

---

## ARIZONA STATE UNIVERSITY URBAN FORESTRY AND CARBON OFFSETS PILOT

---



### Project Overview

In 2017, the University Sustainability Practices (USP) office at Arizona State University (ASU) piloted a new urban forestry program to explore the viability of generating carbon offsets through local tree planting projects.

The pilot utilized the Urban Forestry 2.0 protocol from Duke Carbon Offsets Initiative (DCOI). ASU partnered with the cities of Phoenix and Tempe to install trees in parks and community gardens. Urban Offsets (UO), a privately held company from North Carolina, manages the data and will eventually certify the offsets generated by this pilot. The initial project period planted 359 trees at 15 sites, which are expected to sequester around 1,200 metric tons of carbon dioxide equivalent (MTCDE) by the time that the project reaches full maturity.

The pilot was initially funded with \$10,000 from ASU, then DCOI matched that commitment with an additional \$10,000. ASU and Duke then leveraged this investment to attract a \$15,000 grant from the Arizona Department of Forestry & Fire Management (ADFFM) and US Forest Service (USFS). The pilot and grant also attracted an individual community leader who contributed \$9500 with a request to target low-income neighborhoods with the pilot.

The majority of the funds were used to plant trees and purchase carbon offsets. About a third of these funds were also utilized to develop new programming around urban forestry, including: educational curriculum for middle- and high-school-aged youth, verification and validation protocol trainings, and a best practices publication for municipalities.

## Organizations

- Arizona State University
  - University Sustainability Practices
  - National Sustainability Teachers' Academy
  - Global Institute of Sustainability
  - Sustainable Cities Network
- Arizona Department of Forestry & Fire Management
- USDA Forest Service
- Duke Carbon Offsets Initiative
- City of Tempe
- City of Phoenix
- Reverend Jenny Norton
- Maricopa County Food System Coalition
- Urban Offsets
- Various other community groups

## Background

In 2006, ASU's president Michael Crow convened a group of university presidents to form the American College and University Presidents' Climate Commitment. This agreement provided a mechanism for college campuses across the country to publicly commit to and report progress on the elimination of greenhouse gas emissions from their campuses. In 2009, ASU published its Carbon Neutrality Action Plan which committed the university to seeking carbon neutrality in its buildings by 2025 and for transportation by 2035. The university has made large strides towards the energy efficiency of buildings and has invested heavily in developing a solar-powered energy grid. However, transportation-related emissions, much of which occurs outside of the university's direct control, are elusive and often cannot be prevented. In order to reach carbon neutrality by the 2035 goal, ASU will need to use carbon offsets to reduce this part of the emissions portfolio (offsets are also used to address some unavoidable emissions related to building energy). Carbon offsets allow the university to claim credits for verified emissions reductions to balance out emissions that are created elsewhere.

Typically, forestry-related offsets are generated by large-scale projects elsewhere in the world; the cost margins are usually more manageable when the scale is massive and trees are planted in less economically developed countries. It is very challenging for a purchaser to receive offsets from a "local" project, and the high costs often push educational institutions out of the market. However, traditional large-scale, third-party carbon offsets do not provide an intrinsic value to the academic or research mission of the college or university. So, through the guidance of the DCOI, ASU has sought to offset emissions through local projects that also add value to the academic and research mission of the university. Typically the validation & verification process is labor intensive and third party audits are prohibitively costly. The Urban Forestry 2.0 protocol addresses this challenge.

Urban forestry is an attractive method of generating carbon offsets because of the many co-benefits trees bring to the community, including: improved air quality, beauty, shade, building energy efficiency, walkability and many more. Many of these co-benefits also translate into future cost reductions and/or increased revenues for cities. The Urban Forestry protocol brings together municipalities and academic institutions in order to capitalize on these overlapping and shared priorities; the entities work together to plant the trees and participate in a peer review process to decrease the prohibitively high verification & validation costs.

## Project Goals

- Improve urban forest canopy and realize community co-benefits by planting at least 350 edible/shade trees in Tempe and Phoenix, primarily in underserved and other priority areas
- Explore the viability of local carbon offset projects to address ASU's scope 3 emissions (and some scope 1), by generating carbon offsets from tree planting projects using the DCOI urban forestry protocol

- Develop 5-module lesson plans for primary schools to bring urban forestry curriculum to youth
- Demonstrate the value of trees and encourage planting of trees with on-site fieldtrips, where urban forestry curriculum is piloted
- Produce publications on research into landscape maintenance emissions and municipal best practices
- Educate the public about the initiative by hosting lectures with DCOI and others; live broadcast on the web
- Conduct on-site verification and validation protocol training to develop capacity for more tree offset projects in the future
- Install signage to educate the public about the importance of urban forestry and trees

### Project Implementation

In late 2016, the Duke Carbon Offset Initiative approached University Sustainability Practices with an offer to match USP's investment in an urban forestry project in 2017. USP committed \$10,000 and DCOI matched the contribution. In February 2017, using the \$20,000 in committed funds, USP was awarded a \$15,000 Community Challenge Grant from ADFFM and USFS to pursue a new urban forestry pilot. The same month, ASU, City of Phoenix, City of Tempe and Urban Offsets signed formal agreements to participate in the pilot's implementation (ASU/UO; UO/Tempe; UO/Phoenix).

The pilot implementation included three major components: 1) improving urban tree canopy by planting 350 trees through partnerships with municipalities and volunteer events; 2) catalyzing a local carbon offsets industry by hosting technical trainings and mobilizing municipalities; 3) Educating youth by developing and piloting curriculum around urban forestry and carbon cycle.

Urban Offsets (UO) is a privately held startup business in Greensboro, North Carolina that specializes in working with universities to meet emissions neutrality goals by developing carbon offsets projects and identifying quality third party offset credits. UO agreed to assume the role of leading the coordination of logistics and record-keeping for tree planting projects. The company also provided research and data support to educators to develop STEM lesson plans for secondary and primary school teachers.

The City of Phoenix is the capitol of Arizona, a metropolitan desert city. The City of Tempe is considered a part of the greater Phoenix metro area, and shares its western border with the capitol. Both cities are members of Tree City USA and have formal urban forestry master planning documents. Phoenix and Tempe worked with UO to actually plant the trees associated with the ASU project in parks and community gardens. The cities also supported the coordination of three large volunteer tree planting events.

ASU is a large university with four campuses across the Phoenix metro area, which has been ranked #1 in innovation for three consecutive years. USP is a unit of the business and finance operations, focused on achieving the university's sustainability goals. USP initiated this pilot and acted as a coordinating entity that would organize stakeholders. USP also supported the pilot by working with other ASU entities to execute pieces of the program: 1) the National Sustainability Teachers' Academy (NSTA) developed a 5-module lesson plan; 2) The Sustainable Cities Network (SCN) at ASU helped to mobilize municipal stakeholders around urban forestry by hosting a working group and driving participation in ASU's technical trainings; 3) The Global Institute of Sustainability (GIOS) hosted USP and partners for two technical trainings and a "Sustainability Series" panel discussion to help catalyze a local carbon offset market in AZ.

DCOI is a program at Duke University that is leading the way in the field of voluntary carbon offset projects. The initiative developed the Urban Forestry Carbon Offset Protocol v2.0, which was used to generate the carbon offsets from this pilot program. DCOI also shared their expertise by providing

research support and consultation to USP as needed, and leading the technical trainings and panel discussions. A variety of other groups supported the implementation through financial contributions to the pilot, or recruitment and participation in volunteer tree planting events.



### Project Timeline

- September 2016: USP formed an “open agreement” with Urban Offsets to pursue carbon offsets projects in the near future.
- Late 2016: USP applied to ADFFM/USFS “Community Challenge Grant” program.
- February 2017: USP received notice of award. UO signed formal agreements with cities of Phoenix and Tempe to coordinate tree planting projects.
- March 2017: USP hired and on-boarded a graduate student worker to coordinate the program and conduct research.
- April 2017: USP hosted two large volunteer events to plant over 80 trees in local parks, in collaboration with all partners and additional community groups. A ribbon-cutting event was held by the host site for one community orchard installed by the pilot.
- May 2017: USP held meetings with NSTA and SCN to plan out their roles in the pilot program.
- July 2017: USP held meeting with UO and DCOI to plan for technical trainings and panel discussion in fall. USP’s graduate student worker began to conduct literature review on trees and emissions, and designed and printed educational signage for one community orchard installed by the pilot.
- August 2017: USP held meetings with GIOS to plan logistics for fall panel discussion and technical trainings; USP’s graduate student worker continued to conduct literature review.
- October 2017: Partners finalized logistics for technical trainings and panel discussion. USP presented on pilot progress to Green Devil Network at ASU. USP graduate student designed and printed one-pager info sheet about ASU’s urban forestry pilot. Tempe hosted a large volunteer event to plant 115 trees at a local park.
- November 2017: USP presented on pilot progress to ADFFM at grantee showcase, as well as to SCN. Partners held technical trainings and Sustainability Series panel discussion at GIOS. USP’s graduate student worker resumed literature review.
- December 2017: USP graduate student designed and printed educational “tree tag” signs. USP graduate student drafted publication on research findings. NSTA piloted youth education curriculum with field trip to a local park for fifty 6<sup>th</sup> grade students.
- January 2017: USP finalized publication on research findings. USP wrapped up final grant logistics.

### Financing

There were three main buckets of costs associated with the pilot program: 1) Personnel costs, 2) Cost of purchasing carbon offsets, and 3) Program costs. Personnel costs included over 800 hours logged by USP’s graduate student worker and approximately 10% of the USP Assistant Director’s time. \$1,989 of the graduate student worker’s time was reimbursable per the ADFFM grant. ASU and DCOI each invested \$10,000 toward the cost of purchasing carbon offsets from UO (total cost: \$20,000 – roughly \$15/ton).

Program costs were much more varied and included: \$2,632.51 for technical trainings and Sustainability Series panel (\$1,000 for speaker/facilitator fees and \$1,632.51 for speaker travel); \$200 in facilitator’s fees to pilot the youth education curriculum on a field trip to local park; \$950 funded the design and printing of educational signage; and \$421.82 was spent on refreshments for volunteers at tree planting events. All of the above expenses were reimbursed through the ADFFM grant, with the exception of \$21.82 paid by USP after going slightly over budget on refreshments for volunteer events.

\$9500 in supplemental funding (which covered cost of trees and irrigation system adaptation) was provided by Reverend Jenny Norton to support tree plantings in a historically low-income Tempe neighborhood where multiple community partners are working to revitalize the community. The remainder of program inputs were donated in-kind from partners at ASU and in the community (including administrative support from the NSTA, GIOS and SCN).

### Project Results (as of February 2018)

Through this pilot program, 359 trees were planted in public parks and community gardens in Phoenix and Tempe. The majority of these trees were planted through three large volunteer events; the pilot generated an estimated 200 volunteers, donating over 400 hours of volunteer labor. The trees are expected to sequester approximately 1,200 MTCDE from the atmosphere over their lifetime.

Research shed light on several important variables to consider when planning urban tree planting projects intended to generate carbon offsets. From this research, a publication was developed that includes two worksheets that municipalities can use to calculate the emissions generated from their landscaping activity, and to determine the best sites for tree planting projects intended to generate carbon offsets.

Curriculum was developed for primary and secondary school aged youth that covers the benefits of urban trees, ecosystem services, tree anatomy and the carbon cycle. The curriculum was piloted with a group of 50 sixth grade students at a park in Phoenix.

Two technical trainings and a panel discussion were coordinated by USP and GIOS. DCOI and UO sent guest speakers to train attendees on the carbon offset generation protocols and to learn about the carbon market. Approximately 15 people attended each technical training and approximately 40 people attended the panel discussion (an additional unknown number of people tuned into the live webcast). Attendees included: students, municipal professionals, nonprofit professionals, professors, and university administrators.



## Lessons Learned

There were five major takeaways from the urban forestry pilot.

1. There was a very high level of community support for the urban forestry initiative. This was a great opportunity for ASU to get involved in the community and the buzz around this project successfully attracted supplemental funding and in-kind support from multiple third-party entities. Additionally, each volunteer event had very high turnout, from both community members and stakeholders. The opportunity to work with the public provides additional intangible benefits such as sense of place and community engagement.
2. Mass tree planting projects like this provide unique quasi-experimental conditions for research on the co-benefits provided by urban trees. For instance, a heat island research group at ASU is interested in partnering on the next round of tree plantings to take surface temperature measurements before tree plantings, and regularly thereafter.
3. High costs and access to adequate funding were persistent challenges throughout the pilot. The conditions of the sites selected (parks with high levels of human activity) necessitated purchasing larger, higher-cost trees to reduce the chance of damage from both vandalism and normal human activity. The summer heat and arid climate also necessitate the installation of irrigation lines to ensure the trees survive. Without access to supplemental funding to pay for the larger trees and irrigation, these projects would not have been possible at the scale outlined by project plans.
4. The concept of purchasing carbon offsets was new to ASU's purchasing staff and processes, generating a number of questions and additional conversations and approvals. Issues arose over the potential perception of "gifting" public funds to other entities (city governments), as well as which entity's purchasing policies and approved contractors list applied to hiring landscape and irrigation professionals. Some questions required legal interpretation by university and city attorneys.
5. The generation of carbon credits from urban forestry faces scalability problems due to a high level of administrative complexity, and the relatively high cost of planting trees in the urban landscape (especially in an arid desert environment). A carbon offset program for a large institution like ASU cannot rely solely on a locally-generated offset operation. Rather, a large institution like ASU may need to rely primarily on a diverse portfolio of third party credits, supplemented with locally-generated carbon offsets from urban tree plantings. This combination approach is referred to as a "Community Carbon Bundle" by UO, and would allow for a large institution like ASU to scale up its carbon offsets program.

Moving forward, ASU will utilize these takeaways to improve the urban forestry program. The university's continued goal is to reach the new target 2025 and 2035 goals for climate positivity. ASU will modify the implementation model for this program to make it more scalable. The university will seek opportunities to maximize on the many co-benefits provided from these additional trees, including integrating dedicated research projects as well as engaging with the ASU community.

### For More Information:

University Sustainability Practices  
Arizona State University

<https://sustainability.asu.edu/programs/#usp>