GREENING OCKANICKON

A Sustainable Action Plan for Camp Ockanickon

Prepared by 2016 Graduate Planning Studio
Planning and Community Development
Temple University
For Boy Scouts of America, Washington's Crossing Council

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Introduction

The Boy Scouts of America exists to educate young men in making moral and ethical decisions over their lifetime. Environmentalism has always been a key principle of the Scouts. Scouts have been educated to understand and utilize the Environment in a respectful manner. Until recently sustainability was an unfamiliar word. However, sustainability has always been a part of the nature of the organization. The BSA have said, "Sustainability is in our DNA". Education is a core value of the Scouts and a key piece to achieving sustainability.

In 2014 the BSA launched their first sustainability report. The report was the BSA's first attempt to define sustainability and the steps to achieve it. The BSA also adopted the Sustainability merit badge in 2013, which is now an option for Eagle Scouts. The Scouts also began teaching first year cubs about sustainability through tree plantings as well as through the Outdoor Code and Leave No Trace programs. In addition, the BSA also began reporting examples of sustainable initiatives across the Nation with the goal of teaching by examples. The Council Sustainability Resource Guide created in 2015 showcases examples of sustainable initiatives by topic including: waste, energy, food, water and construction.

Sustainability has also become a key focus for the National Park System (NPS). The NPS is required by federal laws and executive orders to operate in a sustainable manner through meeting renewable energy standards as well as a number of building standards as a part of new construction. The NPS provides a number of available resources on its webpage. In 2012, the NPS created the Green Parks Plan to provide a collective framework for sustainable practices. According to the Plan, a key piece of implementation is educating park officials, visitors and the larger community about climate change and sustainable practices.

Similarly, Pennsylvania State Parks have adopted educational programs to educate staff and visitors of the initiatives they are taking to reduce energy use and their efforts to convert to renewable energy resources. Like the NPS, PA State Parks are educating staff and visitors through show casing sustainability initiatives. Visitors also learn how they can reduce their personal energy use. For example, the PA State Park System instituted the "Green Camping" program. The purpose of the program is "connecting visitors to nature through camping, reducing the environmental impacts from normal camping activities, and spreading sustainable options for camper's personal lives". They marketed this program through a traveling mock campsite which displayed sustainable campsite features to staff and visitors across the State. The State has also begun displaying informal interpretive signs throughout the Park system which are cheap and convey sustainability messages to visitors.

Camp Ockanickon has both an obligation and an opportunity to be a national leader of sustainability. Investing in sustainability initiatives will further enhance the Scouts' relationships with nature. It will have long term benefits including: reducing resource costs, improving environmental quality, providing a sustainable education for scouts and ensuring the continuation of Camp Ockanickon for years to come. Achieving sustainability will require careful planning and consideration of all the elements. Therefore, a sustainable action plan is needed to guide Camp officials in its journey for sustainability.

What is a Sustainable Action Plan?

Sustainable action plans provide organizations with a guide for achieving sustainability. Sustainability has a number of definitions, but the American Planning Association's adopted definition describes it best. The APA's definition of sustainability is, "The capability to equitably meet the vital human needs of the present without compromising the ability of future generations to meet their own needs by preserving and protecting the area's ecosystems and natural resources". In other words humans must adopt sustainable principles to ensure the survival of future generations.

Achieving sustainability requires careful planning and full participation to maximize the efficiency of sustainable programs. Plans are created specifically for different types and scales of organizations. This Plan is specific to Camp Ockanickon. It is intended to guide the Washington Crossing Council, the authority in charge of the Camp. The Council is responsible for managing and improving the conditions of the Camp overtime.

Sustainability is at the core of managing and expanding camp operations. It provides enduring solutions as well as improves and expands relationships with the environment. Finally, it will ensure the continuation of Camp Ockanickon for generations to come.

About Camp Ockanickon

In March 1940, the Bucks County Council purchased land from Charles Larsen to establish a Boy Scout Reservation in Plumstead Township, Bucks County, PA. The Camp was named Ockanickon to commemorate Chief Ockanickon of the Lenni Lenape Tribe. A large portion of the Camp borders the Tohickon Creek and Ralph Stover State Park. Over the years Camp Ockanickon has increased and updated its growing number of facilities. Palmer Hall, one of its main administrative buildings was the first to be established. Additional key facilities added include Foster Hall, its main dining quarters, the Health Lodge, an in-ground pool, the Trading Post, Great Buck Lake and the GE Science Center. The GE Science Center was the first ever constructed science center at a Boy Scout Camp. Therefore, it serves as both a place where scouts receive an education in scientific principles and as a national achievement for the Camp.

Camp Ockanickon has continued to grow The Camp is about 300 acres in size. However, 139 acres of that total are preserved through a conservation easement agreement with the Heritage Conservancy. There are 15 campsites, which have been named using the language of the Lenni Lenape Tribe. About 3,100 scouts attended summer camp in 2014 according to the Washington Crossing Council Annual Report.

Current Conditions

This plan aims to help Camp Ockanickon reach their goal toward higher sustainability. Camp Ockanickon's growing number of visitors has stretched its water resources and has increased energy costs. Poor stormwater management have exacerbated flooding and erosion activity around the Camp. Much of the Camp's restroom facilities are pit latrines, which are outdated and have helped caused bacteria to generate in its water supplies. In the following section, we detail our findings based on site visits and interviews with Camp staff.

Waste

All of the waste produced by the Camp are sent to the landfill. There are no recycling or composing facilities to adequately handle waste. The Camp currently utilizes a 30 yard compactor, which is emptied approximately 12 times a year. The majority of the trash is created by food waste, as well as disposable utensils and plates. The dining facility does have dishwashing infrastructure, as well as reusable utensils and plates, but does not have enough time between lunch sessions to clean dishes.

Stormwater Management

Stormwater is an issue that primarily afflicts urban areas with combined sewers, like the Philadelphia Metro area. With massive proportions of impervious surfaces like streets, sidewalks, rooves, and parking lots, stormwater can cause major infrastructural failings without proper management. In a rural area like Camp Ockanickon, stormwater is not as large of a concern, but it can still be a nuisance. Thankfully, because the stormwater issue at Camp is fairly manageable in scope, these proposed solutions can be implemented at low cost and with little construction effort. In this section, the watershed area and Camp Ockanickon's water feature characteristics will also be highlighted.

Watershed Characteristics

Camp Ockanickon lies in the Lower Tohickon watershed, which services the Tohickon creek, a waterway that drains from Lake Nockamixon, before eventually terminating into the Delaware River. The massive Lake Nockamixon also divides the Upper from the Lower section of the Tohickon, while also serving as one of the largest lakes in Pennsylvania. Therefore, our project area lies within the Lower Tohickon Creek Watershed, beginning at the Nockamixon dam and terminating at the confluence of the Tohickon Creek with the Delaware River. The area of the Lower Tohickon Creek Watershed amounts to a total of 37.69 square miles. The rural nature of the watershed implies its value as a treasured natural, cultural, and recreational resource. Camp Ockanickon lies within Plumstead Township, which comprises about 7,300 acres of the total watershed area. A large majority of the land area within Plumstead Township is open space, including large swaths of agricultural land, as well as High Rocks State Park.

Camp Ockanickon Water Features and Issues

Camp Ockanickon features multiple water features on site. The Tohickon Creek forms the northwestern to northeastern boundary of the Camp Ockanickon property, with some minor stream rivulets that flow into it directly within the camp boundaries. The largest and most prominent water feature on site is Big Buck Lake, where many aquatic Scout activities occur during the peak summer season. The 'lake' (It is generally accepted that a lake is a larger body of water where light does not penetrate through to the bottom, and this 'lake' is around 12 feet at its deepest point) is manmade and primarily spring-fed, however there are some small streams that flow into the lake including one drainage ditch that flows from the nearby southwest residential area. This drainage ditch is one of the stormwater focus areas, as it drains runoff from a nearby residential neighborhood before terminating into Big Buck Lake. With this stormwater managed, it will improve the quality of water entering into the recreational lake system.

Stormwater Focus Areas

SW Focus Area #1: Drainage Ditch

This constructed ditch collects runoff from Shad Lane and Tohickon Hill Road, as well as from homeowners' yards. Possible pollutants in this runoff would be considered 'non-point source', as they would be a conglomeration of various pollutants picked up by rainwater from residential yards, agricultural fields, or streets and other rights of way. These pollutants could include: oil & grease from roadways, commercial or agricultural fertilizers, road salts, pet waste, or excess sediments. The collection ditch that drains the residential neighborhood was recently constructed, and is regularly mowed. No water-loving plants besides conventional lawn grass are present here to help filter out pollutants from the right-of-way.

The rocky drainage ditch seen from the footbridge that drains nearby residential neighborhoods.

Stormwater Focus Areas

Seen from the walking trail, a view of the ATV field during winter. Out of view to the right, the patch of cattails 'wetland' collects some stormwater from this field.

SW Focus Area #2: ATV Field

There are some minor runoff issues in areas where foot and vehicle traffic are common as well. The two examples given by camp staff include the ATV field, and the parking lot/road adjacent to palmer lodge. The ATV field is used for boy scouts and leaders to all-terrain vehicles (ATVs) in a relatively enclosed environment. After a heavy rain, the field often becomes very muddy and collects large amounts of standing water in the compacted track area of the field. A pipe drains some runoff from this field to a small wetland nearby, although the rivets in the field still retain standing water following a storm. Landscaping may be required to grade the land so it drains more effectively, perhaps into the existing wetland, or a rain garden for filtration.

Stormwater Focus Areas

SW Focus Area #2: Palmer Lodge Parking/ Driveway

The parking lot adjacent to Palmer Lodge also collects standing water, which can impede proper foot traffic to and from the lodge, as these large puddles often sit between the lodge, and pathways to the various campsites. Creating a more permeable and re-graded gravel surface for this parking lot (it is currently dirt/ gravel that is largely compacted) may ease some of the minor stormwater issues associated with the lot. Simply adding a new layer of gravel in the affected areas that directs stormwater to more permeable areas allows water to permeate into the ground would be feasible. Stormwater solutions for Camp Ockanickon will be further explored in the following section.

The driveway adjacent to Palmer Lodge is wet for most of the year as stormwater is retained by divots in the gravel.

Restroom Facilities

Camp Ockanickon features full-service restrooms at all of their enclosed buildings. Scout campsites located throughout the Camp rely on pit latrines to serve as restrooms for the campers. BSA and Camp staff expressed their belief that these pit latrines could stand to be updated, or replaced with a viable alternative that requires less maintenance, less instances of emptying, and produces less odor. Camp Staff has expressed concern at the state of the current pit latrine system, and also would like to see a lower maintenance alternative installed that produces less odor, requires less maintenance, and requires less emptying. Camp staff have expressed their belief that restroom facility updates (in particular updates to the camp latrines) should be a top priority. There are 18 latrine facilities on Camp property, and each of these facilities contains multiple squat-holes while sharing a common pit.

Potable Water

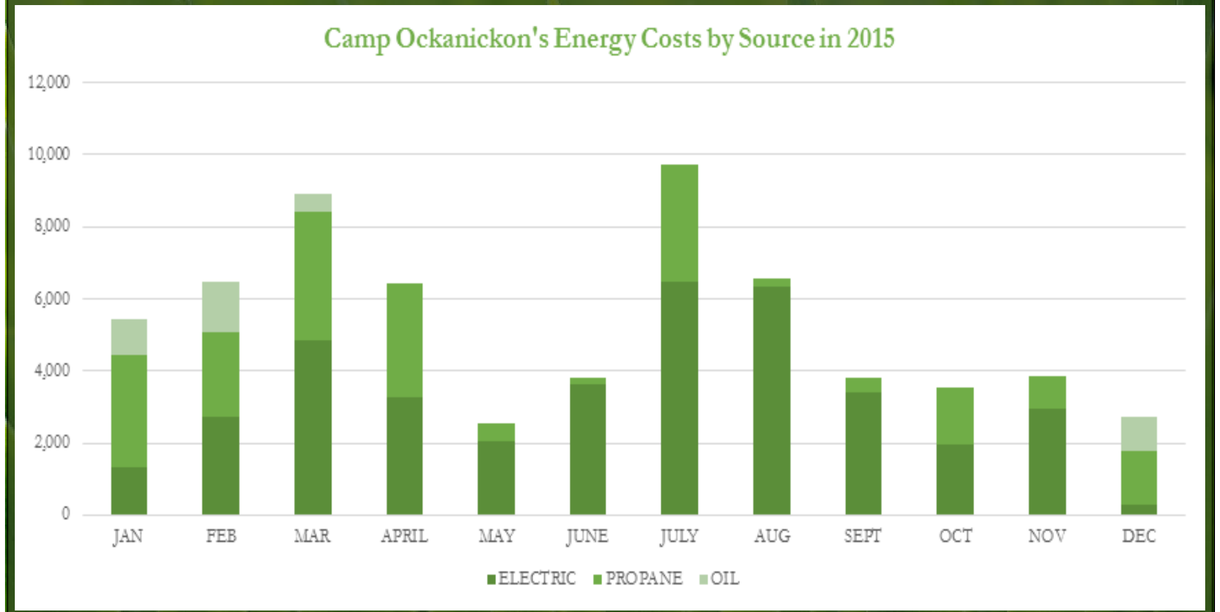
Potable water can be obtained from any of the ten active wells on site, but space for water storage is limited. There are a total of 6 water storage containers across the camp, but they frequently reach capacity and are drained within a season. This is very time consuming considering that the water must go through chlorination treatment before it can be used. The Camp estimates that it needs to expand its storage capacity by 130,000 to 200,000 gallons of water in order to meet the demand of peak season.

Energy

Camp Ockanickon spent a total of $63,900 on energy expenditures in 2015. That total accounted for roughly 5.5 percent of total expenditures according to the financial office of the Washington Crossing Council. Graph 1 below shows the Camp's energy costs by source. Energy expenditures were highest during July, the peak month of the camping season. Propane and oil use account for a larger share of energy costs during the fall and winter months.

Camp Ockanickon staff have confirmed that the only energy saving strategy they have adopted is incorporating some light emitting diodes (LED). Energy costs are one of the top operating expenditures of campground facilities. Another issue is that Camp Ockanickon is a privately funded campground which means there are less funds available. Camp Ockanickon can cut energy costs and reduce its environmental degradation through sustainable energy initiatives.

Graph 1.



Sustainability Practices

After researching case studies relevant to conditions observed at Camp Ockanickon, we have distilled the best sustainability practices in the following categories:

1. Waste Minimization
2. Stormwater Management
3. Restroom Facility Updates
4. Potable Water
5. Sustainable Energy Initiatives

Waste Minimization

"Reduce, Reuse, Recycle" is a phrase that has been around for years. Not only is the phrase geared toward lessening pollution, it also can help minimize the use of natural resources, as well as monetary costs. It also allows products to be used to their fullest extent by reusing in the community and recycling. Introducing new waste management policies to the camp will be beneficial for both the environment and the camp budget.

In order to minimize the amount of waste generated, Camp Ockanickon can model some of the actions of other camps throughout the county. Each of these camps have implemented their own waste minimization projects.

Waste Minimization Case Studies

YMCA Camp Minikani

Get campers involved with making better informed portion sizes with a food waste challenge. At the end of the meal, all uneaten and non-compostable food will be weighed. Each group should be given a waste goal at the beginning of their stay as well as the notion of a reward if they meet or bypass their goal. At Camp Minikani, a frequent reward is giving the campers the option of which counselor they would like to see jump in the lake fully clothed.

BSA Camp Noyo

This camp is located in a remote location where trash pickup is unavailable. Since all of the waste must be packed out, they have taken measures to minimize as much as possible. First, they started composting uneaten food and donating the compost to local farmers. The camp also encourages campers to only take what they eat in order to lessen the amount of waste generated.

BSA Camp Constantine

Camp Constantine has invested in a large, commercial grade dishwasher to reduce the need for disposable plates and cutlery. This has cut their waste collection times in half, and also saved over $2000 annually.

BSA Camp Loud Thunder

Using a method of composting food products and recycling aluminum, cardboard, and plastics, has reduced costs of trash collection for the camp. After finding an issue with milk cartons (non-recyclable due to it make up of waxed paper), the camp created a challenge to see how many folded up milk cartons can fit into one normal milk carton. This helps reduce the amount of space taken in the camp's dumpsters, as well as provides a way to get the campers involved.

Composting

As food waste is a large portion of the trash collected at Camp Ockanickon. In order to lessen the amount of trash pickup times, we suggest that a compost operation is adopted. The dining hall is currently operated by Aramark Services, and the employees are mostly college students. Due to the camp's location in the woods, wildlife is a major concern for composting piles.

Backyard Composting demonstration at YMCA Camp Minikani, Hubertus WI

What is Composting?

Compost, defined as "a mixture of various decaying organic substances, as dead leaves or manure, used for fertilizing soil." Small amounts of food waste can easily be composited on site. In order to properly compost waste, five categories must be considered. The first category is the balance of feedstock and nutrients. This is known as "brown matter" (large amounts of carbon and low nitrogen) and "green matter" (large amounts of nitrogen. Examples of brown matter include dry leaves and wood, while green matter is food scraps and grass clippings. Next is particle size. Grinding down the pieces of matter within the pile will increase the surface area in which microorganisms can feed. Moisture content is also important to monitor. Too small of particle size, however, may cause issues with air circulation. Microorganisms need a damp environment to survive. In some dry cases, watering the pile may be necessary to encourage decay. Oxygen flow is also necessary, and bulking agents such as woodchips or newspaper may be added in order to help aerate the pile. Last, a proper temperature range must be kept in order to keep the pile decaying. Microbial activity will cause a rise in temperature, and a lack of increase may cause rotting.

Table 1. Examination of Compost Pile Types

Pile Type	Services	Advantages	Disadvantages	Expected Cost
Backyard/ On Site	Done in a small, shaded area. Combines a mixture of water, green matter, and brown matter in alternating order to promote decaying. Needs to be turned to reheat the pile, as well as provide aeration.	Great Visual Easy to build	BEARS! Must be turned	$ >100
Aerated Static Pile	This type of open air pile composts within 3-6 months, and is most suitable for homogenous mixtures (yard trimmings, consumer waste, etc.). Can sustain a larger amount of waste. Pile is aerated by using loosely placed bulking agents like wood chips or newspaper. Another option is to place pipes in the pile to help circulate air throughout (sometimes with use of an air blower).	Great Visual Quick turnaround time No turning	BEARS! Complicated to set-up	$ <100
In-Vessel	Composting within a closed, contained unit. Can handle almost all types of organic waste. Works well for all types of composting material, can be mechanically turned. Takes weeks to months to produce finished compost due to temperature and microbial activity.	Less odor Less leachate Can be kept indoors	Lacks Visual Expensive Start Up	$< 200
Vermicomposting	Composting done with the assistance of red worms, done in a bin with organic matter. One pound of red worms can eat up to a half pound of organic matter per day. The end result of this type of pile includes "castings", which can be used as potting soil, and "worm tea", which is a high quality liquid fertilizer.	Great Visual Provides liquid fertilizer and castings	Weather variation may kill worms, BEARS!	$>100

Recycling

Camp Ockanickon currently sends all of its waste out together, and does not participate in any recycling programs. Currently, the camp uses a trash compactor that compacts approximately 30 yards of waste per week. The compactor is emptied approximately 12 times per year. Much of the waste is food waste or recyclable materials. Adding a recycling pick up service may help reduce the amount of waste sent to landfills.

Republic Services: Addition of Single Stream recycling service to current service is $70/wk, as well as a one-time $125 delivery charge.

Potential dumpster to be kept for on-site recycling.

Republic Services Representative:
Brian Murray
Email: bmurray@republicservices.com
Phone: (215) 660-3453

Stormwater Management

In a rural area like Camp Ockanickon, stormwater is not as significant of a concern for infrastructural functionality as in a large city. However, stormwater buildup and retention in areas like gravel parking lots and grassy fields can collect sediment and motor vehicle pollutants, which can then run into major bodies of water causing pollution. The drainage ditch that services the nearby residential area also likely conveys these common pollutants to Big Buck Lake. Easily implemented and economically viable green practices are highlighted in this section to help mitigate surface runoff at the 3 previously highlighted stormwater focus areas, while also helping to reduce potable water use in garden hoses (with the use of rain barrels).

GSI Definitions

In this section, 3 SMPs that are appropriate for open spaces like Camp Ockanickon have been selected and will be analyzed for their effectiveness in each particular stormwater focus area. Some strengths and weaknesses of each SMP will be highlighted, as well as an expected total cost.

Rain Barrels

Rain barrels are a frugal and simple way to manage rooftop stormwater. They are easy to install and connect to any rooftop gutter downspout. Stormwater that would otherwise fall onto the ground as runoff or infiltrate the ground surrounding the structure becomes captured to be used for non-drinking purposes. As Camp Ockanickon has expressed their concern with potable water usage (particularly a need for more water storage), this would be a quick and simple way to secure water suitable for any non-drinking use, and it would free up drinkable water for its intended purpose. Rain barrels require little time or effort to install, and can be installed on any structure with a roof and a gutter. Ideally the water collected will be used for watering gardens, lawns, or window boxes.

As most of the driveways at Camp Ockanickon are gravel, having rain barrels attached to structures adjacent to gravel lots will help remove stormwater from flowing onto the gravel and possibly moving it around into an undesirable formation. As is evident at the Palmer Lodge, the gravel lot has many divots and missing portions of the top layer of gravel, which has likely been exacerbated by stormwater in the past. Installing rain barrels at Palmer Lodge would be a simple solution to extend the life of gravel top layers at that parking area.

Advantages

- Inexpensive, helps lower water costs
- Easy to implement, no retrofit neces sary
- Repurposes collected water, less reliance on hoses or spigots

Disadvantages

- Must be emptied between storms to maintain capacity
- Overflow occurs during larger storm events

Expected Cost

- $80-100 per barrel

Rain Gardens

Rain Gardens present an ideal solution for managing large amounts of stormwater runoff from an open space. Ideally, this open space will be angled or graded toward the rain garden to direct stormwater straight to where it will be collected, filtered by the plants and soil layers, and reinfiltrated into the groundwater supply. Rain gardens are designed according to the open area that they manage, so larger open areas would require a larger and/or deeper rain garden to accommodate more runoff. Typically, the first inch of runoff carries the most pollutants like oil, grease, and sediment. The plants and soil in rain gardens capture and remove these pollutants from runoff before reinfiltrating the water into the groundwater supply.

Camp Ockanickon's ATV field is an open space that likely produces runoff with heavy sediment levels (possibly containing lawn care chemicals as it is a mown space) due to the areas of open dirt. Much of the runoff is currently directed to a 'wetland' of sorts that is dominated by cattails. However, much of this runoff remains on the field creating muddy conditions not conducive to good ATV use.

Advantages

- Little landscaping required, wetland already in place
- Manages a large amount of runoff
- Provides aesthetic value with flowering plants

Disadvantages

- Can attract mosquitoes when not draining properly
- Requires infiltration test to determine feasibility

Expected Cost

- Estimated $300-1000 (plants, labor, to soil, water pipes)

Swales

Swales are depressed strips of vegetated space that convey or transport stormwater from one place to another. They utilize native species of hardy plants that can tolerate both wet and dry conditions, while slowing the speed of runoff and reinfiltrating water as it is transported. The drainage ditch that runs from the nearby residential community to Big Buck Lake already mirrors the physical landscape structure of a swale. All that remains is creating a more vegetated strip that can slow the speed of water running through it, while also filtering out pollutants to improve the quality of water that enters the lake. Similar to the rain garden suggested for the ATV field, much of the physical landscaping necessary for proper stormwater management is already in place. What's left is to select suitable hardy plant species and create a more vegetated and aesthetically pleasing space.

Advantages

- No landscaping required
- Cleans water entering into lake system
- Help to prevent lake overflow during larger storms
- Provides aesthetic value with flowering plants

Disadvantages

- Can attract mosquitoes when not draining properly
- Maintenance/trash removal required
- Requires infiltration test to determine feasibility

Expected Cost

- Estimated $300-1000 (plants, labor, topsoil)

Infiltration Test

For various SMPs, including rain gardens and vegetated swales, where the SMP would be ideally infiltrating the water back into the ground, a preliminary infiltration test must be conducted at the site of the SMP. The test is very simple and can be conducted with relatively common household items. See Appendix 2 for detailed step by step directions for conducting an infiltration test.

A variety of native plants used by the Philadelphia Water Department

Plant Catalogue

The Philadelphia Water Department provides a comprehensive catalogue of native plants for SMPs, as well as categorizing various parameters depending on location, elevation, water level, and sun exposure. These parameters help the user decide which plants would be most suitable for the SMP in question, how many of each plant to use, how to plant them, and where in SMP they should plant each species. The Field Inspector's Manual provides a detailed look into how to create these visibly pleasing gardens and swales, and informs user experience. Below, the four most commonly used plants by PWD for both rain gardens and swales are provided.

Restroom Facility Updates

An out of date latrine system for Camp Ockanickon has the potential to become exponentially more costly, a maintenance nightmare, and more difficult to update if left in its current state. A sustainable alternative to the current latrine system will produce less odor, require less frequent (and less involved) maintenance, and require fewer emptying which will help pay for the upfront cost of the latrine updates overtime. Leaving the latrine system in its current state could also have negative environmental ramifications, such as groundwater contamination. A new system would be much less likely to fail and require expensive cleanup procedures for the Camp.

Composting Toilets

Composting toilets are often renowned as being superior alternatives to pit latrines. Composting toilets consist of a sealed chamber that contains excreta, with an opening at the top for finished compost removal. The chamber also typically features a ventilation vent with a fan at the rear, above the restroom facility to help keep odor out of range of human detection. Combined with some sort of substrate (usually sawdust), the excreta will decompose aerobically into a useable dry compost. These toilets require much less maintenance, and require fewer emptying than traditional pit latrines because of the ability to actively use the (decontaminated) effluent for various agricultural purposes. As a sealed self-sufficient system, the composting toilets will produce less odor than traditional pit latrines, and require much less maintenance.

Composting toilet storage chambers are typically above ground for easier access, and this quality also reduces risk of groundwater contamination significantly. Operations and maintenance of these systems still requires the use of protective gear, to reduce risk exposure of people coming into close contact with raw excreta. Additionally, composting toilets can be further modified by adding earthworms to assist in decomposition, in which case they would be called vermicomposting toilets.

The major drawback with composting toilets is their inability to deal with urine. Composting toilets are not meant to handle large amounts of liquid waste, so it is advisable to install 'urine diverting' toilet seats that will separate the liquid from the solid. Waterless urinals are also a viable low-maintenance option.

Table 2. Sustainable Restroom Initiatives

Restroom Fixture	Services	Advantages	Disadvantages	Expected Cost
Timed Showers	• limits the time a shower can be used per instance • efficiency arises by more users taking short showers	• less water use • less energy use (for water heating) • encourages shorter showers • can be retrofit to existing nozzles	• irritating to use • complaints from campers • no issues with current showers other than efficiency	$50-100 per nozzle
Waterless Urinals	• eliminates liquids without needing water input • requires greywater system • touch free/uses a disposable cartridge	• zero water use • less energy use • very little maintenance • likely only at non-campsite restrooms • low odor	• significant up-front cost • no major issues with current urinals • cartridge replacement costs can add up	$250-400 per urinal $40-50 per cartridge (replace once per season)
Low-Flush Toilets	• minimizes water used per flush • usually touch free systems	• less water use • financially viable overtime	• significant up-front cost • no issues with current toilets other than efficiency	$350-400 per toilet (1.28 gpf) ~20% savings from conventional toilets (1.6 gpf) ~65% savings from older toilets (4.0 gpf)
Composting Toilets	• combines human and other organic waste using natural process to create humus	• very low odor compared to latrines • reduces volume of waste up to 30% • produced humus can be buried onsite or trucked away	• neglecting maintenance will cause major issues • most composting toilets require power • health issues if humus is improperly handled	$1,500-8,000 per location
New/ Re-lined Pit Latrines	• Allows camp to maintain traditional pit latrines	• Supporting infrastructure in place • No major construction necessary	• May not solve odor or water contamination issues	Cost data unavailable
Hand Dryers	• Provides a zero waste alternative to paper towel use	•Significantly reduced paper waste •Money saving overtime	• Significant up-front costs • Higher energy usage	$100-200 per dryer

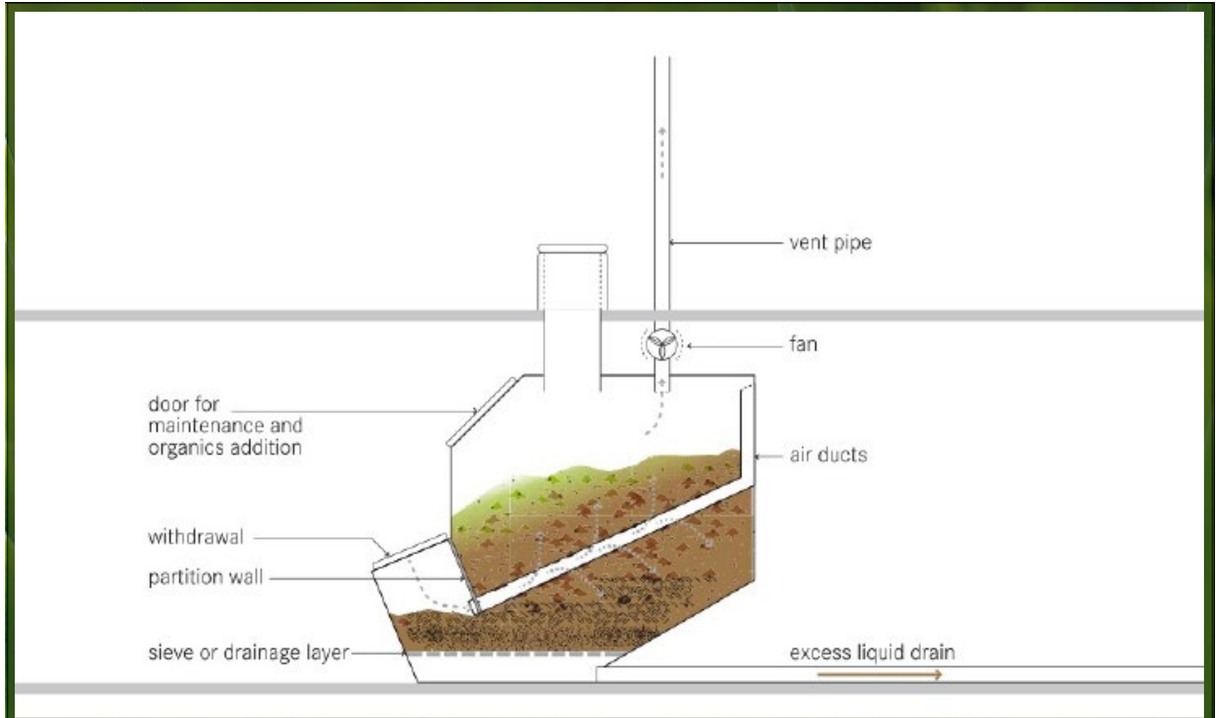


Diagram of a composting toilet system

Potable Water

Water is a very important natural resource for Camp Ockanickon. Since it is available to camp on-site, it is important that proper steps are used to take care of it. The camp currently tests the water quality on a monthly basis.

Description of Water Treatment Types

Chlorination

Chlorination is a very common water treatment process due to its effectiveness as a disinfectant. It removes most bacteria and viruses from water, with the exception of some protozoa. It provides low cost and acceptable treatment. One issue that may arise with chlorination is the potential odors and taste.

Reverse Osmosis

RO is a water treatment that is completed by pressure-driven membrane separation. As noted by the EPA, it is currently the most effective water treatments available. Although it has become more widespread, it is a fairly expensive procedure.

UV Lighting

Water is exposed to a UV (Ultraviolet) light while in a steel chamber. The light kills pathogens and bacteria, therefore providing a safer water once completed. This type of treatment is generally more effective than a water filter or chlorination. No foul taste or odor is experienced. Purchase of a UV system can range from approximately $700 to $2500 depending on how many bathrooms will be attached.

Table 3. Examination of Water Treatment Types

Treatment Type	Services	Advantages	Disadvantages	Expected Cost
Chlorination	Uses chemicals to disinfect water	Status Quo	Does not kill all bacteria that causes diarrheal disease	$
Reverse Osmosis	Uses pressure driven membrane to disinfect water	Highly effective in removing radionuclides and other contaminants	Membrane failure may allow bacteria to flow through	$$$
UV Lighting	Uses ultraviolet lighting to disinfect water	Eco-Friendly, Great for private wells	Camp would most likely require several systems	$$$

Water Storage

Currently, Camp Ockanickon has the means to hold 60,000 gallons of water. With the imminent drilling of two more wells on site, the camp needs to expand to hold approximately 130,000 to 200,000 gallons. The camp has several tanks all over the camp, and would like to keep the water storage in one large tank.

Table 4. Examination of Water Storage Types

Storage Type	Services	Advantages	Disadvantages	Expected Cost
Water Tower	Holds water above ground in an elevated structure	Holds large quantities of water	Long construction time	$$$
Bladder Tank	Holds water in a collapsible, lightweight pouch	Easy to transport	May not be stable in a storm scenario	$$
Underground Tank	Holds water in an underground tank	More space for camp activities	Requires excavation	$$$
Concrete Tank	Holds water in a large concrete structure. Currently used on site	Can be constructed in any size needed	Long construction time	$$

Sustainability Energy Initiatives

Camp Ockanickon should first reduce its energy use through adopting a number of energy saving strategies. Energy is primarily used for lighting and heating/cooling. Therefore, reduction measures will target these two focus areas. All energy savings products should also have an "Energy Star Certification" (See Appendix 5). This certification means that a product satisfies the EPA's strict energy performance standards. Products that are certified have the blue "Energy Star" symbol on them.

In addition all new construction should be built to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) standards. LEED is the most widely used third party verification system for green or sustainable building projects. LEED verification has a number of benefits including ensuring projects are sustainable and it demonstrates leadership, innovation, environmental stewardship and social responsibility (See Appendix 5).

Finally, it is also recommended that Camp Ockanickon invest in solar energy technology. A site visit and meeting with staff determined that solar energy is the most viable renewable energy solution for the Camp. Photovoltaic solar systems are the most cost effective and efficient form of solar energy technology.

Sustainable Energy Initiatives

Energy Reduction - Lighting

The costs for each method were estimated using market prices. Therefore, costs may vary depending on market conditions. Labor costs for installing products have been provided, should Camp officials need to hire contractors to install these fixtures. These prices are also subject to change. These methods are supported by the U.S. Department of Energy (DOE), National Park Service (NPS) and PA Department of Conservation and Natural Resources (DCNR). DCNR published a document focusing on "greening" parks through a number of energy initiatives including: light level metering systems, T8 or T5 light bulbs and using Energy Star products. More information related to these methods can be found on the DOE's website (See Appendix 5). These measures are relatively inexpensive and can significantly save money in energy costs. Over a 10-year period, an LED light bulb will cost $16.37 compared to $76.70, the cost of a standard incandescent light bulb. The costs for lighting will largely be determined by wattage and bulb type.The financial savings will continue to accrue overtime.

Additional information on savings costs can be found on the Energy Star website (See Appendix 5). The website provides a light bulb savings calculator. It allows the visitor to enter their energy rates and light bulb types. It then asks the visitor to select alternative light bulb types to compare the savings to conventional bulb types. Energy Star also provides a consumer guide to buying light bulbs, which shows the appropriate uses for each bulb type (See Appendix 5). Camp Ockanickon Staff could use this guide to identify which bulb types are needed for each lighting fixture. Finally, the NPS also published the "Lighting Retrofit Work" (See Appendix 5). The workbook provides readers with a detailed guide for updating all types of lighting fixtures. Camp Ockanickon could use this guide as a reference for implementing these lighting initiatives.

Table 5. Recommended Lighting Initiatives

Initiatives	Advantages	Disadvantages	Expected Costs*
Compact Fluorescent Lights (CFL)	Lower energy use (~70%). Equal output. Moderate lifespan (10x longer).	Contain a small amount of mercury. Operate poorly in extremely cold temperatures. Must be enclosed if outdoors.	Based on wattage and bulb type.
Light Emitting Diodes (LED)	Lowest energy use (~75-90%). Very long lifespan (25x longer).	Slowly decreases in light output over time. Can also shift colors.	Based on wattage and bulb type.
Fluorescent Tubes (T8 or T5)	Moderate energy use (~25-35%).High output. Moderate - long lifespan (10-23x longer). Suitable for large indoor areas.	Not suitable for most indoor and outdoor lighting. Not as efficient as CFL or LED lights.	T8: ~$3 - $6 T5: ~$6
Outdoor LED Spotlights with Motion Sensor and Built in Timer	Improved security. Less light pollution. Lights do not turn on during the day and timer shuts lights off during late hours.	Light output will decrease overtime. Timers must be adjusted per season and conditions.	Materials: ~$75 - $200 per unit. Labor: ~$250 - $500 per unit.
Light Level Meter or Dimming System (LED and/or CFL Compatible)	User controlled lighting. Reduces wattage and output of lights. Saves energy. Increase service life of bulbs.	Dimming system must be compatible with bulb type.	Materials: ~$15 - $90 per unit. Labor: ~$150 - $350 per unit.

Sustainable Energy Initiatives

Energy Reduction-Heating and Cooling

The material and labor costs have also been estimated using market prices. They are supported by DOE, NPS and DCNR. The Bureau of Land Management (BLM) specifically endorses the use of increased insulation, window glazing and installation of Energy Star products. Some of these techniques utilize solar energy for producing heat. These are referred to as passive solar energy techniques which include skylights, low emissivity windows and building materials with high thermal masses. Passive means that these types of techniques do not require machinery to produce energy.

The initiatives are proposed for future renovations and new construction. Camp Ockanickon will continue to grow and so will its need for infrastructure improvements. All infrastructure improvements should be completed in a sustainable manner. This can be completed using the LEED certification guide. These improvements are sustainable solutions and would satisfy LEED construction criteria. It is important to keep in mind that it can be challenging to implement these initiatives for current structures. However, there are building guides available through DOE and other government agencies. A particularly useful guide was produced by the Los Alamos National Laboratory and is available on the DOE's website under "Advanced Energy Design Guides" as well as on the LANL's website. (See Appendix 5)

The efficiency of insulation to absorb heat depends largely on the material used. Graph 2 shows the R-value of different insulation materials (See Appendix 5). It also shows the difference in R-values when the material is used for attic insulation versus for the walls. The R-value is a measurement of an insulation material's ability to prevent heat from passing through it. The higher the R-value the better the insulation material is. It is important to note that certain applications of insulations are more effective such as the use of blown fiberglass in a wall versus an attic. The R-Value difference is 0.75 which is a significant difference. Insulation materials are used for a variety of purposes and require different skill levels to install. Table 7 shows applications for different insulation types and the skill level required to install each type of insulation.

Table 6. Recommended Heating and Cooling Iniatives

Initiative	Advantages	Disadvantages	Expected Costs*
Skylights	Air temperature control. Improved air quality. Lower heating, cooling and lighting costs.	Can result in unwanted solar heat during summer season (solvable through glazing techniques). Possible water leaks. Skywindows could possibly shatter.	Materials: ~$100 - $500 per unit. Labor: ~$500 - $3,000 per unit.
Exterior Storm Windows with Low Emissivity Coating	Minimize ultraviolet and infrared light waves without compromising visible light levels. Controls solar heat gain and loss. Reduce energy costs (~30-50%).	Cost more than regular windows (~10-15%). Can result in too much or too little solar heat gain if coated at an improper level.	Materials: ~$60 - $200 per unit. Labor: ~$164 - $287 per unit.
Super Insulation	Lowers heating use and costs.	Improper insulation can result in air leaks. Air leaks cause heat loss.	Depends on insulation type and project scale.
Programmable Thermostats	Air temperature control. Can save 5 - 15% in energy costs annually by altering thermostats for certain hours of the day.	Improper location will result in less efficiency and performance.	Materials: ~$106 - $255 per unit. Labor: ~$170 per unit.
Thermal Mass Floors and Walls for New Buildings	Materials store or absorb heat produced by the sun and emit heat throughout a building. Lowers heating use and costs.	Could absorb too much solar energy during above average temperatures and create unwanted heat.	Depends on building materials and project scale.

Graph 2.

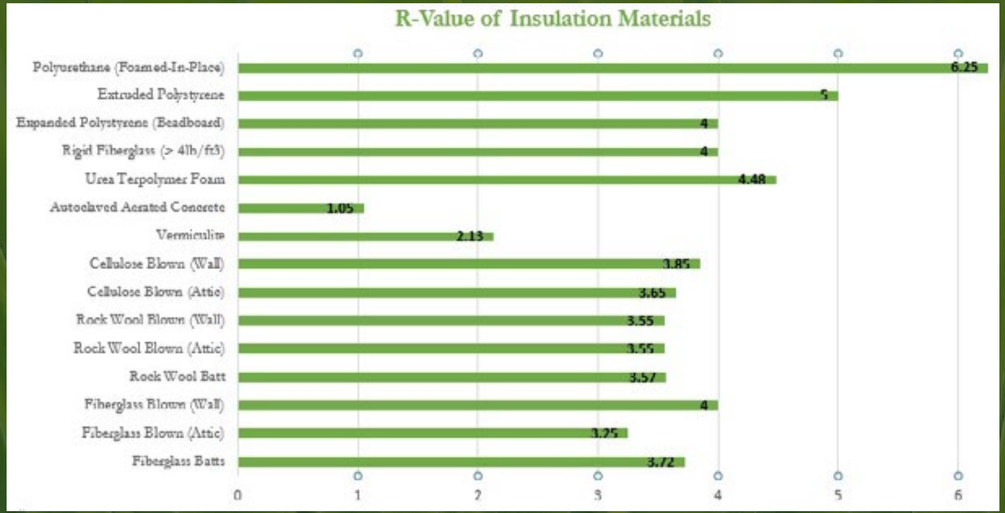


Table 7. Insulation Types, Uses and Skill Required to Install

Insulation Type	Material	Best Suited For	Skill Type Required
Blanket: Batts and Rolls	Fiberglass	Unfinished walls, including foundation, basement and crawlspace walls	Basic
	Mineral (rock, stone or slag) wool	Floors and ceilings	
	Plastic fibers		
	Natural fibers (cotton, wool)		
Foam Board or Rigid Foam	Polystyrene	Unfinished walls, including foundation, basement and crawlspace walls	Intermediate
	Polyisocyanurate	Floors and ceilings	
	Polyurethane	Unvented low-slope roofs	
		Exterior continuous insulation	
		Exterior below grade foundation walls	
Loose-Fill and Blow-In	Cellulose	Enclosed existing wall or open new wall cavities Unfinished attic floors	Intermediate
	Fiberglass	Unfinished attic floors	
	Mineral (rock, stone or slag) wool	Other hard-to-reach places	
Rigid Fibrous or Fiber Insulation	Fiberglass	Ducts in unconditioned spaces	Intermediate
	Mineral (rock, stone or slag) wool	Other places requiring insulation that can withstand high temperatures	
Sprayed Foam and Foam-In-Place	Cementitious	Enclosed existing wall	Advanced (Certified Installer Needed)
	Phenolic	Open new wall cavities	
	Polyisocyanurate	Unfinished attic floors, attic ceilings	
	Polyurethane		

Similar to insulation material building materials vary in their ability to absorb and release heat effectively. The higher a material's thermal conductivity is, the better an object can store and release heat. Table 8 shows the thermal conductivity value of common building materials in watts per meter per kelvin unit. By far the best building material for thermal conductivity is steel. Stone, concrete and brick are also very effective building materials. Despite lower material costs, wood is not an effective conductor of heat. Using materials with higher conductivity values will allow for lower heating and cooling costs. Costs have not been determined for insulation and thermal building materials because it depends on the material used and the scale of the project. However, these figures help to explain which insulation and building materials are the most energy efficient.

Table 8. Thermal Conductivity Levels for Common Building Materials

Building Material	Thermal Conductivity
Steel	45
Stone	1.8
Dense Concrete Block	1.63
Concrete	1.13
Brick	0.73
Water	0.6
Gypsum Plaster	0.5
Unfired Clay Bricks	0.21
Aircrete Block	0.15
Timber	0.14
Carpet	0.05
Mineral Fibre Insulation	0.035

Case Studies - Boy Scout Reservations

Bar A Scout Ranch, Michigan Crossroads Council

The Camps' cabins were built in the 1950's with poor insulation which resulted in high propane costs to heat the cabins. The Council obtained a grant to properly insulate the buildings which resulted in large energy reductions. Camp Ockanickon can seek similar funding for insulation investments.

Pioneer Scout Reservation, Erie Shores Council

The Pioneer Scout Reservation implemented a few sustainable energy initiatives including converting incandescent light bulbs to CFLs (BSA, 2015). This simple initiative results in immediate annual energy savings.

Latimer Scout Reservation, Middle Tennessee Council

The Latimer Scout Reservation constructed all of their buildings with metal roofs and used stone where possible. These materials are sufficient heat conductors which helps to maximize solar heat. The Camp saves money in energy costs as a result.

Case Studies - National Parks and Resorts

Furnace Creek Resort

The Furnace Creek resort is owned and operated by Xanterra Parks and Resorts. Xanterra is one of the top concessionaires for the NPS. They currently operate in ten key National Parks and have made sustainability a top focus. The resort installed a building management system which allows for more efficient room temperature control and saves energy. Windows and doors were replaced with double-pane gas-filled glass. This glass material helped to reduce temperatures for guests. Exterior lighting fixtures were upgraded to reduce light pollution. Finally, more than 300 incandescent light bulbs were replaced with either CFLs or LEDs.

Yellowstone National Park Lodges

Yellowstone National park Lodges are also owned and operated by Xanterra. The lodges implemented a number of energy conservation measures in recent years. In 2011, the dining room was updated with LED lamps. During that same year upgrades were made to lighting fixtures in the administration buildings. The T12 fluorescent light bulbs were upgraded to T8 light bulbs. In addition 500 other T8 lightbulbs were installed and thousands of incandescent light bulbs were replaced with CFLs.

Big Bend National Park

Big Bend National Park completed exterior lighting fixture upgrades to the Chisos Basin. The lighting fixtures were replaced with 1 watt LED light bulbs which produce adequate lighting, create less light pollution and reduce energy costs. The original lighting fixtures used 60 watt incandescent and fluorescent light bulbs. The original annual cost of lighting was $3,293 compared to only $164, the cost of the new system. This equates to a 98 percent reduction in energy consumption, wattage and light pollution.

Case Studies - PA State Parks

Yellowcreek State Park

In 2008, Yellowcreek State Park near Indiana, PA was designated as the pilot green park. During that time a number of sustainable initiatives were tested and showcased to the public. Yellowcreek installed CFL light bulbs and low emissivity windows to reduce energy costs. Other initiatives included the use of programmable thermostats and super insulation to reduce heating and cooling costs.

R.B. Winter State Park

Also during that time period Pennsylvania implemented the "Model Green Parks" program which named four different State Parks as green leaders including R.B. Winter State Park. The Park updated its lighting fixtures with LED light bulbs as well as motion sensors. The Park also shuts down some of its facilities during the winter months to reduce energy use.

Solar Energy Technology

The use of solar energy technology continues to increase due to their increasing efficiency and decreasing costs. As a result the return time of time it takes for an investment to "pay for itself" is quickening. The 2015 Annual Energy Outlook Report completed by the U.S. Energy Information Administration (EIA) estimates that electricity production from renewable energies will increase by 109 gigawatts between 2013 and 2040. Nearly half of those gigawatts (48) will be generated by solar technology. Electricity produced by renewable energy as a whole is expected to increase from 13% to 18% by 2040. The price of solar energy technology has continued to decline significantly within the past 20 years. A report completed in 2015 by the Lawrence Berkeley National Laboratory titled, "Tracking the Sun VIII" revealed that between 1998 and 2014 the median installation price declined at an annual rate of 6% to 12%. Also the efficiency of solar module technology has steadily increased in recent years. The efficiency rose by 2% from 2010 to 2014 and is continuing to improve. Investing in solar energy technology is a worthwhile investment with many benefits.

Solar energy technology produces energy from a perpetual resource without any emissions. Once installed they are easy to operate with little maintenance. Solar energy technology often times benefits the larger community as well. Individual's solar panels can create excess amounts of energy for which they receive compensation. That energy is pumped into the grid for other users. This also creates energy security because it reduces reliance on fossil fuel supplies. For example, Ukraine has recently saved approximately 3 billion in energy costs due to solar energy plants. Investing in renewable energy technology also creates more jobs. In the U.S. solar related jobs increased by about 46,000 between 2009 and 2013. Therefore, Camp Ockanickon should invest in solar energy technology as part of its sustainable strategy.

Installing solar panels at Camp Ockanickon is viable option for two key reason. First, the Camp only runs for about 3 months out of the year. While energy usage is high during that time period, the Camp has a 9-month time-frame each year where there are not a lot of visitors. Solar panels generateelectricity year-around. So the Camp will be able to rack up energy credits during the offseason.

Second, the Camp is run by a non-profit organization. Non-profits have the option to enter into solar contract agreements with solar installation companies. A solar contract allows for the Camp to have thebenefits of solar energy without owning the panels themselves. The Boy Scouts are a prestigious non-profit organization, which is likely to be supported by a number of solar installation companies. Camp staff should consult with a range of contractors before settling on one, to maximize benefits.

Photovoltaic Solar Panels

Photovoltaic (PV) solar panels are an array of panels made up of cells containing semiconductor materials that convert solar energy directly into electricity. Each panel has a watt rating which is the numbers of watts a pane can generate in a single hour. On the right is a diagram of a typical roof mounted PV solar panel system. PV systems can either be ground mounted or placed directly on a rooftop and other building surfaces. Ground mounted systems are viable if there is open space available with little tree cover. Rooftop systems are efficient where there is little space available. Rooftop systems could also absorb more solar energy depending on their placement and height. Generally they are placed on an angle facing southward to maximize solar exposure.

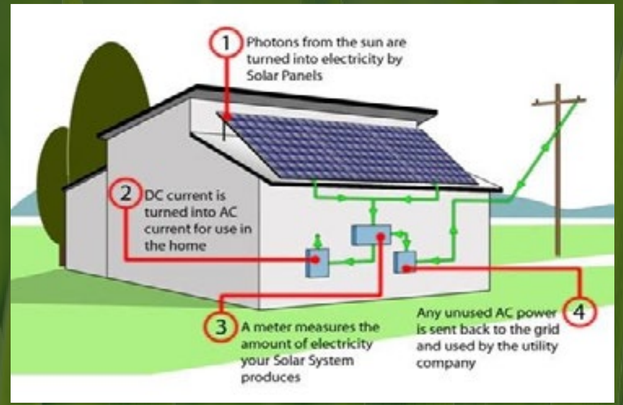


Diagram of a photovolatic solar panel system

Investors also receive energy credits for any excess energy produced, established by the Solar Renewable Energy Certificate (SREC) program. The rate is 1 energy credit for every 1,000 kilowatt hours. Each credit can be sold to an electric company which are required to purchase them every year as part of their solar portfolio .The selling price of each credit is subject to market conditions. The SREC program has a website which provides up-to-date market rates for credits for every state (See Appendix 5).

The cost of installing a PV panel system continues to plummet. Residential costs for installing PV systems has declined by 45% since 2010. The total cost of a PV panel system is calculated using a set rate per installed watt. A number of factors determine that rate which include: parts, labor, permit fees, taxes and inspections. Larger panel systems will cost more overall but may have lower rates per watt. Solar Estimates provides a calculator for determining the costs of a solar panel system and provides a listing of financial incentives based on the address of the property (See Appendix 5).

The costs will also be influenced by the selection of a solar installation company. Solar installation companies can provide free estimates as well as expertise for choosing an adequate system. Solar Reviews provides a listing of solar installation companies and customer reviews for counties across the U.S. According to Solar Reviews there are 27 companies in Bucks County alone (See Appendix 5). As mentioned already, Camp Oackinckon can choose to make a contract with a solar provider. This will allow the Camp to have the benefits of a solar panel system, without actually owning the panels. Camp officials should consult with several local solar providers before settling on one, to achieve maximum profitability.

GE Betz Science Center

Camp Ockanickon has a number of buildings which are potential candidates for roof mounted PV systems. The photo on this page shows a picture of the GE Betz Science Center. The GE Betz Science Center is suitable for a PV system because it has adequate roof space and there is little tree cover surrounding the building. Camp Ockanickon could also install rooftop solar panels on all of its buildings including the dining hall, restroom facilities, administration buildings and pavilions. Scout reservations and campgrounds have placed solar panels on top of latrines. The panels are an efficient means of providing adequate lighting, keeping water pumps running, circulating fans and charging batteries.

In addition there is also open space available for a ground mounted PV system. The photo on this page shows a portion of Stern Field which is currently not being regularly used for any large purpose. Camp Ockanickon could use this space to install a large ground mounted system. Camp Ockanickon could choose to pursue either one of these strategies or both. It will depend largely on the Camp's energy needs. If the number of annual visitors continues to increase then a larger investment will be needed. It is recommended that Camp Ockanickon first install roof mounted systems. The Camp will then conduct energy monitoring actions to determine the impacts of those systems. This will help to determine if more investments are needed in solar panel systems.

Stern Field

Case Studies - Boy Scout Reservations

Frank Fickett South Training and Service Center, Capital Area Council

The Capital Area Council partnered with Meridian Solar to install a 74.15 kW solar panel system on top of its training center. The investment will save approximately $360,000 and reduce emissions by more than 127,000 pounds of carbon dioxide over the next 25 years.

Camp Krietenstein, Crossroads of America Council

The Crossroads of America Council constructed a new shower house, powered by solar panels. In addition a solar array was installed in 2013. The system generates 300 kilowatt-hours of power per month except for during the winter season. It is estimated that this amount of power is enough to charge a single cell phone for 10 years.

Pioneer Scout Reservation, Erie Shores Council

The Erie Shores Council established an off the grid solar panel system to support camp operations. Solar panels have also been installed on the tops of latrines to provide lighting, charge batteries and power circulation fans.

Case Studies - National Parks and Lodges

Lamar Buffalo Ranch, Yellowstone National Park

In 2014 the Ranch updated and expanded its solar energy grid. Battery banks were replaced and PV panel systems were replaced with revised designs. The system also has a backup propane tank if there is an issue with the PV system. Park officials worked closely with the solar panel industry and other related businesses to accomplish the updates.

Natural Bridges National Monument

The Park is almost totally powered by a PV system which produces a total of 50 kW of power. The Park's system was established in 1980, making it one of the oldest park solar systems to be installed. The Park chose to invest in solar energy because of abundant sunshine and a lack of utility lines. Also the Park has a 40 kW backup diesel generator in case of an unusually high demand or malfunction of the equipment.

Little River Canyon

Little River Canyon contracted with E4E Energy Solutions to install a 5kW PV panel system. This small system provides 10% of the Park's energy needs. The investment is expected to save over 100 tons in carbon emissions, over 12,000 gallons of gasoline and over 6,000 kWh of electricity over a 20 year period.

Case Studies - PA State Parks

Bald Eagle State Park

The Nature Inn was constructed at Bald Eagle State Park and received Gold LEED certification status. Energy initiatives helped to reduce energy costs by 14%. The constructed incorporated a couple passive energy techniques including daylighting and using high thermal building materials. The Building also included solar collectors to offset energy costs.

Codorus State Park

Codorus State Park installed a ground mounted 2 kW solar panel system in August of 2008. The system employs a single-axis tracking device which increases efficiency by 25%. It operates using a liquid refrigerant that shifts from East to West through copper transfer tubes.

Educate Boy Scouts and Community

It is vital that Camp Ockanickon institute sustainable education programs. These programs can educate staff, scouts, visitors and the larger BSA community about how Camp Ockanickon is reducing its energy use in a sustainable manner. Sustainability education will also increase the legitimacy of sustainability programs. It will also increase awareness and support for future initiatives. It also provides Camp Ockanickon with an opportunity to showcase its sustainability to other Scouts across the Nation.

Education Initiatives

1. Educational seminars to inform staff, scouts and visitors of sustainable practices.
2. Implementing required sustainability education for all staff members and scouts to inform and increase participation for these programs.
3. Creating an annual sustainability newsletter, detailing sustainable initiatives and key annual updates.
4. Install informal interpretive signs around Camp to convey sustainability messages to scouts and visitors.
5. Create and distribute educational brochures, detailing sustainable practices to the local community.
6. Encourage and facilitate projects that incorporate sustainable practices.
7. Communicate and showcase sustainability projects to the National Sustainability Team (See Appendix 5).

Case Studies - Boy Scout Reservations

Don Reynolds Scouting Resource Center, Las Vegas Area Council	Sea Scout Base Galveston, Bay Area Council	Camp Karoondinha, Susquehanna Council
The Don Reynolds Scouting Resource Center installed a 100 kilowatt solar energy system and show cased it for visitors to observe the system and how it can successfully achieve energy savings. Scouts can view up-to-date statistics on energy produced and carbon emission as a result of the system. This information is also available to community groups and visitors to the Center.	The Bay Area Council successfully completed a major sustainable construction project. The project was a 5-story, 60,000 square foot headquarters built to LEED Platinum standards and an extensive network of solar panels. It was the first BSA building to earn LEED platinum certification. The Base's sustainable features are showcased to children and visitors to teach sustainable principles.	The Bison Consulting Group developed a sustainability leadership strategy for Camp Karoondinha in 2014. The strategy lists 4 main objectives for achievement. The Camp has an ecology building where scouts are taught sustainable principles.

Case Studies - National Parks and Lodges

Yellowstone National Park

Yellowstone Park has its own sustainability plan called, "Vision for Sustainability". A key piece of achieving that vision is educating and communicating sustainable practices to park officials, visitors and the larger community. Yellowstone's overall education goals are to engage stakeholders and tell a story that articulates the sustainability vision and long term goals. Sustainable education programs included annual progress reports, implementing a communication strategy, incorporating sustainable messages in plans and documents as well as engaging and educating youth about sustainability principles.

Carl Sandburg Home National Historic Site

The Carl Sandburg Site has embraced sustainable principles to mitigate the impacts of climate change. These initiatives include: reducing GHG emissions, solid waste management, water conservation and education and communication. Education and communication initiatives include: establishing a Climate Friendly Workshop, developing an interdisciplinary green team, establishing a partnership with Furman University Shi Center for Sustainability and acquiring grant funding for the Track Trails brochure program which informs visitors of how they can live more sustainability.

Pea Ridge National Military Park

The Park and the Pea Ridge School coordinated to form the Ambassadors for Green Living Program. A greenhouse was built at the school and sustainable education programs were initiated. Teachers utilize the greenhouse as a learning center for teaching children sustainable practices including: rainwater collection techniques, solar energy and growing plants for plant-based fuels. Students join park rangers and officials as members of the Pea Ridge NMP Green Team in educating visitors and communicating sustainable practices.

Case Studies - PA State Parks

Yellowcreek State Park

Yellowcreek State Park has served as a model for sustainability within the PA State Park System. In addition to incorporating sustainable energy practices, Yellowcreek has initiated education and communication measures. Yellowcreek has showcased its sustainability practices to the public. It has also upgraded an old farmhouse into a sustainable environmental education facility. The Park incorporated a 2 kW PV system as well as a 10 kW wind turbine which were built largely to educate visitors.

Presque Isle State Park

The Tom Ridge Environmental Center at Presque Isle State Park is one of the State Park's systems best examples of sustainable building practices. The Center showcases a number of sustainable energy practices including a 10 kW wind turbine and passive solar techniques. It provides educational programs for visitors to educate and encourage sustainable practices. The Park also incorporates interpretive signage to help convey messages to visitors.

Recommendations

Waste

Proper signage can teach campers how to use the new waste infrastructure.

In order to lessen the amount of waste being sent to the landfill, we suggest that Camp Ockanickon utilizes an In-Vessel compost bin. This will eliminate most odors and leachate, and can even be kept indoors if necessary. Another recommendation is to add a recycling dumpster to the current trash service. These two efforts combined with remove a large portion of waste, and will most likely give the opportunity to use a smaller trash dumpster.

Stormwater Management

Each stormwater focus area has a clear solution that can be implemented in a fiscally responsible and simple way.

To help reduce standing water in any walking or parking area, it is recommended that large structures with rooves should be serviced by rain barrels. These barrels will help lessen the impact of rainstorms on parking lots, while also reducing dependence on otherwise potable water for use in hoses.

Some parking areas like the one outside of Palmer Lodge could stand to be outfitted with a new layer of gravel, angled in such a way that it allows stormwater to runoff to the sides instead of stagnating in one spot.

The ATV field currently has relatively good drainage. It could be improved with landscaping, or the addition of an underdrain below the areas where water stagnates. However this would be more expensive to accomplish, and not necessarily worth it. It is recommended, however, that the wetland where draining water leads to be populated with diverse native plants to improve the aesthetic value.

The drainage ditch that drains residential runoff into Big Buck Lake should be much more vegetated to improve the quality of water entering into a publically used body of water. Native plant species can be chosen using the Field Inspector's Planting Manual.

Restroom Facilities

For full service restrooms, it is recommended to update to high efficiency restroom technology, to help save water and electricity. Many of these cost-saving practices require significant up-front costs, while paying for themselves years later. Timed showers, waterless urinals, low-flow toilets, and timed showers will help significantly reduce water and energy use, while being financially beneficial for the Camp in the long run.

For the latrines, to help curb the odor problem while creating a cheaper and easier to maintain system, it is recommended that Camp Ockanickon transition to composting toilets. These toilets can be retrofit onto the existing latrine systems, while reducing produced waste, smelling better, and requiring less emptying.

Potable Water

It is recommended to remain using chlorination as Camp Ockanickon's water treatment procedure. The addition of another type of treatment is very expensive and unnecessary.

In order to have easily accessible water storage, constructing a large concrete water tank in front of the GE Betz Science Building, in place of the two current water tanks. This is the most cost friendly, and feasible solution.

Energy

Camp Ockanickon officials should implement the outlined all or a portion of lighting initiative immediately. Switching out the lightbulbs to LED and/or CFL bulbs is relatively inexpensive and can be done by Camp officials and Scouts. Lighting fixture installations are more complicated and will require a higher degree of skill. Therefore, Camp officials should consult local electricians to price out and install the recommended fixtures.

Similarly Camp Ockanickon staff will have to consult local contractors to implement heating and cooling initiatives. New infrastructure should be constructed using the outlined initiatives. It is easier and less costly to implement these initiatives as part of new construction. However, Camp Ockanickon should look for ways to improve the efficiency of its current facilities. Camp officials could properly insulate buildings using simple insulation materials explained in Table 7. Camp officials know what capacity they have to incorporate these practices. Therefore, they will implement other initiatives at their own discretion. All new construction should be built using LEED standards to ensure that new buildings are eco friendly.

Camp Ockanickon should consult several local solar energy companies and enter into a contract with the most affordable one. A listing of local solar providers is available in Appendix 5. The GE Betz Science Center is a prime location for a roof mounted solar system. The Camp should monitor the systems after they are installed to determine how much energy is being produced and what additional energy is needed. Installed a ground mounted system is advised, but it is not a priority.

Monitoring Progress

Monitoring sustainability programs is essential for determining the success of a program in evaluating a program's outcome and improving those programs. It has a number of other benefits including: improved budgeting, assisting with financing future initiatives, improved product quality of programs and coordinating energy management actions (DOE). Evaluating programs is a difficult yet necessary process for future management of sustainability programs.

Sustainability management guides provided by federal and state agencies indicate that monitoring progress of programs is a 5 step process which is as follows:

Step 1: Assigning Personnel to Key Roles
Camp Ockanickon must first appoint a sustainability director or manager to facilitate programs and initiatives. They are largely responsible for implementing initiatives and tracking the progress of those initiatives. They will also be responsible for communicating sustainable practices to Camp staff and leaders. A qualified candidate will have an understanding of sustainability and have financial work experience. A sustainability board or panel composed of 3 to 5 members should be appointed to vote on related initiatives and serve as an advisory board to the Director.

Step 2: Performing an Initial Assessment of Practices
The Director will be responsible for performing an initial assessment of current practices. The Oregon State Park System has created a self-evaluation tool or score card for an initial assessment (See Appendix 5). The assessment tool provided by Oregon covers all aspects of sustainability. The tool asks simple yes or no answers and uses a weighted point system to determine rating of sustainability. Camp Ockanickon could use this tool or use it to create a similar assessment tool. In addition, the Director will work with staff to distribute survey and feedback forms to staff members and former scout visitors. This will help to determine their perspectives of the Camp's sustainable practices.

Step 3: Identify Criteria and Specific Targets
The Director in coordination with the Panel will be responsible for creating a list of criteria and setting specific targets for programs. Criteria establish a rating for a specific measure and targets help to improve outcomes of programs. An example of criteria for installing a PV solar panel system includes: efficiency, power tolerance, power rating and temperature co-efficient (Energy Sage). Specific targets for solar energy could include: setting energy reductions and adding a specific amount of voltage by a certain date. The criteria and targets must be approved by the Panel, prior to evaluating the progress of initiatives.

Step 4: Evaluating Progress
The Director will first be responsible for performing a quantitative analysis to assess the impacts of the initiatives using the outlined criteria. The Director will then perform a comparative analysis of the data and the target measures to determine their success in achieving the targets. Following the comparative analysis, the Director will coordinate with Camp staff to survey staff and scouts as well as gather feedback. This will help to determine how successful the programs were in influencing camp staff and officials as well as gain an understanding of their perspectives. The Director will then prepare an annual progress report in coordination with the Energy Panel. Reports must be approved the Panel before they can be released.

Step 5: Communicating Progress
Communicating the progress of programs is essential for performance evaluation. Achievements increase the legitimacy of programs and ensure stakeholders that the programs are moving in a positive direction. The Director will be responsible for distributing progress reports to all staff and member of the Council. The reports will also be placed on the website for visitors to read. An open meeting will be held by the Council with staff and scout members regarding the progress report. Finally, the Director and the Panel will lead a discussion about the progress of the Camp and future of sustainable practices.

Funding

Currently, Camp Ockanickon has access to a portion of grant money which can be used to help pay for these initiatives. They have been approved for the Emergency Forest Restoration Program from USDA (managed by NCSR of PA) for a total of $231,775 with a cost share of 25%. They have also applied for a Forestry Plan Development Grant with NCSR. However, due to the extent of these expenses it may be necessary to seek other funding sources available. There are a number of government grant programs available from both the Federal and State governments. Table 9 provides several of these available programs that are applicable to projects in this plan.

Table 9. Examination of Funding Types

Type of Agency	Agency Name	Type of Funding	Purpose
Federal	Federal Housing Adminstration (FHA)	Loan	To help fund energy efficient implementation in buildings
State	PA Alternative Energy Portfolio Standard Program (PA AEPS)	Credit	To provide monetary credit for solar energy projects
State	PECO	Rebate	To give compensation for efficient energy projects

**The funding types noted in the above table are just a sampling of what is currently available. Please see Appendix 6 to find links for up to date funding information, as well as other funding resources. See Appendix 6 for resources.*

Table 10. Grant Sources Available

Type of Agency	Agency Name	Grant Name	Purpose
Federal	National Science Foundation (NFS)	Environmental Sustainability/ Green Engineering	Stormwater management, recycling and reuse of drinking water, green infrastructure construction
State	Department of Conservation and National Resources (DCNR)	Community Recreation and Conservation Planning	Master Site Development Plan, Comprehensive Recreation, Park and Open Space and Greenway Plan
Federal	Environmental Protection Agency (EPA)	Clean Water State Revolving Fund	Stormwater management, watershed and estuary management
Federal	US Department of Agriculture (USDA)	High Energy Cost Grant Program	Implementation of solar energy projects

**The grants noted in the above table are just a sampling of what is currently available. Please see Appendix 6 to find links for up to date funding information, as well as other funding resources. See Appendix 6 for resources.*

Next Steps

The Plan calls for a large number of sustainable solutions to help address current issues. Some initiatives will be easier to implement than others for a number of reasons including: costs, availability of labor, expected timeframe and approval process. Therefore, an incremental implementation process is needed. The proposed initiatives will be broken down into short, medium and long term solutions. Initiatives have to be completed on a seasonal basis due to the nature of the Camp's operating schedule. For this reason, seasonal timeframes will be assigned for each. Short term solutions are proposed to be completed by the end of the season. Medium term solutions are proposed to be completed in a two to three season timeframe. Finally, long term solutions are posed to be completed in a four to six season timeframe. There are also a number of routine or annual procedures to monitor the Camp's progress and keep officials on track.

Short Term (2016 Season)

1.	Hold a meeting for all Council members and staff to inform them of the Plan.
2.	Appoint a sustainability coordinator or director to lead sustainability improvements.
3.	Incorporate sustainability projects as part of the summer camp curriculum.
4.	Evaluate each building's current heating and cooling techniques to determine applicable upgrades to each.
5.	Conduct preliminary infiltration tests for future stormwater improvements using PWD's guide (See Appendix 2).
6.	Purchase an In-Vessel compost bin.
7.	Add a recycling pick-up service.
8.	Install rain barrels on building structures.
9.	Incorporate a variety of native plants at the ATV Field and the Drainage Ditch (See Native Species Commonly Used by PWD Photo).
10.	Switch out incandescent light bulbs to CFL or LED bulbs using NPS's Lighting Retrofit Workbook (See Appendix 5).
11.	Install sustainability informative signs around the Camp.
12.	Share this Plan with the BSA Sustainability Team.

Medium Term (2017 - 2018 Seasons)

1.	Consult with several local solar panel installers to discuss opportunities (See Appendix 5).
2.	Coordinate with contractors to determine costs for energy reduction initiatives.
3.	Incorporate timed showers, waterless urinals, low-flow toilets, and timed showers.
4.	Update pit latrine systems with composting toilets.
5.	Upgrade both indoor and outdoor motion sensor or occupation lights.
6.	Update insulation of current structures (See Chart 2 and Table 7).
7.	Start incorporating heating and cooling upgrades to facilities.
8.	Add a new layer of gravel to parking lots.
9.	Install a rain garden at the wetlands near the ATV Field.
10.	Install a photovoltaic (PV) solar panel system on the GE Betz Science Center.
11.	Create sustainability practices brochures to distribute to visitors and community members.

Long Term (2019-2021 Seasons)

1.	Construct a large concrete water storage tank in front of the GE Betz Science Center.
2.	Construct a ground mounted solar system on Stern Field.
3.	Install additional PV panels to other existing and new building structures as funds become available.
4.	Finish heating and cooling upgrades to existing structures.

Routine Procedures

1.	Begin each season with a progress meeting for all Council members and staff.
2.	All future construction projects should be built to LEED certification standards (See Appendix 5).
3.	Sustainability coordinator should prepare an annual assessment of current practices using a self-evaluation checklist, similar to Oregon's sustainable park system guide (See Appendix 5).
4.	Coordinator will then prepare a list of targets or goals to complete for each season.
5.	Coordinate with Finance staff to obtain additional funding through suggested grant programs (See Table 9).
6.	Hold an end of the season meeting with all Council members and staff.
7.	Create an annual progress report to determine accomplishments and future directions.
8.	Update the Plan as needed.
9.	Share progress and showcase projects to the BSA Sustainability Team.

Conclusion

The Boy Scouts of America have always had a close relationship with the environment. They have a deep respect for it and an understanding of how to utilize it for a number of reasons including survival. However, until recently sustainability has never been a key focus of the Scouts. It has only been 2 years since the BSA created their first sustainability report. Sustainability strengthens the relationship of humans and nature further by creating a more interconnected bond between the two. It also recognizes that humans and nature are equal partners. This means that our existence depends on the ability of humans to work with nature. Achieving sustainability is a challenging process. Some of its key requirements include: cooperation among stakeholders, long term investments and dedication. Planning guides individuals and organizations in achieving a desired goal or outcome. Therefore, planning is a vital process for achieving sustainability.

This Plan was created to help guide the Washington Crossing Council in achieving sustainability at Camp Ockanickon. Implementation of the recommendations set forth in this Plan are at the discretion of the Council. The Council will need to make changes to the Plan overtime, as changes occur. This will ensure that the Plan is relevant and increase its efficiency in helping Camp officials achieve sustainability. The Plan is also intended to educate officials, staff, scouts and the larger Boy Scout community about sustainable measures. Although it is specific to Camp Ockanickon, it contains useful information and ideas which are applicable to Boy Scouts camps across the United States. Therefore, the Plan should be made easily accessible to help other camps in achieving sustainability. The Washington Crossing Council has both an obligation and an excellent opportunity to be a national leader of sustainability for the Boy Scout of America.

Appendices and Reference Links

Appendix 1. Waste

Council Sustainability Resource Guide	http://www.greentodeepgreen.org/wp-content/uploads/2015/10/council_sustainability_guide.pdf
Composting Information Resources	http://www.epa.gov/sustainable-management-food/types-composting-and-understanding-process

Appendix 2. Stormwater

Lake or Pond - What is The Difference? New Hampshire Department of Environmental Services.	http://des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-49.pdf
Bucks County Watersheds	http://www.buckscounty.org/docs/PC/BCWatersheds.pdf image.
What is Nonpoint Source? EPA.	http://www.epa.gov/polluted-runoff-non-point-source-pollution/what-nonpoint-source
Lower Tohickon Creek Watershed Conservation Plan. DCNR.	http://www.dcnr.state.pa.us/cs/groups/public/documents/document/D_001911.pdf
A Homeowner's Guide to Stormwater Management. Philadelphia Water Department.	
Green City, Clean Waters: Implementation and Adaptive Management Plan, Philadelphia Water Department	
Field Inspector's Planting Manual., Philadelphia Water Department	

Appendix 3. Restroom Facilities

Information on Low-flow toilets	http://www.poplarnetwork.com/news/payback-period-low-flow-toilets-cost-offset-water-savings
Information on Composting Toilets	https://www.epa.gov/sites/production/files/2015-06/documents/comp.pdf
	https://www.go-gba.org/resources/green-building-methods/composting-toilets/
Information on Pit Latrines	http://www.who.int/water_sanitation_health/hygiene/emergencies/fs3_4.pdf
Information on Timed Showers	https://www.bradleycorp.com/showers/group-showers
Information on Waterless Urinals	http://www.decorisland.com/product/sloan/wes-5000/wes-5000-waterless-urinal-s1005000/white/?details-feed=yes#feeddetails

Appendix 4. Potable Water

Information of Reverse Osmosis	http://cfpub.epa.gov/safewater/radionuclides/radionuclides.cfm?action=Rad_Reverse%20Osmosis
Information on Chlorination	http://www.cdc.gov/safewater/chlorination.html
Information on UV Lighting	http://www.pelicanwater.com/pelican-uv-systems.php
Information on Water Tanks	http://www.caldwellwatertanks.com/tank-multicolumn-overview.html
Information on Bladder Tanks	http://www.everychina.com/m-collapsible-water-storagetanks?cpc_kw=collapsible%20water%20tank&cpc_flag=c66082

Appendix 5. Energy

Information of Energy Star Certified Products	https://www.energystar.gov/products.
Lighting Made Easy: Purchasing Checklist	https://www.energystar.gov/sites/default/files/asset/document/purchasing_checklist_revised.pdf
Information on Light Bulb Savings	ttps://www.energystar.gov/products/lighting_fans/light_bulbs/light_bulb_savings
Information on Sustainable Design	http://www.lanl.gov/orgs/eng/engstandards/esm/architectural/Sustainable.pdf.
Lighting Retrofit Workbook: A Practical "How To" Guide for the National Park Service Visitor Centers.	http://www.nps.gov/sustainability/documents/Energy/NPS_lighting_guidebook.pdf.
Solar Calculator	http://www.solar-estimate.org/?page=solar-calculator
Solar Panel Reviews	http://www.solarreviews.com/solar-power-installers/solar-companies-pennsylvania/solar-panel-installers-bucks/
Guide to Passive Solar Home Design	http://energy.gov/sites/prod/files/guide_to_passive_solar_home_design.pdf.
Lighting Choice to Save You Money	http://energy.gov/energysaver/lighting-choices-save-you-money.
Oregon's Developing Sustainable Park Systems Guide	https://www.oregon.gov/oprd/PLANS/docs/scorp/2013-2018_SCORP/Developing_Sustainable_Park_Systems.pdf.
BSA: Green to Deep Green: Share Your Story	http://www.greentodeepgreen.org/index.php/2015/10/26/share-your-story/

Appendix 6. Funding

Environmental Protection Agency	www.epa.gov/funding
Department of Conservation and Natural Resources	www.grants.dcnr.state.pa.us/Dashborard/Grants#Planning
NC Clean Energy Technology	www.programs.dsireusa.org
Pennsylvania Department of Environmental Protection	www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Grants/GrantLoans