

Green Fund Annual Project Review



Fiscal Year 2019

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Introduction

The student body of Northern Arizona University (NAU) established the Green Fund in March of 2010. The fund was set up in the form of a \$5.00 per student semester fee, and was established to promote student participation in and provide funding for projects that reduce NAU's negative impact on the environment and create a culture of sustainability on campus. Upon the approval of the Arizona Board of Regents, this fee was raised to \$15 per student per semester in Spring of 2019. The Green Fund committee is a primarily student-based group and Green Fund project proposals can come from students, faculty and staff. All funded projects are required to have a goal of reducing the carbon emissions directly on campus and/or contributing to the culture of sustainability on campus. The Green Fund voting committee, which consists of six students and three faculty/staff advisors, vote on submitted proposals. The NAU Green fund has funded over 70 projects and has spent a total of \$1,589,172 to date. The results of the funded projects range from increased awareness of sustainability initiatives on campus, the creation of a more sustainable culture, and a reduction in greenhouse gas emissions.

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This document includes all projects approved in fiscal year 2019. Each section includes the project title, the amount paid or still encumbered, and the executive summary from the original proposal for projects over \$1000.

High Temperature Hot Water Heater Metering

\$125,000.00 (Encumbered)

Since the signing of the President's Climate Commitment, discussions on how to achieve neutrality have notably lacked conversation in how to address the natural gas usage. Many discussions revolved around how to perform energy efficiency projects and then generating electricity renewably. Biomass was the only component discussed to replace natural gas on campus for the central heating systems, but evaluations have shown this to be a drastic increase in cost. Specifically, 70% of the natural gas usage on campus is utilized by the campus central plants, which equates to roughly 30% of NAU's carbon footprint. The heat from natural gas combustion is distributed to most of campus through distribution piping of steam or high temperature hot water.

Within the last few years the district energy industry has shown that converting to low temperature hot water distribution systems (instead of high temperature or steam) drastically increases the efficiency of systems and then allows for conversion to generation from electricity through heat pumps or heat recovery chillers. If electricity is used to generate heat, it could potentially be supplied with on-site renewable or grid tied which is becoming decarbonized. Such a system gives NAU an alternative path forward that can lead to decarbonizing our district heating systems in a cost-effective manner.



Installing the high temperature hot water meters is the first step to analyzing a conversion to electric heating that can then be included in our next climate neutrality plan. Metering the existing high temperature hot water lines will determine the actual peak building loads. The loads are important to determining if any components can be reused, which is an embedded carbon concern, and may allow Facility Services to replace failed equipment with the conversion in mind before a full plan is in place. The meters will also assist with efficiency evaluations for the individual buildings and the central plant as a whole. They also can be utilized by students and professors for class or research. Previous examples of metering data utilized by students are building efficiency studies by engineering classes, building usage pattern analysis by climate science and solutions, renewable energy feasibility by numerous types of classes, and predictive analysis for computer science students.

San Francisco Solar Array

\$100,000.00

San Francisco Solar is an ongoing project, continuing to pay off the \$1,000,000 solar installation on top of the San Francisco Parking Garage in \$100,000.00 per year installments. This 561.6 kW array was installed in April of 2017. As of this fiscal year, the Green Fund has paid \$500,000 towards this project.



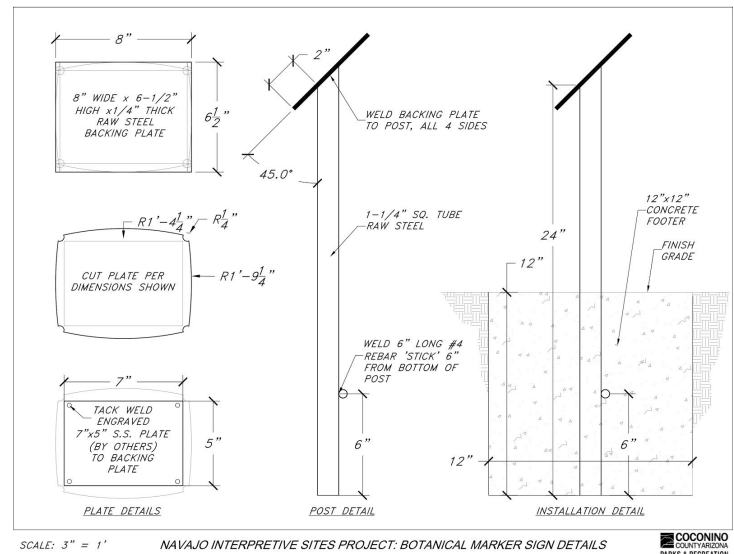
Arboretum

\$37,710.00

The arboretum was started in late 1970s by Professor J. Norm Grimm, a biologist. Professor Grimm and several other faculty members undertook transplanting native trees and shrubs from our regional forest to the arboretum. During the early 2000s, the NAU student botany club and Flagstaff Master-Gardeners Club added native flowers. The arboretum is used for several botany classes and labs. There is no dedicated funding for the arboretum.

The arboretum is identified in the 2015 NAU Landscape Master Plan as a significant pedestrian destination to be enhanced to feature plant species native to our region. Pedestrian circulation and amenities are identified to encourage the use of this unique space, including a shrub garden with a mountain arboretum theme and QR codes with new signage to identify plant species. In 2018, a project was undertaken by Planning, Design & Construction (PD&C) to replace the steam tunnel lid that runs through the space. As part of this project, some of the sidewalks within the space were improved. At this time, NAU's Landscape Architect and PD&C Director generated a design plan for the arboretum for landscape upgrades, including:

- Outdoor seating manufactured with sustainable, low-maintenance materials.
- Continuation and enhancement of the existing native limestone planting bed border including removing all plastic edger at planting beds.
- Refurbishment of a small lawn area from a weedy patch when irrigation was disturbed during a prior utility project.



- Replacement of the outdated arboretum sign and plant identification signage with new signage and QR codes.
- Updating planting beds with additional native shrubs and perennials as understory plantings to fill in where they have become sparse.
- Naturalistic paths to invite visitors to get closer to plant material and identifying signage.

This project will implement the upgrades outlined above, with the goals of providing an opportunity for students to connect with and study in nature, create an intimate social space on campus, learn about the region's native plants, and enhancing its use for classes and labs. The updated arboretum is scheduled for a grand opening at the end of the Spring 2020 term.

Menstrual Cups

\$22,302.72

Currently, the commercial menstrual products that are available to menstruating individuals are pads, tampons, and liners. These products consist of 90% plastic, contributing a significant amount of plastic waste to the environment. In the United Kingdom, menstruating individuals produce an average of 200,000 tons of plastic waste per year from menstrual products. This means every individual is throwing away about 20,000 disposable menstrual products in their lifetime, which is a significant amount of plastic. In addition to the environmental consequences, there are several health concerns associated with the use of pads and tampons. Tampons have been linked to toxic shock syndrome, which can be fatal. Additionally, many disposable menstrual products are bleached or contain chemicals that may harm an individual – several of the chemicals found in mainstream pads and tampons have been found to be carcinogenic. Additionally, pads and tampons are made of materials that can interfere with the body's natural levels of moisture and pH level.



One way to combat the issues associated with disposable menstrual products is with menstrual cups. Menstrual cups are silicone grade cups that offer a more sustainable, healthy way for individuals to handle their menstrual cycle. The cups can be cleaned and reused for several years, eliminating the waste generated by disposable menstrual products. Aligning with the Green Fund's revitalized focus on intersectional sustainability and building bridges between the economic, social, and environmental spheres of sustainability, the committee approved the purchase of 1,200 Dot brand menstrual cups at a cost of \$17.50 each for a project total of \$22,302.72. The initial costs were funded by the NAU Honors College and reimbursed from the Green Fund. The Office of Health Promotion currently houses and runs this initiative.

Bike Power Generator System

\$8,460.41

The goal of this project was to obtain a “fleet” of bicycle power generators to use at Green Jacks’ Earth Jam in April 2019, as well as at relevant future events. With 10 bicycle generator stands, a power utility box, and a “pedalometer,” it will be possible to generate enough energy to power the musical performances at annual Earth Jam events. Students create energy by pedaling bicycles that are placed on “roll-up generator stands.” That energy is then passed through the power utility box (with a junction box since there are more than five roll-ups), which converts this energy into usable AC for devices rated up to 1000W. The pedalometer is a 3 foot tall LED light, whose color scheme changes to reflect power input so that the participating cyclists know whether they are generating enough energy.



With this basic set-up, it will be possible to power a variety of existing student events with bicycles, such as Earth Jam and the Better World Film Series. It will also be possible to utilize the bike generators as stand-alone features powering, for example, blenders, device chargers, ice cream makers, a single PA speaker, and any number of other small electrical appliances. Incorporating bike-power into educational and outreach efforts in this way would provide a fun, interactive, healthy, and emissions-free way for the community to engage with sustainability. In addition to complementing existing events, having a “fleet” of bike power generators opens a range of new opportunities for implementing off-the-grid events at NAU and in the community. As such, this project represents a unique and innovative way to satisfy each of the Green Fund’s goals while also earning NAU the distinction of being the first entity in Arizona to host a bike-powered event. In addition to inherently reducing NAU’s resource use, bike-powered events necessarily require direct student involvement since the bikes must be pedaled by rotating groups of students. The baseline need for energy generation also presents natural opportunities for reaching out to student groups whose members are not necessarily interested in sustainability.

For example, when the leader of this project helped to found UCLA’s annual bike-powered music festival, she recruited the university’s cycling and triathlon teams to participate, as well as other student groups that are generally enthusiastic about competing against one another, such as fraternities, sororities, club sports teams, and residential halls. In addition to ensuring a smoother energy supply, their participation brought a lot of new faces to our event, which is often a major challenge for sustainability programming. In this way, bicycle-powered events that incorporate music and other forms of entertainment provide an opportunity to engage with students and community members who would otherwise be unlikely to attend sustainability-related events.

In addition to promoting awareness of energy use by being off-the-grid, this project would also contribute to a culture of sustainability by promoting bicycling. More specifically, we are coordinating with the Yellow Bike Program to utilize their bikes at the event so that we may advertise their program while simultaneously contributing a nice aesthetic to the power-generating arrangement.

Our initial plan for harnessing “pedal-power” at Earth Jam involved manually constructing bicycle generators. However, the potential risks associated with that approach seemed unmerited given the advantages associated with purchasing specialty equipment from Rock the Bike. This is the vendor that the project leader worked with to make the aforementioned bike-powered music festival at UCLA a reality. She was very impressed by Rock the Bike’s products as well as their professionalism.

Compared to other vendors, their equipment is better suited to fulfilling a wide range of potential applications while also being relatively compact, reducing storage space requirements. In fact, all of the equipment would fit in a small closet space, and Chandler McCormick has generously offered to store them in the Green NAU Office in Facility Services.

De-Icer Cable Refit

\$2657.98 (Encumbered)

This project involves the replacement of the snow-melt cables on top of SBS West with newer, temperature/moisture sensing snow-melt cables. The current system is constantly running regardless of the amount of snow on the roof, wasting energy an estimated 85.73% of the time. Installing a new system would support the goals of the Green Fund by eliminating 3.56 tons of carbon emissions per year.

Additionally, this project would provide an annual energy savings of \$262.93, thus incentivizing the university to implement this newer system in more locations where possible.

A second component to this project is to exactly quantify the electricity savings, and in turn emissions reduction through the use of the new Green Fund electricity meter. Engineering students will analyze the data and quantify the effects for the Green Fund’s records. This project will also demonstrate the utility of energy meters.



Electricity Meter

\$6,114.40

This project involved the purchase of a portable electrical meter that can measure the electrical demand of most electricity consuming equipment on campus, including wired technologies that are not directly plugged into a wall (e.g. electric resistive heating, lighting, information servers, etc.). This meter is to remain a tool owned by the Green Fund to estimate the effectiveness of future Green Fund proposals that aim to reduce the use of electricity either through upgraded technology, conservation efforts or behavioral changes. A meter can measure the baseline electricity use before a project is implemented, and measure the actual changes in electrical energy use after the project is in play. This data will allow the Green Fund to quantify how much electrical energy was reduced and in turn the associated emissions, resource use and cost reductions that are realized when less electricity is consumed.



Quantitative data that supports real energy savings will motivate administrative decision makers to extend newly adopted technologies, processes or programs funded by Green Fund across the larger NAU campus, extending the sustainable impacts of these projects. The scope of this proposal includes financing for the meter and associated accessories, as well as ten electrician labor-hours to verify the correct operation of the meter before its measurements are used by students to assess or verify the sustainable performance of Green Fund projects.

Protocycler

\$2,411.84 (Encumbered)

The MakerLab in Cline Library processes more than 3,000 print requests a semester from students of various majors and members of the community. Due to the large number of requests, about 75 kilograms of filament material is wasted each semester. Additionally, the polylactic acid (PLA) filament material is no longer recyclable in the City of Flagstaff and is being thrown into the landfills. Cline Library anticipates the continued growth of 3D printing on campus. In an effort to counter the effects of the discarded filament, we are recommending



they purchase the Protocycler, which utilizes unused or discarded polylactic filament material from 3D printers and creates new filament for the 3D printers. In order to use the Protocycler in the MakerLab, an additional investment for the purchase of 3 experimental extruders is required. Combined, the Protocycler and Extruders would offset the waste produced by the 3D printer and reduce the need for purchasing new PLA filament. Furthermore, all students, faculty, and community members have access to the MakerLab and will be able to use the Protocycler which will increase the culture of sustainability at NAU and in the community.

****UPDATE 11.18.19:** This project has been put on hold, as the Protocycler company is no longer in business. The Green Fund and Cline Library are working together to look into other options.

Other Projects

Reusable Straws - \$780.00

Glass Recycling Signage - \$393.00