
Sustainability Action Plan for New England Wild Flower Society

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NEW ENGLAND
WILD
FLOWER
SOCIETY



Sustainability has been defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”¹ but perhaps most compellingly as, “life forever”.²

Sustainable practices support ecological, human, and economic health and vitality. Sustainability presumes that resources are finite, and should be used conservatively and wisely with a view to long-term priorities and consequences of the ways in which resources are used.³

Sustainability is both an imperative and a benefit for the New England Wild Flower Society. It is implicit in the mission, *Conserving and promoting the region's native plants to ensure healthy, biologically diverse landscapes*, and working to drive sustainable practices and behaviors throughout The Society can only benefit attainment of the mission. Further, the cost savings associated with operating a cleaner, more efficient organization can be the first benefit realized⁴, and those savings can be reinvested to further support staff and programs and improve infrastructure.

Sustainability is a process, or road, and a platinum-standard ideal. Adopting sustainability principles and practices provides a framework for an organization to always be striving toward the goal of sustainability, incrementally and iteratively with learning, evaluating, and adapting along the way. The “three pillar” structure used to balance economic development, social development, and environmental protection can be applied to organizational operations with “the objective to maximize social, environmental, and economic benefits of a decision and to minimize the adverse effects of conflicts among these three pillars”.⁵

¹ World Commission on Environment and Development 1987 p41

² Sitarz 2008 p13

³ UCLA Sustainability Committee <http://www.sustain.ucla.edu/about-us/what-is-sustainability/>

⁴ Sitarz 2008 p24

⁵ Committee on Incorporating Sustainability into the U.S. Environmental Protection Agency 2011 p5

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Background

Conserving and promoting the region's native plants to ensure healthy, biologically diverse landscapes

Founded in 1900, New England Wild Flower Society (The Society) is an environmental non-profit headquartered in Framingham, MA at their botanic garden, Garden in the Woods, with a production nursery facility at Nasami Farm in Whately, MA. The purpose and vision of The Society is to engage in activities and programs to conserve New England native plant species in healthy wild populations and to educate people of all ages about plants, their habitats, growth, beauty, care and uses, for the promotion and protection of these species in healthy ecosystems. As human activities can negatively impact the functioning of natural systems, The Society seeks to drive sustainability throughout their operations to improve the consequences of its own contributions, thereby providing a strong future for natural ecosystems and The Society.

Three of the Society's properties were studied for this plan: Garden in the Woods (The Garden) in Framingham, MA; the adjacent Intern House; and Nasami Farm in Whately, MA. These properties are regularly staffed. The Society owns eight other properties throughout New England, but with the exception of the Hobbs Fern Sanctuary in Lyman, NH, these properties are natural areas without building infrastructure. The cabin at Hobbs was not included in this study.

Garden in the Woods is an approximately 45 acre botanical garden and also headquarters of The Society. There are five buildings (Administration, Education, Horticulture, Gift Shop, and Curtis Cottage), a storage garage, and a greenhouse on the property. The majority of the staff currently work at or out of this location. Although the build-out timeline is very much theoretical at this point, the recently completed Garden Master Plan calls for major changes to infrastructure at Garden in the Woods. It is expected that three of the buildings will be replaced entirely and the remaining two may undergo significant envelope and system upgrades.

The intern house is a typical three-bedroom suburban home adjacent to The Garden. The Society pays for the electricity and heating fuel for the house. In years past the house was used only spring through fall and used infrequently for guests during the winter. More recently however, the house has been occupied through the winters as well.

Nasami Farm is the production nursery for The Society for plants sold at Nasami Farm and Garden in the Woods. The property is approximately 75 acres, but most of this area remains as wetland, woodland, and hayfield. Building infrastructure consists of a multi-function building with staff offices and work space, public program space, and a plant-sales shop, a garage/ work shop building, several greenhouses, and an old tobacco barn. Construction was completed for the main building and the garage/ workshop in 2009, and the main building was certified LEED Gold.

Driving sustainability throughout The Society with the reduction of energy use intensity and carbon footprint (energy, material use, and waste) will address a variety of opportunities and risks.

Opportunities	Risks
<ul style="list-style-type: none">• Cost savings for financial stability• Resiliency to increased energy and waste removal costs• Attractiveness to additional funding opportunities• Support of staff enthusiasm and productivity• Improved work environment comfort• Improved visitor experience• Maintained and improved credibility as an environmental organization	<ul style="list-style-type: none">• Developing finance and funding struggles• Customer dissatisfaction• Loss of credibility as a professional organization in the field

Additionally, The Society's contribution to climate change will be reduced, further aligning operations with the mission to protect plant species and habitats.

The Society is currently addressing sustainability measures individually as time and budget allow and almost entirely as the responsibility of Mark Richardson, Director of Horticulture and Facilities. These measures are focused on equipment changes without benefit of a plan to designate an effective implementation schedule or engage the rest of the staff, utilizing their individual and collective expertise, to drive sustainable behavior throughout The Society and bring additional opportunities to light and fruition.

The goal of this project is to provide an overarching plan for sustainability measures, so that they are not piecemeal but part of a sequence of financially feasible initiatives with defined goals, and to provide guidance for engaging the staff to foster sustainable behaviors. This project is especially vital because the staff do not currently have bandwidth to explore and research opportunities and collaborate on the development of an implementation plan.

Client Requirements for the Sustainability Action Plan
<ol style="list-style-type: none">1. Recommend improved sustainability practices within existing office, garden, and nursery infrastructure: energy, water, and material use and waste production2. Recommend best practices for initiating and running a garden café3. Provide suggested implementation schedule and method for on-going metrics and iterative improvement process

Important Actions Already Taken:

The Society has already taken important actions to improve their sustainability:

- Removing solar GH from heating fuel demand on cottage
- Utilizing organic gardening techniques at Garden in the Woods
- Diverting organic materials from waste stream to compost on-site at Garden in the Woods and Nasami Farm
- Experimenting with on-line course development
- Replacing incandescent and florescent lights with LEDs
- Engaging a plastic pelletizer to recycle accumulated used flats and trays at Nasami Farm and taking advantage of plastic film recycling for the used greenhouse covers.
- Switching Conservation Department from paper volunteer packets and information files to electronic records
- Replacing older toilets with high efficiency models
- Recycling efforts, including regular recycling of toner and ink cartridges

Recommended Initiatives

There are relatively immediate and cost-effective ways for The Society to incorporate more sustainability initiatives into day to day operations. Recommended initiatives have been grouped into the following categories, detailed below:

- Energy use
- Water conservation
- Recycling and waste management
- Paper use reduction
- Sustainable purchasing.

The initiatives detailed in this section have been derived from an inventory of the day-to-day energy and material burdens of The Society (see Supplemental Material). They should be fairly straightforward to implement and generally require little in up-front costs.

Energy Use

Energy use, although not the largest component of The Society's expenses, is the most obvious source of the Society's GHG footprint. NEWFS is explicitly committed to helping protect plant species that are subject to negative impacts of climate change. The use of fossil fuel energies leads directly to climate change. Changing to renewable energy sources is one part of eliminating the GHG contributions from The Society that directly and simultaneously supports The Society's mission. Energy efficiency is the essential, cost effective partner to renewable energy. Energy efficiency will require some equipment upgrades, but also conscientious behaviors on the part of staff. Incremental usage changes

can lead to savings across the organization; savings that can be redirected to support people and programs.

Electricity

Overall, the Society used slightly less electricity in 2015 than 2014, even with a significant jump in electricity use at the Intern House in 2015 over 2014. The house was largely unoccupied during 2014, therefore it is likely that the 2015 data reflects more typical usage at the Intern House.

At both Garden in the Woods and Nasami Farm, total kWh use was less in 2015 than 2014, but the total cost was higher for each location in 2015. The total cost for electricity for the Society in 2015 was over \$4,000 greater than 2014. It is expected that electricity costs will only continue to increase, or at least “traditionally produced” electricity will not become less expensive than it is currently.

Heating

The cost of heating oil and propane deliveries at Garden in the Woods decreased by almost \$2000 from 2014 to 2015 exclusively due to heating fuel prices. Six hundred more pounds of propane (approximately 143 gallons) were delivered in 2015 than 2014, but the total cost increased only \$118. Heating fuel oil deliveries also increased slightly (32 gallons), but the total cost declined over \$2000. The cost of propane heating fuel deliveries to Nasami Farm dropped almost \$5000 from 2014 to 2015. The amount delivered declined almost 1000 gallons as well. However, total fuel oil use at the Intern House increased 330 gallons and \$280 from 2014 to 2015.

Although The Society enjoyed an unexpected windfall with low heating fuel prices during 2015, continued low prices cannot be relied upon.

Overall, GHG emissions from electricity use and heating fuels throughout The Society were stable, declining slightly, from 2014 to 2015. The GHG Calculation Methodology is included in the Supplemental Material.

The approach typically prescribed for managing costs and GHG emissions is

- first to look for opportunities for energy conservation through behavioral change and updating energy consuming equipment efficiency to reduce energy use loads,
- then manage some or all of the remaining loads through renewable power production,
- and finally, potentially, invest in offsets for the energy portion not produced from renewable sources.

Based on this approach and the inventory included in the Supplemental Materials, the following actions are recommended:

Retro-Commissioning

Recommend retro-commissioning for all Garden in the Woods buildings, particularly those that will not be immediately or greatly altered during Garden Master Plan buildout. Building commissioning examines the systems and components of the building to ensure that they are working together as efficiently as possible, and provides guidance for the efficient operation of the building by the building occupants and maintenance team.^{6,7} Please see Supplemental Material for an illustration of some building commissioning aspects.

Commissioning Benefits

In 2009, work at the Lawrence Berkeley National Laboratory estimated a cost of \$0.30/ft² for retro-commissioning projects with a median 16% total building energy savings.⁸ The Garden in the Woods buildings total approximately 16,000ft² for a potential retro-commissioning cost of \$4800. Commissioning scope can be adjusted based on available budget. A much more conservative 5% savings for all existing Garden in the Woods building infrastructure (heating and electricity) post retro-commissioning would be \$1200 in 2014. With these calculations, retro-commissioning fees could be paid back in a little over two years with on-going heating and electricity savings.

As components of the commissioning process, the following actions are also recommended:

- Recommend including evaluation of existing building insulation R-Values. If insulation upgrades are possible, evaluate simple payback time for cellulose or recycled material installation: the number of years of it would take to pay back the materials and installation costs based on the expected yearly heating fuel savings. If pay-back time is less than the anticipated remaining life expectancy of the building, installation is recommended to achieve GHG emissions reductions.
- Revisit Nasami Farm commissioning documentation created during LEED certification process to ensure "persistence of the corrections (and associated energy savings)..., as many commissioning measures are operational and thus easily reversed if not monitored".⁹

⁶ US EPA 2008 ch.5 p2

⁷ Additional resource https://www.epa.gov/sites/production/files/2015-09/documents/ae-guidelines_appendixb.pdf

⁸ Mills 2009 p1

⁹ Mills 2009 p11

Commissioning Certification Organizations

Search functions on these websites can be used to identify certified individuals and firms¹⁰:

- *Certified Commissioning Professional (CCP)*: Building Commissioning Association (BCA), <http://bccbonline.org/ccf/registry/> and <http://bccbonline.org/ccp/registry/>
- *Certified Commissioning Provider*: Associated Air Balancing Council Commissioning Group (ACG), <http://www.commissioning.org/default.aspx>. This website also has information for building owners for developing an RFP.
- *Systems Commissioning Administrator*: National Environmental Balancing Bureau (NEBB), <http://www.nebb.org/>
- *Certified Building Commissioning Professional (CBCP®)*: Association of Energy Engineers (AEE) <http://www.aeecenter.org/custom/cpdirectory/index.cfm>

Electric Meter

Recommend disconnecting meter 892291232 at Nasami Farm. This meter appears to cover only the auxiliary (old) pump house. There is a monthly fee of \$30 currently (\$360 a year) to have the meter whether the pump is used or not. Although it is anticipated that this pump will be used more frequently during the growing season now that it has been repaired, Mark has suggested it would be more cost effective to lay new electrical cable to the pump house from a panel serviced by one of the other two meters at Nasami Farm than to continue paying for this third meter.

Lighting Efficiency

Recommend replacing and upgrading existing lighting fixtures as follows:

- ***Incandescent bulbs*** - Immediately identify and replace incandescent bulbs with more energy efficient alternatives.
 - Check desk lamps and other task lighting – replace incandescent bulbs with LED bulbs and upgrade fixtures where needed to improve task lighting. Appropriate task lighting can reduce the amount of overhead lighting needed.
 - Replace any remaining overhead incandescent lightbulbs with LED bulbs, upgrading fixtures if needed.
- ***EXIT sign lighting*** - Where lighted, these fixtures are drawing power all the time. LED lights will greatly reduce the power draw. Additionally, LED fixtures avoid hazardous mercury waste. Recommend replacing any signs using bulbs over 18 watts with LED fixtures and consider replacing any fixtures over 5 watts.

¹⁰ US EPA 2008 ch.5 p6

Exit Sign Upgrades

The yearly savings for electricity for a 5 watt fixture vs. an 18 watt fixture is approximately **\$23 per fixture** (at \$0.20 per kWh). Depending upon the replacement fixture selected, each will pay for itself in about a year and a half on reduced electricity costs alone, with additional expected savings on future bulb replacement.

- **Florescent bulbs** - Replace overhead florescent fixtures and bulbs with LED fixtures and bulbs as the florescent bulbs burn out or the fixtures malfunction. The price of LED bulbs and fixtures continues to decrease making them a good fiscal and environmental choice for fixture replacement. In addition, florescent bulbs contain toxic mercury whereas LED technologies do not. Replacing with LED improves worker and environmental health and safety and reduces disposal costs and hassles. Purchase quality LED products to ensure longer product lifespan and reducing waste of time, money, and materials.
- **Compact fluorescent bulbs** - Replace compact florescent bulbs (CFLs) with LED technologies as the CFL bulbs burn out. CFLs contain toxic mercury requiring special handling and disposal. Quality LED products should last longer than a comparable CFL. Replacing with LED reduces waste of time, money, and materials.
- **Motion detection lights** - Install motion detection or other occupancy sensors for Administration Building basement storage area and tunnel lighting. Evaluate other locations that could benefit from these sensors if they do not already exist, such as Education Building storage closets and the Horticulture Building shop area.

Thermostats

Recommend installing occupancy sensing thermostats or even occupancy sensing adaptive thermostats in Education Building classrooms. There are system dynamics, such as efficiency and indoor/outdoor temperature differential, that complicate the ability to estimate potential savings from these thermostats, but substantial savings may be possible for regularly vacant spaces with independently controlled systems and limited thermal interaction between zones.¹¹

Windows and Doors

Recommend ensuring windows and doors are properly sealed to minimize heat loss in the winter and heat gain during the summer.

Appliances

The Society should ensure that all major appliances - refrigerators, freezers, microwaves, dish and clothes washers - are Energy Star rated appliances. The Society should prioritize

¹¹ Woolley et al 2014 p 3-347

replacement of non-Energy Star rated appliances based on usage. Replacements for frequently-used, non-Energy Star rated appliances, such as refrigerators, will pay for themselves in energy savings. For less frequently used non-Energy Star rated appliances, The Society could actively seek donated upgrades or consider purchasing an upgraded appliance.

In addition, the following actions can be performed to test and improve efficiency of existing appliances.

- Perform dollar bill test on refrigerators. Close a dollar bill in the door gasket and try to pull out the bill once the door is closed. Test several locations. If the bill is removable, replace door gasket.
- Track frequency of use of refrigerator in Education Building kitchen. If it is used for events less than every weekend, it is recommended that the refrigerator be completely emptied, unplugged and left with doors ajar (clean towels or such over doors) and only plugged in for use during events.

Green IT

Recommend the following IT initiatives to reduce energy use associated with computers, monitors, and printers:

- Activate power management tools on PCs to enter sleep mode after a period of inactivity.
- Regularly encourage staff to turn off monitors if they will be away from their desk for more than 20 minutes.
- Regularly encourage staff to shut off computers at end of day – not just monitors.
- Recommend ensuring intern computers and other infrequently used computers are on easily accessible power strips that are turned off when the computer is not in use particularly when interns are not in session and between volunteer days.
 - Educate and instruct volunteers to turn off power strip after shutting down the computer and volunteer supervisors to ensure that the computer is shut down and power strip turned off for the night after a volunteer work day.
 - Educate and instruct intern supervisors to ensure computers are powered down and the power strip is turned off when internship is completed (usually fall and winter seasons).

Water Conservation

Potable water and irrigation water at both Garden in the Woods and Nasami Farm are withdrawn from wells, and both locations have septic systems. The cost of water at these locations is limited to the electricity needed to run the well pumps and filtration systems. Improving water use efficiency will save some money and reduce GHG emissions by impacting overall electricity use. The Intern House is serviced by town water and sewer, so water efficiency here also has the potential to save The Society money. The combined water

and sewer cost for the Town of Framingham is \$12.76 per 748 gallons¹² (as of July 1, 2015). The following actions will reduce water use throughout The Society:

- Ensure that the clothes washer at the Intern House is Energy Star rated and water efficient. Typical cycle lengths of High Efficiency (HE) washers may be a concern, however, due to the number of people needing to use the machine during the summer season.
- Install a rain barrel at the intern house for garden irrigation to reduce town water used for this purpose.
- Replace toilets at Garden in the Woods and the Intern House that have not already been updated with higher efficiency toilets (1.6gpf).
- Check water flow rate for bathroom sinks at Intern House. Standard residential bathroom fixtures allow up to 2.2 gallons per minute (gpm). The U.S. EPA WaterSense label standards allow a maximum of 1.5gpm.¹³ Replace inefficient faucets with WaterSense faucets.



- Check water flow rate for public restroom handwashing sinks at Garden in the Woods. The maximum flow rate should be 0.5 gpm for public (non-residential) applications according to ANSI standard ASME A112.18.1.¹⁴ Replace inefficient faucets.

Recycling and Waste Management

The Society has demand removal of accumulated waste and therefore incurs cost not on a regular schedule, but each time a full dumpster needs to be emptied. Therefore, additional waste reduction strategies can also be cost saving measures.

Composting Food Waste

Recommend improved on-site food waste composting methods and processes. Garden in the Woods and Nasami Farm already do a great deal to divert organic waste created from Garden and Nursery activities, but organic food waste including coffee grounds, at Garden in the Woods in particular, is a component that still regularly ends up in trash dumpsters to be removed from the site.

¹² <http://www.framinghamma.gov/187/Water-Sewer-Rate-Table>

¹³ https://www3.epa.gov/watersense/products/bathroom_sink_faucets.html

¹⁴ http://www.allianceforwaterefficiency.org/Faucet_Fixtures_Introduction.aspx

In order to facilitate disposal of compostables, it is recommended that convenient compost receptacles be provided in addition to the compost pile in the yard. In addition to locations convenient for staff use, the following locations are recommended:

- **Gift shop**—A compost receptacle should be available in the gift shop for the staff lunch organic waste, but also for the spent coffee grounds. A gift shop staff member will also need to organize the daily removal of the organic waste to the compost pile, perhaps as part of opening or closing routines.
- **Picnic patio**—Recommend installing a compost receptacle on or near the picnic patio for visitor use. Signage will be extremely important to encourage use and also ensure only proper materials are included. Securing an outdoor compost receptacle from wildlife is an issue.

Compost receptacles will need to be emptied and maintained regularly.

- If compost receptacles are located conveniently, a staff rotation could be established for emptying the receptacles, perhaps a different person each month. This person would empty the receptacle in the compost pile in the yard during their lunch time - either before or after they eat as they prefer. Although material may sit in a receptacle over night, they would then be emptied daily. Staff will also need guidance on when and how to clean the receptacles (perhaps once at the end of their month, or more as needed).
- A person could be designated for on-going compost receptacle maintenance such as ensuring lids are fitting properly and filters are replaced at intervals.
- Another option is to engage the cleaning company to empty the compost as part of their duties, but this is less cost effective. Either way, the cleaning company needs to be informed to not empty the compost into the regular trash and to not take away the compost receptacles.

Education will be necessary to encourage staff to place their own compostables in the designated locations.

- Recommend staff education on the impact and cost savings of reducing the number of times the dumpster is emptied over the year and of providing valuable garden nutrients.
- The horticulture and nursery staff could create and post a list of acceptable and unacceptable food types and other compostables to be included in the on-site compost to ensure proper usage.

Other Compostables

Recommend diverting paper hand towels used at sinks in restrooms and kitchens at Garden in the Woods from the trash to a commercial composting facility. The Society's current waste hauler for Garden in the Woods, B-P Trucking, is listed on the recyclingworksma.com

website as also accepting food waste and compostables.¹⁵ Diversion of this waste source from the typical waste stream will necessitate the following:

- Additional waste receptacles and signage in restrooms and kitchens to separate the towels (and other compostables) from other wastes.
- An additional site collection container from the waste hauler
- Discussing proper disposition of commercially compostable waste with staff and cleaning contractor

After successful diversion of paper hand towels, the program could be expanded to include other commercially compostable materials such as coffee cups currently used in The Garden Gift Shop. Additionally, engaging in smaller scale diversion of commercially compostable materials now will allow for learning and adjustment before the commercially compostable portion of the waste stream is increased with the potential installation and operation of a garden café.



Recycling

Ensure proper disposal of a maximum percentage of recyclable materials.

- Each town has its own recycling protocols, and an employee's hometown recycling coverage may vary from that at the location where they work. Employee education, during new employee orientation for example, about permitted materials is recommended to encourage full utilization of recycling availability and ensure employees are aware of the potential differences between recycling programs in Framingham and Whately and their home towns.
- Additional recycling signage is recommended at Garden in the Woods to make the comingled recycling obvious to visitors and staff. Recycling is an important way to indirectly support the mission of The Society. A variety of signage examples are available on-line.



¹⁵ <http://www.recyclingworksma.com/listing/b-p-trucking/>

Electronic Waste

Recommend ensuring electronic waste is handled by an R2 Certified (or similar) Recycler. The R2 Standard is concerned with driving global environmental and worker health and safety for the electronics refurbishing and recycling industry.¹⁶ A local certified handler accepting drop-offs is ICT Asset Recovery, 239 Commercial St, Unit B, Malden, MA 02148.¹⁷

Sustainable Purchasing

Purchasing covers all the materials and equipment bought into The Society. The criteria used to select products for purchase and the products ultimately selected can have a great impact on The Society's sustainability measures through impacts on the environment, society, and financial well-being.

Recommend creation and adoption of a Society-wide Environmentally Preferable Purchasing policy (EPP) for regularly purchased materials and durable goods.

Environmentally preferable means "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose." This comparison applies to raw materials, manufacturing, packaging, distribution, use, reuse, operation, maintenance, and disposal.¹⁸

US Green Building Council LEED Standards gives some guidance (and credit) for the adoption of an EPP in order to reduce environmental harm and air quality impacts from materials purchased, used, and disposed of in the operations, maintenance, and upgrades of buildings.¹⁹ At a minimum, the LEED credit requires the EPP to address:

- Ongoing purchases
 - The five most purchased product categories based on total annual purchases.
 - Paper, toner cartridges, binders, batteries, and desk accessories.
 - Lamps (indoor and outdoor, hard-wired and portable fixtures)
- Durable goods
 - Office equipment, appliances, and audiovisual equipment
 - Electric powered equipment

The Sustainable Purchasing Policy from Brookside Gardens is included in the Supplemental Material as an example, and initial criteria for the following categories are addressed below:

- General purchasing

¹⁶ <https://sustainableelectronics.org/r2-standard>

¹⁷ <http://ictcompliance.com/electronics-recycling/>

¹⁸ <https://www.epa.gov/greenerproducts/about-environmentally-preferable-purchasing-program>

¹⁹ <http://www.usgbc.org/credits/mr1>

- Cleaning products purchasing
- Garden and nursery equipment purchasing
- Printed materials purchasing
- IT and electronics purchasing
- Garden and Nasami Farm Shop merchandise purchasing

General Purchasing

Society staff would identify products that they regularly purchase including a list of supplies regularly purchased by the Administrative Assistant. Environmentally preferable options which meet the needs of the staff could be identified for the items on the list, and the list and options would be verified once a year. As other products are identified, they can be added to the list for easy reference and so that they do not need to be researched every time.

Environmentally preferable features would need to be identified for the creation of the EPP and can include:

- If the product category has an environment standard available, is the selected product certified or does it meet the designated standard criteria, such as Certified Organic, Energy Star, Design for the Environment, WaterSense, Epeat, Forest Stewardship Council (FSC), LEED Certified, Fair Trade, USDA Biopreferred, Green Seal, Cradle to Cradle, etc.? The websites of certification standards typically have a search mechanism to locate certified products.
- Does product contain maximum recycled content?
- Is product recyclable?
- Is packaging minimized?
- Does the product contain any hazardous substances such as PVC, lead, mercury, or carcinogens?
- Are there organizational values supported or harmed by the purchase?
- Can purchasing be batched with other items to reduce shipping frequency? (This is handled well through batched Staples and paper products orders)

Cleaning Products Purchasing

Recommend engaging cleaning company to utilize “products and procedures that contribute to healthy surroundings for building occupants and cleaning staff while minimizing the impact of cleaning operations on the environment.”²⁰ The Society should consider including criteria for green cleaning products in the EPP²¹ that require the products:

- Are not tested on animals
- Are phosphate-free and not harmful to aquatic life
- Are not petroleum-based

²⁰ <http://www.energyandfacilities.harvard.edu/facilities-services/custodial-cleaning>

²¹ <http://www.energyandfacilities.harvard.edu/sites/energyandfacilities.harvard.edu/files/Green%20Cleaning%20at%20Home.pdf>

- Have plant-based and/or biodegradable ingredients
- Can be diluted
- Have recyclable packaging and packaging made from recycled content
- Do not contain toxic ingredients (carcinogens, mutagens, and reproductive toxins). A list of commonly found toxins is available at www.uos.harvard.edu/fmo/custodial/greencleaning
- Display one of the following logos:



Garden and Nursery Equipment Purchasing

Additional criteria for Garden and Nursery equipment—tractors, utility vehicles, leaf blowers, leaf shredders, chainsaws—would need to be developed for the EPP. For example, specifying replacement with electric alternatives where available such as the Mean Green Electric “Blast” BackPack Blower²² or Stihl BGA 85 Cordless Electric Blower.²³ Although electric equipment tends to be more expensive initially, fuel savings over the life of the equipment will help subsidize the purchase.

Additional resources include:

- <http://www.thegreenstationproducts.com/home.html>
- <https://www.quietcommunities.org/>
- <http://www.ecolandscaping.org/05/sustainability/can-electric-equipment-revolutionize-landscape-maintenance/>
- <http://www.meangreenproducts.com/>

Printed Materials Purchasing

It is recommended that The Society specify criteria for utilizing print shops employing environmentally preferred printing processes and materials that meet the print needs of The Society. The print industry as a whole has improved greatly over the last decade, but it would be beneficial for The Society to ensure use of an environmentally committed print shop. The following elements could be required as part of purchasing environmentally preferred print materials: paper that is chlorine free, contains post-consumer content and/or alternative fiber content, and is FSC Certified, Green Seal certified, or Carbon Neutral Plus, low VOC, vegetable based inks, and digital printing presses. Additionally, print shops utilizing alternative energy sources either directly or through offset purchases could be preferred.

²² <http://www.meangreenproducts.com/electricbackpackblower.html>

²³ <http://www.thegreenstationproducts.com/BGA85.html>

IT and Electronics Purchasing

It is recommended that The Society purchase personal computers, notebook computers and monitors that meet at least the EPEAT Bronze rating level, with a preference for Silver or Gold rating²⁴. At a minimum, purchase EnergyStar rated devices.

Garden and Nasami Farm Shop Merchandise Purchasing

Recommend developing additional EPP criteria, beginning with the above lists, for product categories sold in the Garden in the Woods and Nasami Farm Shops. With careful attention to the origins and presentation of the goods for sale, the Shops can reinforce the Society's mission in the visitor experience.²⁵ NY NOW and Polar Bears International provide potential criteria and structures for an EPP targeted specifically at gift shops.

NY NOW categories for Degrees of SustainAbility initiative²⁶:

- "Green" Products: products that are manufactured or constructed with only recycled, recyclable and/or sustainable materials.
- Environmentally-friendly Production Processes: manufacturers who are using renewable or alternative sources of energy in production, including wind, sun, and alternative fuels.
- Socially-responsible business practices: products produced by indigenous peoples, creating viable, sustainable trades and markets in poverty-stricken and needy communities worldwide; and manufacturers who donate percentages of their sales to not-for-profit organizations.
- In 2010, NY NOW introduced a "Zero Tolerance" for products with: VOC; Lead (for baby, children and food-related products); PVC, without recommendation for use and disposal, and unless repurposed; and Aniline dyes, formaldehyde, chlorine (for textiles)

Polar Bears International purchasing policy to stock on-line store - offer quality merchandise and reduce contributions to GHG emissions in order to save the polar bears arctic habitat²⁷:

- Country of Manufacture: Try to offer products made in Canada and the United States. This reduces the amount of GHG emissions that are released in shipping the products from abroad to their Montana headquarters.
- Materials: Whenever possible, select items created from organic, renewable, or recycled materials. This reduces the amount of GHG emissions and chemicals released into the environment through non-sustainable manufacturing methods and collection of new resources.
- Shipping: Use repurposed, recycled and biodegradable packaging

²⁴ <http://www.epeat.net/>

²⁵ <https://www.bgci.org/education/1678/>

²⁶ <http://www.nynow.com/sustainability-design-for-a-better-world/>

²⁷ <https://www.polarbearsinternational.org/fr/gift-center/sustainability-policy>

Paper Use Reduction

There are several types of paper used by The Society: printer paper, stationary, and publications. Printer paper use is the suggested focus for reduction. Reducing paper use saves natural and financial resources throughout the lifecycle of the paper, including energy and resources to produce and transport the paper, cost of purchase, cost, energy, and ink for printing, and cost, transport, and energy for recycling.

- Discourage printing of communications, emails, and files.
- Set printers to default to double sided printing or otherwise encourage double sided printing. The default printing preferences should be adjustable on each computer under Device (Printer and Scanner) Settings.
- Investigate and convert to a paperless purchase order system. An electronic purchase order system could have the added benefit of facilitating report creation.
- Investigate and convert to paperless time sheet system. Staff currently submit bi-weekly, paper timesheets. Conversion could save over 750 sheets of paper per year.

Fostering Sustainable Behavior of Leadership, Staff and the Community in Support of the Initiatives

The long term success of the continuing drive toward sustainability will require a shift in internal focus and behavior. It is time to recognize that day-to-day operations can either help or hinder the achievement of the mission - environmentally and financially. Continuing with the same operations model will at best limit environmental impacts. In order to create a truly sustainable organization, The Society will need to make substantive changes to operations.

The following components will help integrate sustainable behaviors and decisions throughout The Society activities²⁸:

- Vision of Sustainability
- Leadership Commitment
- Sustainability Decision Framework
- Guiding Coalition ("Green Team")
- Clearly-Defined Roles and Responsibilities
- Communications and Marketing

²⁸ Adapted from the framework *Accelerate* by John Kotter (2012), *Fostering Sustainable Behavior* by Douglas McKenzie-Mohr (2008), and *Green Team Toolkit* (2013) from Strategic Sustainability Consulting

Vision of Sustainability

A continual, defensible drive toward sustainability protects and builds the reputation of The Society. Communicating the sustainability vision throughout The Society to create buy-in will build enthusiasm and motivation for sustainability and change initiatives and support staff follow-through on initiatives. Sharing this sustainability vision publically can show the public that you back up your commitment to the environment in the day-to-day practices and decisions of the organization.

I recommend adoption of an internal sustainability vision statement to provide focus for making decisions that ultimately drive the public mission of The Society. The following working statement²⁹ could be a starting point for fashioning a vision that reflects the goals and position of The Society:

In order to advance the public mission of New England Wild Flower Society, we will reduce the impact our operations have on the environment through sustainable practices and source reduction initiatives and make continual progress toward elimination of the release of any substances as a result of our operations that may cause environmental damage to the air, water, or the earth and its inhabitants.

In addition to support for individual initiatives, the Executive Director and Board could utilize and reference the sustainability vision in decision making.

Leadership Commitment

Engaging staff to drive sustainability throughout the organization's operations requires enthusiastic commitment and support from leadership. Two areas where visible and outspoken leadership can have a significant impact include:

- ***Maintaining a sense of urgency and commitment*** to drive initiatives forward, encourage identification of new opportunities and initiatives, and address barriers to change. The drive to sustainability is an exciting process, a journey that supports deeper ownership of the mission of The Society. Leadership must be careful not to declare victory too soon, but to keep learning from experience and encouraging the staff to do the same.
- ***Celebrating visible, significant short-term wins*** to build momentum and show that decisions and actions are benefiting The Society. These wins can be identified from a subset of collected metrics such as, year over year electricity use, or a seasonal comparison to the same season over several years, the gallons of food waste diverted from the trash receptacles to the compost pile, or receptiveness of the staff to the sustainability initiative. Whatever the win, the key is to clearly and publicly communicate and acknowledge them to maintain enthusiasm and energy.

²⁹ Adapted from Sitarz 2008 p 259

Sustainability Decision Framework

Adopt a sustainability decision framework to be used to research and analyze opportunities. On the simplest level, this requires asking, “What are the organizational values, such as the public mission and sustainability vision, supported or harmed by this decision?” A more advanced framework that does not need to require an overly time-consuming level of effort is the US EPA Level 2 Sustainability Framework, which asks organizations to consider the following components for complex sustainability decisions³⁰:

- Sustainability screening evaluation of decision to be taken – how does this opportunity impact on one or more of the three pillars – environmental health, social development, and financial development?
- Scoping and options identification, stakeholder identification, indicator and metrics selection, and collaboration opportunities
- Sustainability impact assessment – analyze the probable effects of a particular project or proposal on the social, environmental, and economic pillars of sustainability, minimize impact, and optimize decision’s contribution to sustainability.
- Tradeoffs/ synergy analysis to maximize synergies and identify and minimize conflicts among the three pillars
- Results to decision makers
- Decision taken and implemented
- Evaluation of outcomes – demonstrating effectiveness of actions and providing information to be used in a feedback loop to modify goals or processes.

One component essential for sustainable decision making at The Society is the development of an internal timeline for Garden Master Plan buildout. Even if this timeline is not set in stone, a baseline realistic expectation is needed in order to make decisions impacting the maintenance and running of the existing infrastructure.

Guiding Coalition (“Green Team”)

With a staff the size of The Society, each staff member can be visibly active in the drive toward sustainability. However, building an interdepartmental “Green Team” or “guiding coalition” can provide Society-wide support for communicating sustainability goals and identifying and implementing sustainability opportunities. A Green Team supports ownership of individual initiative roles, ensures gathering and study of metrics, facilitates discussion and communication of initiatives up and down the hierarchy, helps address and break down barriers to implementation, cultural/behavioral and financial, facilitates training sessions for initiatives as needed, and organizes educational opportunities.

The Green Team would hold regular progress and discussion meetings with next-step outcomes. They could also facilitate brainstorming or information-gathering sessions with staff, visitors, and volunteers to identify sustainability opportunities. Green Team can be

³⁰ Committee on Incorporating Sustainability into the U.S. Environmental Protection Agency 2011 p54-68

voluntary, comprised of interested staff (and board) members with the enthusiastic commitment of executive leadership to empower change. Some Green Team support documents are included as Supplemental Material to support the formation and functioning of the team.

Removing Barriers and Empowering Action

Informational campaigns can raise awareness and change attitudes, but behavior is best affected by initiatives that focus on removing barriers to an activity and enhancing the activities benefits. The Green Team will be positioned to gauge barriers to behavioral change and develop mechanisms to remove these barriers. Barriers may include

- the ability to identify specific behaviors to influence (composting vs. composting paper hand towels from the restroom or using less electricity vs. turning off computer monitor when stepping away from the desk)
- time to research, initiate, and follow up on opportunities
- financial limitations
- lack of ownership for a problem or opportunity (staff lack interest or do not feel empowered to act)

Three methods to overcoming behavioral barriers include seeking a voluntary public commitment to an action, noticeable, self-explanatory, positive prompts to remind to do an activity, and developing social norms (let others see you acting sustainably).

In addition, helping people see themselves as environmentally concerned can lead them to be more committed to other environmental activities. For example, for a person who regularly recycles, composting food waste is a natural way to reduce waste even more, and commitment to The Society's mission leads to operational behaviors to drive that mission.³¹

Clearly Defined Roles and Responsibilities

Each staff member holds great responsibility for driving sustainability within their sphere of influence (daily processes – energy and material use and waste production) but also across the organization. Initiative owners work to ensure that initiatives maintain momentum, are functioning as intended, and that barriers to implementation are addressed. They are not expected to be the sole driver for an initiative, but facilitate initiative acceptance throughout The Society.

Suggested staff owners are provided here to get the ball rolling, but changes are encouraged based on interest and staff size. There may be a clear owner, but in many cases, this is an opportunity for cross-departmental collaboration, stretching individuals beyond their expected sphere of influence. Green Team could work with staff to better distribute ownership roles based on interest and influence.

³¹ McKenzie-Mohr 2008 p108,114-116

Proposed Initiatives	Suggested Staff Owner
Retro commissioning and lighting upgrades	Mark Richardson
Computer energy management	Sid Koul
Occupancy thermostats	Mark Richardson or Anna Fialkoff
Window and door seals and appliances	Horticulture intern and conservation intern
Toilets and faucet water flow rates	Mark Richardson
Composting – food waste	Green Team
Composting – additional compostables	Anna Fialkoff and horticulture intern
Recycling signage	Lana Reed and Rachel Wolff Lander
Paper use reduction	Sid Koul, Jessica Pederson, and Christine Bennett
EPP – sustainable purchasing	Green Team, Noni Macon, Lindsey Schreier, Christine Bennett

Communications and Marketing.

Recommend activities and mechanisms to increase awareness of specific sustainability initiatives as a component of The Society's story for internal and external communication. It drives accountability, helps reinforce wins, and raises public awareness of The Society's commitment that will help with PR and possibly fundraising.

Possible communications and marketing activities include:

- Sharing the highlights of a fully developed and articulated sustainability plan on The Society's website to reinforce The Society's commitment to mission-driven sustainability. For example, the Missouri Botanic Garden introduces the components of their comprehensive sustainability plan covering many aspects of operations affecting horticulture, energy efficiency, recycling and waste reduction, janitorial and cleaning supplies, building construction, storm water management, food service and bottled water, the garden shop, publications, employee engagement, and community education.³²
- Publication and sharing of wins based on gathered metrics throughout The Society and on The Society's website.
- Development of educational programs that integrate additional sustainability subjects into curriculum, workshops, etc.
 - Green Team or staff-led lunch-and-learns on sustainability topics, initiatives, and case studies for creating a broad sustainability knowledge

³² Missouri Botanic Garden's Sustainability Fact Page (<http://www.missouribotanicalgarden.org/media/fact-pages/sustainability.aspx>) and Sustainability program pages (<http://www.missouribotanicalgarden.org/sustainability/sustainability/about-sustainability.aspx>).

base, encourage discussion, and build excitement about identifying and implementing new initiatives.

- Continued Public Programs offerings to leverage The Society's knowledge strengths to drive sustainability throughout the region such as organic gardening and land maintenance techniques, garden waste and soil management (composting), rain gardening and water management, and habitat structure.

Performance Metrics & Reporting

Performance metrics are a means of tracking the progress of a project, identifying strategies that work well, and seeing where improvements can be made. As noted earlier, recognizing and celebrating small wins can increase motivation and participation of the staff and provide encouragement to the Green Team to identify additional opportunities. The Green Team could play a role in gathering and publicizing quarterly and year-end total performance metrics, and leadership can acknowledge and celebrate them. I have provided energy use and greenhouse gas (GHG) tracking spreadsheets (as a separate file) and some recommended metrics below. The proposed targets for 2016-2017 are a yard stick for understanding progress at check-in points during the year and can be adjusted based on initiative implementation.

<i>Sustainability Initiative Category</i>	<i>Data to Evaluate</i>	<i>Notes</i>	<i>2016-2017 Target</i>
Electricity	Compare monthly and yearly kWh and cost per meter and property totals to previous years	Obtained from electricity statements	7% reduction in total kWh consumption for The Society
	Compare yearly GHG emissions to previous years	Greenhouse gas calculation methodology	7% reduction in GHG emissions resulting from electricity use
Heating fuel oil	Compare seasonal and yearly gallons and cost per delivery per tank and property totals to previous years	Obtained from delivery statements	5% reduction in total heating fuel consumption for The Society
	Compare total yearly GHG emissions to previous years	Greenhouse gas calculation methodology	5% reduction in GHG emissions resulting from heating fuel oil use
Propane	Compare seasonal and yearly gallons (or pounds) and cost per delivery per tank and property to previous years	Obtained from delivery statements	3% reduction in total propane consumption for The Society

<i>Sustainability Initiative Category</i>	<i>Data to Evaluate</i>	<i>Notes</i>	<i>2016-2017 Target</i>
	Compare total yearly GHG emissions to previous years	Greenhouse gas calculation methodology	3% reduction in GHG emissions resulting from propane use
Water use	Compare gallons through Garden in the Woods filtration system and gallons and cost from water/sewer bills at Intern House to previous years		5% reduction in total water use at Intern House and 5% reduction in building water use at Garden in the Woods (not irrigation)
Waste production and handling	Compare to previous years number of times landfill waste container at Garden in the Woods is emptied by waste hauler seasonally and yearly and the cost for removal	Obtained from waste hauler receipts or statements	Reduce number by 2 times over the year
	Estimate seasonal and yearly number of gallons of food waste compostables that are retained on site and compare to previous years once a baseline is established	Track estimate of compost receptacle fullness each time one is emptied	Approximately 500 gallons, or 2/3 of a very full trash dumpster
Paper use	Compare amount and cost of seasonal and yearly purchases of printer paper to previous years	End of year/ beginning of year inventory should be noted to determine amount of paper used in one year	Decrease use by ½ case or 2500 sheets of paper
Financial flow due to sustainability initiatives	Track startup costs for initiatives such as equipment upgrades		
	Track any realized savings such as electricity or fuel savings		Create sustainability reserve to use realized savings to fund future and on-going initiatives

As additional initiatives are introduced, Performance Metrics can be revisited to identify metrics that best represent the goals of the initiatives. Several additional areas where metrics can be determined and reduction targets set include:

- Total gasoline used for business travel and associated GHG emissions

- Total gasoline used for power equipment and maintenance vehicles at Garden in the Woods and Nasami Farm
- Percentage of particular categories of purchases meeting EPP criteria

Sustainability Capital Reserve

A sustainability capital reserve could be set up to offset expenses for future sustainability projects which require up-front capital costs outside the normal operating budget of The Society. Funds could be incrementally accrued to this rotating reserve from the realized savings from other sustainability initiatives. This may be savings from reduced electricity demands, heating loads, material demands, or waste production.³³

Future Recommendations

The above sustainability initiatives should require low or no upfront materials and equipment costs to implement. There are many additional initiative options to deepen The Society's sustainability commitment, but some of these may require significant capital which may or may not be recouped over the lifetime of the opportunity. Recommendations are provided below in the following areas:

- Buildings & Construction
- Vehicles
- Solar Energy
- Retail Plant Containers
- Sustainable Café Operation

Buildings & Construction

The Garden Master Plan offers a number of opportunities to integrate thinking about sustainability into The Society's long term planning and to prioritize key building initiatives.

- **RFP** Requirements - Recommend including the following requirements as part of the Garden Master Plan RFP criteria:
 - Architecture 2030 Challenge or AIA 2030 Commitment adoption for a carbon neutral campus³⁴
 - Proven experience with integrative design and high performance building construction³⁵
 - Proven experience with building energy simulation modeling.³⁶
- **Cottage and Greenhouses** - Recommend prioritizing Garden in the Woods cottage and greenhouses for renovation or removal under the Garden Master

³³ <http://sustainabilityadvantage.com/2012/10/23/sustainability-business-case-2/>

³⁴ <http://www.aia.org/practicing/2030Commitment/>

³⁵ [http://www.rmi.org/Performance+by+Integrative+Design\)](http://www.rmi.org/Performance+by+Integrative+Design)

³⁶ [Applebaum 2015 p4](#)

Plan. The cottage complex accounts for a significant portion of the electricity and heating energy used at the garden. In 2015, the cottage electricity cost 13% of the total electricity for the Garden and 23% of the total cost of heating the Garden buildings.

It is anticipated that a greenhouse will be needed on site at Garden in the Woods for Conservation and Horticulture projects and possibly Public Programs classes. However, greenhouses are historically heavy energy users. It is strongly recommended that alternative and renewable energy sources such as, ground source heat, solar hot water, passive solar heat storage, solar powered electricity, and waste heat capture be utilized for the upgraded greenhouse structure.

- **Education and Horticulture** - Recommend taking advantage of Garden Master Plan build out to update Education and Horticulture building envelopes and heating and cooling systems to incorporate improved building envelope efficiency with renewable energy sources to reduce heating and cooling system loads to strive for a carbon-neutral campus in alignment with the Architecture 2030 targets.³⁷
- **Construction Waste** – Recommend minimizing construction waste by removal and reuse of materials and fixtures either on site, through material resale or donation, or by providing them to a construction material recycler. While this may result in additional cost for demolition and construction, it greatly reduces environmental footprint
- **Storm Water Management** – Recommend improved integrated storm water management mechanisms to handle runoff from buildings and parking lots to alleviate erosion such as increased vegetation, bioretention swales, and vegetated filter strips.
- **Sustainable SITES Initiative** – Recommend participation in Sustainable SITES Initiative to purposefully plan the built environment as part of a healthy functioning landscape.³⁸

Vehicles

Acquisition of an additional, fuel-efficient, vehicle for Society staff business travel for staff use should be considered. The current Society vehicle for staff use at Garden in the Woods is a 2014 Toyota Tacoma that was driven approximately 21,000 miles during each of 2014 and 2015. While useful when large or hazardous equipment needs to be moved, it is highly inefficient when transporting staff only.

³⁷ http://architecture2030.org/2030_challenges/2030-challenge/

³⁸ <http://www.sustainablesites.org/>

A second, fuel-efficient vehicle could be the preferred vehicle for staff when large or hazardous equipment does not need to be transported. Staff would appreciate a vehicle that seats five adults fairly comfortably. Examples of vehicles are Subaru Outback or Prius V.

<i>Vehicle</i>	<i>MPG</i>	<i>Yearly Fuel Cost (\$1.70-2.30/ gallon)</i>	<i>GHG emissions (metric tons CO₂ eq)</i>	<i>% fuel used</i>
2014 Toyota Tacoma – 2WD, 6cyl	19	\$1878.95 - \$2542.11	13.38	100%
2015 Subaru Outback AWD, 4cyl	28	\$1275 - \$1725	10.27	68%
2015 Toyota Prius	50	\$714 - \$966	7.22	38%
2015 Toyota Prius V	42	\$850 - \$1150	8.07	45%
Note: MPG estimates from fueleconomy.gov				

Based on estimated fuel savings, adding a second, fuel efficient vehicle is unlikely to pay for itself over time when insurance and additional maintenance are factored in. However, the availability of a second, fuel efficient vehicle would potentially lower the Society’s GHG emissions over the use of the Toyota Tacoma and staff personal vehicles. In addition, a portion of the cost would be offset by reducing the per mile payment to staff for use of personal vehicles.

Staff reported personal vehicle use for business travel in excess of 8000 miles in 2015. This mileage is reimbursed by The Society at \$0.50 per mile currently. Much of this mileage was accrued due to a particular project that runs through 2016 with the possibility of extension. However, approximately 3000 miles or more per year of reimbursed personal vehicle miles can be expected by The Society.

A second, Society-owned, fuel efficient vehicle would alleviate some of the need for staff to use their own vehicles for business travel due to schedule conflicts. Utilizing a conservative estimate of 2000 miles of personal vehicle use shifted to a Society-owned vehicle, The Society would see a yearly savings of \$836 to \$932 based on the current mileage reimbursement rate, estimated combined fuel economy, and estimated fuel cost.

<i>Vehicle</i>	<i>Cost per 2000 miles</i>	<i>Difference</i>
Staff personal vehicles	\$1000	
2015 Subaru Outback	\$122 - \$164	\$836 - \$878
2015 Toyota Prius	\$68 - \$92	\$908 - \$932

An alternate recommendation is to replace the Toyota Tacoma with a more fuel efficient vehicle with a trailer hitch and trailer. Staff suggested a Subaru Outback with trailer hitch (towing capacity 2700lbs) and trailer as a potential future replacement for the pickup truck. The trailer could be attached and used for transporting equipment when needed. A trailer would decrease the fuel economy of the Subaru Outback, reported as 28mpg (fueleconomy.gov), but the overall fuel economy would be better than the pickup truck as the trailer would not be used for all mileage put on the vehicle.

Solar Energy

As discussed above in the Recommended Initiatives, Energy Use section introduction, although The Society has been using less electricity, the overall cost continues to rise for traditionally produced and distributed electricity. Installation of solar panels at Nasami Farm, on the horticulture building at Garden in the Woods, and on other buildings at Garden in the Woods as acceptable for installation could provide environmental and financial benefits.

As a non-profit The Society would bear the entire cost of panels if purchased out-right, but there are a few options available to defray or eliminate these costs. First, the Nasami Farm portion of a solar installation *may* qualify for assistance under the REAP (Rural Energy for America Program), a USDA program that provides grants (up to 25% of project cost) for purchase and installation of renewable energy systems in rural areas (<http://programs.dsireusa.org/system/program/detail/917> and <http://www.rd.usda.gov/programs-services/rural-energy-america-program-renewable-energy-systems-energy-efficiency>).

However, I recommend engaging in a third party power purchase agreement (PPA) to take advantage of both the environmental and financial benefits to The Society of utilizing alternatively produced electricity. For a PPA, the panels are usually installed on Society properties, but ownership is maintained by another company. The Society would then purchase the produced energy, and not be responsible for panel maintenance. A PPA could provide a financial benefit as well with a negotiated, stable rate for the purchase of the electricity produced by the panels over the contracted period.

There are a variety of resources for identifying solar installers and PPA partners including:

- <https://www.energysage.com/>
- <http://www.621energy.com/>
- <http://www.solarcity.com/>
- <http://newenglandcleanenergy.com/>
- <https://www.revisionenergy.com/>

Challenges specific to The Society will need to be addressed in order to make solar power a reality and attractive to PPA partners including updating roof structures, removing some tree cover, and balancing demand vs. capacity of each property. Specifically, the Nasami Farm property has plenty of room for capacity, but little overall demand and the Garden in the Woods property has greater demand, but much less suitable space for capacity. Some suggestions for taking advantage of potential capacity at Nasami Farm are to consider solar powered heating for all or a portion of the greenhouses or to approach immediate neighbors to develop a community solar project for the neighborhood.

The Trustees of Reservations has solar panels on several properties installed using several different funding mechanisms. Their experiences could help inform The Society's decisions, and it is recommended that they be contacted for further information on their solar installations. Jim Younger may be able to answer questions or provide direction to knowledgeable individuals.

Retail Plant Containers

Petroleum based plastic containers for growing retail plants are the industry standard for durability and cleanliness but are resource intensive. Currently, efforts are made by The Society to reuse or recycle containers where possible.

- **Re-use** - At Nasami Farm, seed sowing flats and some woody plug trays and containers are sanitized and reused several times. However, perennial plug trays are more difficult to clean thoroughly or do not stand up to multiple uses.
- **Recycling** - Used plastic containers can be included in comingled recycling at the Garden, but they are currently not accepted in the Nasami area recycling program. Waste containers are sometimes transported to the Garden for recycling. Customers do not frequently return containers purchased either at the Garden or at Nasami to the Garden for recycling and the containers may not be acceptable in the customer's local recycling program. The Farm does not have the space or staff to operate a more thorough container recycling program for customers.

Continuing in this vein, The Society should consider the following actions:

- Ensuring the maximum possible recycled content of retail product containers. This will involve discussions with partner nurseries to influence their container selection if they are not already using recycled content containers.
- Exploring ongoing relationship with plastic pelletizer to accept future accumulations of used flats, trays, and containers from Nasami Farm.

However, the use of alternative material containers could substantially reduce the environmental impact of the retail plant operation. This would represent a complex project in order to ensure the containers were appropriate to propagation and sales timing, climate and cultural requirements, and pricing.

The following high-level steps would be necessary:

1. Research available alternative containers - The Universities of Georgia and Florida produced a short paper³⁹ on the properties of many of the alternative material containers available, and the University of Tennessee Institute of Agriculture has created a four-part series on the features of alternative material container types.⁴⁰
2. Contact companies for samples to test a variety of options.
3. Ensure that containers are compatible with retail mechanisms, such as sales trays.
4. Negotiate with partner finishing nurseries - the alternative material containers would need to be compatible with the growing processes of the partner nurseries.

³⁹ Chappell and Knox 2012

⁴⁰ Cypher and Fulcher 2015

5. Determine impact on pricing - At this time, alternative material containers tend to be more expensive and would cut into profit margins unless sale prices are adjusted to recoup the difference.

Sustainable Café Operation

The inclusion of an expanded Garden Café operation can enhance the experience for Garden visitors, but there are challenges to create and operate a café that embodies the sustainability vision of The Society.

The Green Restaurant Association Certification Standards⁴¹ are a great resource for elements, from processes to materials, to incorporate in a sustainable café operation. Along with water efficiency, waste reduction, and chemical and pollution reduction standards, the Certification Standards reference a variety of product standards that can help identify environmentally preferable materials and equipment, including:

- Energy Star for cooking and refrigeration equipment
- Biodegradable Products Institute (BPI) for certified compostable products including plates and service ware
- Cradle to Cradle Products Innovation Institute for a variety of products from cleaning products to seating and carpets.

The following recommendations can help maximize sustainability in the development of the café:

- Use of reusable or biodegradable (commercially compostable) service ware – plates, napkins, utensils.⁴²
- Purchase of used furnishings or furnishings constructed from repurposed, renewable, or recyclable materials.
- Maximizing reusable, recyclable, and compostable (including commercially compostable) elements to minimize “trash” elements arising from café operation – such as snack bar wrappers and unprepared food packaging such as plastic bags.
- Organic food and minimal, or no, meat offerings. Depending on how robust the café menu, The Society can take advantage of local organic farms and farmer markets, perhaps partnering with one or more specific farms to obtain local fruits, vegetables, dairy and other products.⁴³

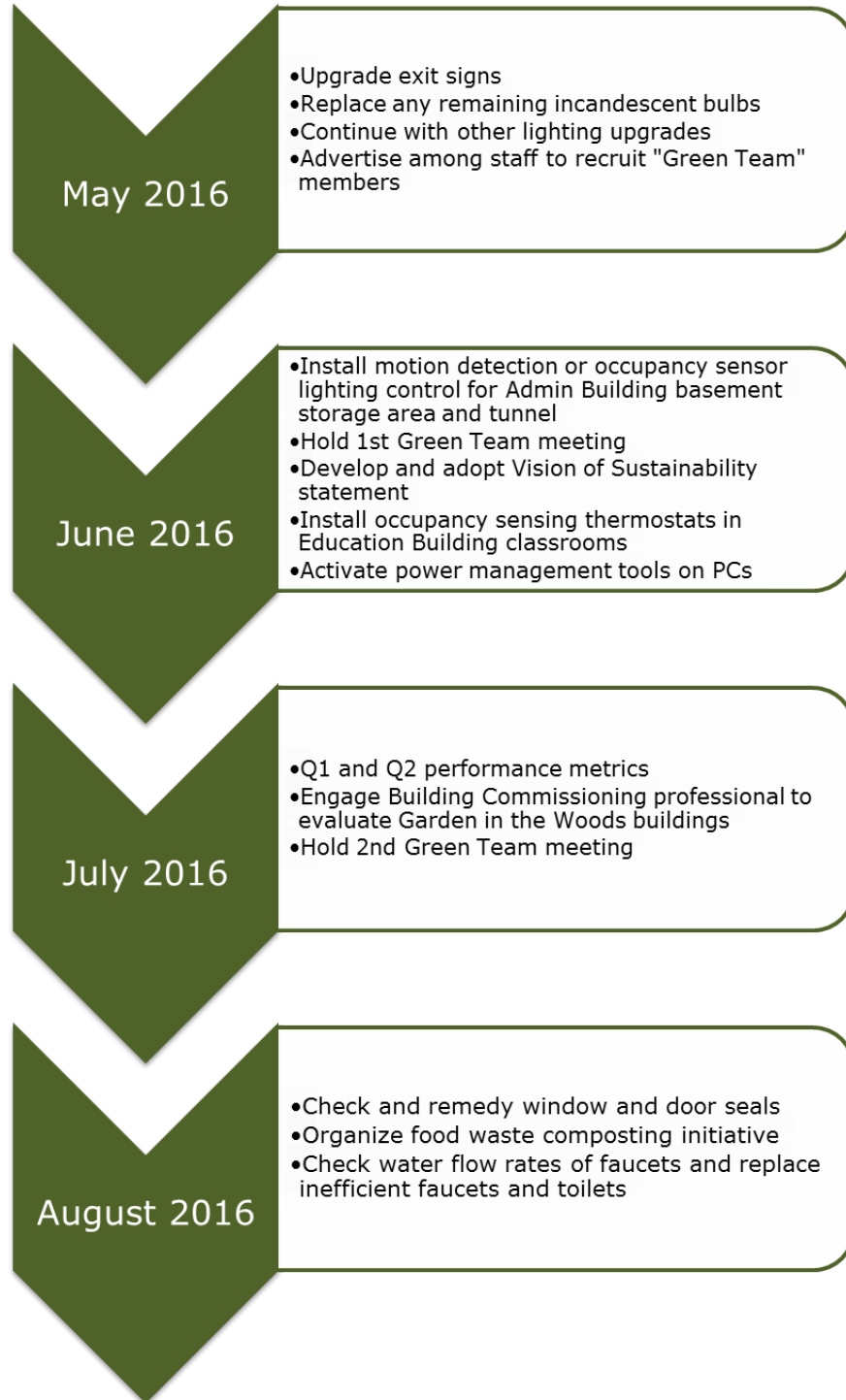
⁴¹ <https://www.dinegreen.com/default.asp>

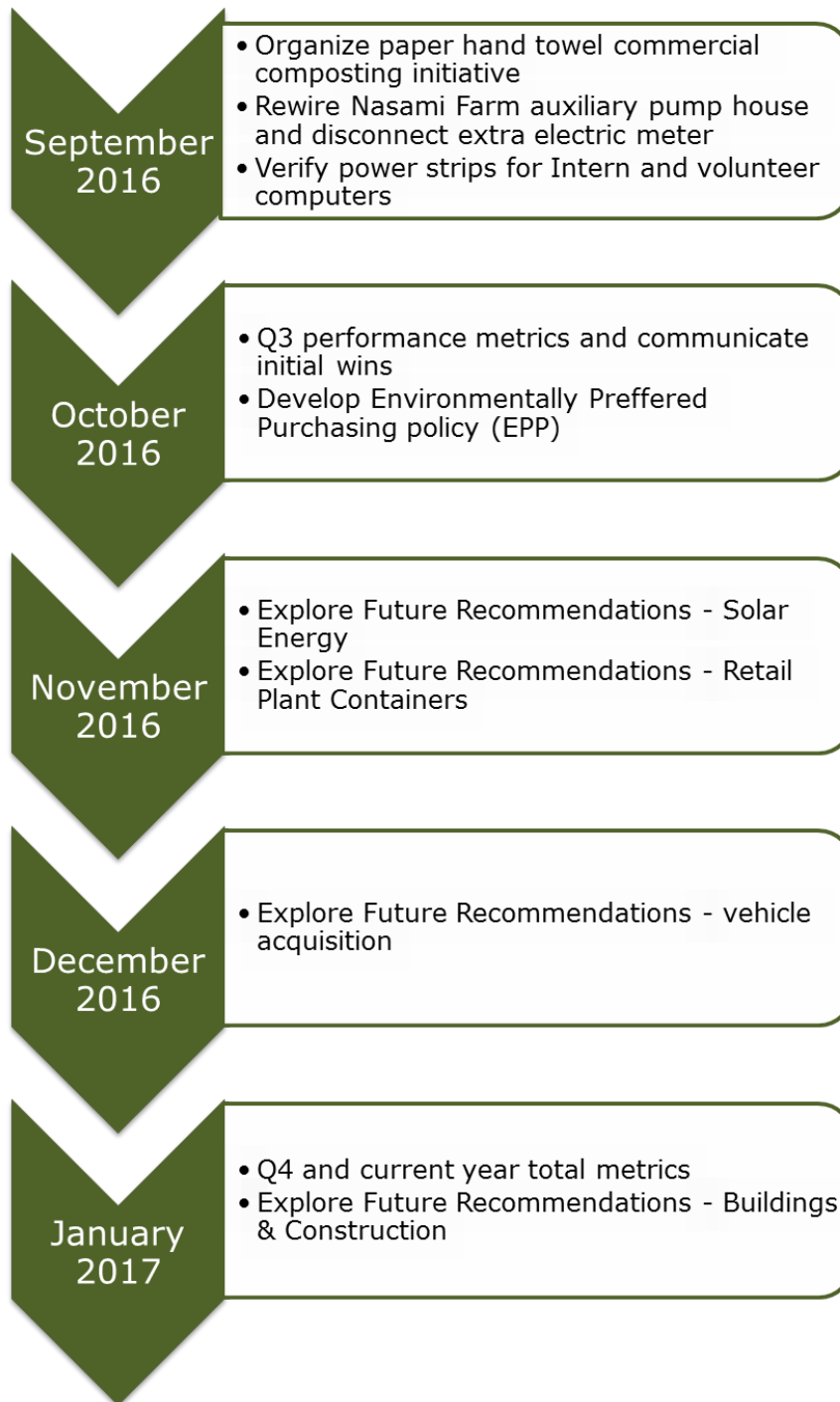
⁴² <http://www.bpiworld.org/BPI-Public/Approved/1.html>

⁴³ <http://massnrc.org/farmlocator/map.aspx?Type=Organic%20Farms> and <http://www.nofamass.org/>

Roadmap

The following timeline identifies a roadmap, or schedule, for completing some of the key initiatives recommended in this Sustainability Action Plan.





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