feb. 26-Mar. 3	Week9 Mar. 4-10	Week10 Mar. 11-17	Week11 Mar. 18-24	Week12 Mar. 25-31	Week13 Apr. 1-7	Week14 Apr. 8-14	Week15 Apr. 15-21
STARTING															
Establish groups for the course	█														
Start-up meeting	█														
Contact project mentor Project lead: Lyndsay Shular	█														
Completeion of Forms	█	█	█	█											
Team Charter	█														
PLANNING & COMPONENTS															
Completion of Project Plan Project Lead: Kate Hewitt	█	█	█	█											
Development Research Project lead: Glen Gallinger	█	█	█	█	█	█	█	█	█	█	█	█			
Permaculture Research Project lead: Lyndsay Shular	█	█	█	█	█	█	█	█	█	█	█	█			
Land Stewardship Research Project lead: Kate Hewitt	█	█	█	█	█	█	█	█	█	█	█	█			
Alternative Energy Research Project lead: Sarah Carruthers	█	█	█	█	█	█	█	█	█	█	█	█			
Portfolio building & Product	█	█	█	█	█	█	█	█	█	█	█	█	█		
Bibliography	█	█	█	█	█	█	█	█	█	█	█	█	█		
IMPLEMENTING															
Project Management Session			█												
Donald Building Site Visit				█											
Contact Interviews					█	█	█	█							
Performance to Date						█									
Peer Evaluation Session					█										
Literature Review Part 1	█	█	█	█											
Literature Review Part 2	█	█	█	█	█	█	█								
Progress Meeting						█	█								
Progress Report									█	█					
Webpage and article session								█	█	█					
CLOSING															
Hand in Draft Product											█				
Draft Product Meeting												█			
Webpage Finalized													█		
Hand in Final Product														█	
Hand in Article															█
Official Project Closing															█
Peer Evaluations															█