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# Duke Carbon Offsets Initiative Carbon Sink Guide



**Duke Carbon  
Offsets Initiative**  
DUKE UNIVERSITY

# Duke Carbon Offsets Initiative



## History

In 2007, Duke University signed the American College and University Presidents' Climate Commitment (ACUPCC) and set a target of achieving climate neutrality by 2024. After being aggressive with reducing emissions on campus, Duke will have to offset an estimated 185,000 metric tons per year of carbon dioxide in 2024. The Duke Carbon Offsets Initiative was created as a branch of Sustainable Duke to help Duke University reach climate neutrality. Since its beginning in 2009, it has developed a variety of innovative carbon offset programs in swine waste-to-energy, energy efficiency, solar, and urban forestry.

## Vision

To make Duke University a model climate-neutral institution and to lead peer institutions in their efforts to become climate neutral.

## Mission

- To meet Duke University's climate neutrality goal by 2024 by **developing and implementing the University's strategy** for identifying, creating, and purchasing carbon offsets.
- To implement the strategy in a way that **provides educational opportunities** for students, faculty, and staff.
- To **prioritize local, state, and regional offsets that provide significant environmental, economic, and societal co-benefits** that are beyond the benefits of greenhouse gas reduction.
- To **facilitate and catalyze high-integrity, unique offset projects** by serving as a resource for other institutions.

# Carbon Sinks

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## Introduction

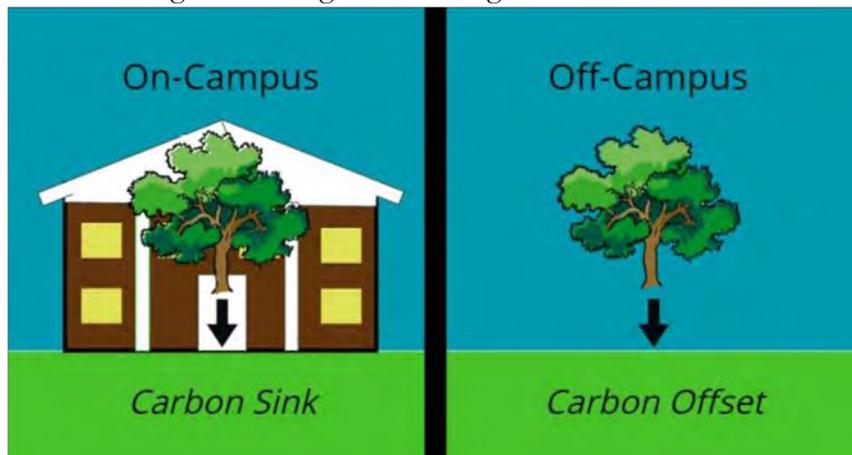
As climate neutrality goals have been set by colleges and universities across the country, new and innovative ideas for offsets have continued to surface. Urban tree planting offset projects are growing in popularity, due to the local co-benefits they provide for educational institutions and their surrounding communities. To facilitate these project types, the Duke Carbon Offsets Initiative (DCOI) developed an [Urban Tree Planting Protocol](#) that provides guidance on how to generate offsets from tree plantings. Through a partnership with [Urban Offsets](#), a start-up out of Greensboro, NC, DCOI has provided guidance for tree plantings across the US – with over 6,400 trees planted in 2017.

As an extension of this program, to accommodate increasing interest from academic institutions, this document aims to provide a pathway for institutions to count additional carbon sequestered from trees planted on-campus. It is important to note that because this document focuses on planting within the university's owned acreage, these tree plantings could not be counted as offsets. Instead, they are counted as carbon sinks and negative line items towards on-campus Scope 1 emissions in greenhouse gas (GHG) accounting.

To meet the growing desire for on-campus tree plantings while ensuring PAVER requirements are met, steps must be taken to qualify these plantings as carbon sinks. Specifically, additionality becomes challenging, as few institutions keep a full and updated inventory of on-campus trees, or track routine plantings and removals of trees to set the Business-As-Usual (BAU) scenario. In approaching carbon sinks, universities and colleges should avoid two issues:

1. Institutions counting on-campus tree plantings as offsets, rather than as carbon sinks.
2. Institutions selectively counting the carbon sequestration of some activities, like on-campus tree plantings, but not others, such as land use changes or clear cutting for new construction, that may result in increased emissions overall.

For example, if an institution decided to consider on-campus tree plantings in their greenhouse gas accounting, they would need to approach the situation systematically. By just counting future plantings as offsets, the institution is encountering both issues detailed above. First, any plantings counted on campus must be considered as carbon sinks. Offsets are emissions reductions outside of the territorial bounds of the university. Second, by only counting plantings, without inventorying on campus trees, or establishing a replacement policy, the school is not proving additionality of the carbon sequestration. While carbon sinks are treated differently than offsets, institutions should still adhere to best practices in their greenhouse gas accounting.



## Best Practices for Additionality

To establish additionality and ensure that calculated emissions reductions reflect actual values, several steps are required:

1. Complete a five-year inventory of all campus trees and establish a strict tree replacement policy.
2. Establish emissions equations for landscaping/construction impacts and include in Scope 1 accounting.
3. Plant and monitor additional trees and calculate carbon sequestered annually.
4. Count the carbon sequestered as a carbon sink – as negative emissions under Scope 1 in GHG accounting.
5. Count carbon emitted through land use change and timber harvest as emissions under Scope 1 accounting.

### Case Study: Colgate University

Colgate University follows the best practices listed above. The campus has an inventory of all on-campus trees, and calculates the rate of carbon sequestration and emissions when trees are removed. In 2013, Colgate conducted its initial tree carbon inventory. Utilizing the technical expertise of a local forester and guidance from the US Forest Service (USFS), the inventory involved conducting field measurements of all trees larger than 3 inches in diameter at breast height (DBH) in 174 sample plots. Using established guidelines and calculations, these measurements were used to determine the amount of stored carbon and annual rate of sequestration. Additionally, students created a GIS database of all trees on the main campus and the Office of Sustainability published the university's [protocol](#) to share with other institutions. Altogether, the field measurements took a few months throughout the winter with another few months to compile the data and write the report. Besides staff and faculty time, the university also paid the forester some consulting fees. According to John Pumilio, the campus sustainability director, including campus forests is a vital and necessary component to Colgate's sustainability and climate action work.

The tree inventory process involves being accountable for tree management on campus. As universities grow and needs change, this typically involves land-use changes that result in major tree removals. For many colleges and universities, this alone is reason enough to pass on inventorying on campus-trees. But for Colgate, this was an opportunity to see trees as a campus asset and ensure that if trees had to be removed, they would be replaced in their entirety.

Recently, Colgate has encountered this exact scenario. To construct two new dormitories on campus, 2.5 acres of trees were removed. While this is only a fraction of the 1,000+ acres of trees inventoried, the loss mattered. Upon tree removal, Colgate's president, Brian Casey, requested a full count of trees lost. Colgate has a campus policy to plant two new trees for every one lost. This policy ensures that Colgate's forests will remain vibrant and a part of the university's long-term natural heritage. The tree removal for the construction of the new residence halls will result in positive emissions in their greenhouse gas accounting, but according to John, those are meaningful carbon emissions that should be tracked and included.

In 2018, Colgate will complete the first re-inventory of its forest carbon. John hopes that with the inventory process better understood on campus, that this will allow for greater faculty and student participation. As the leader in carbon accounting for on-campus trees, Colgate has helped to create the model, rather than following one. Recently, Hamilton College, a neighboring institution to Colgate, decided to follow a similar model and verification process. It is John's hope, that as colleges and universities see the rationale and feasibility of a full on-campus tree inventory, more institutions will act, creating a new standard practice.

On campus trees are an important part of Colgate's aesthetic and culture, but the concept and methodology is well within reach for other institutions. John cites technical expertise as the largest barrier for adoption of this methodology, but the success at Colgate and Hamilton shows proof of concept. For more information on the work at Colgate or how to get the conversation started at your school, contact [John Pumilio](#).

## The Challenges of Meeting Best Practices

DCOI recognizes that not all universities have the ability to fulfill the requirements entailed above. While some universities, like Colgate, have the resources and motivation to accomplish this goal, competing priorities on campus may make this challenging for others. Recognizing the need to establish additionality and meet other PAVER requirements without an overhaul of current campus systems, DCOI proposes the following as a compromise that provides a different pathway for establishing additionality.

## The Compromises for Additionality

If following the best practices outlined above are not possible for your university, there are two reasonable opportunities for compromise. Each option can independently meet the standards for qualification as a carbon sink. Colleges and universities are encouraged to explore both options and determine which fit best. The following steps outline the two alternate routes for establishing additionality:

1. Establish a one-for-one tree replacement policy that is strictly adhered to, or,
2. Designate an area on campus as a learning forest and internally commit to planting a minimum of 25 trees and protecting this area for 40 years.
  - a. When designating a 'learning forest' one must also fulfill the requirements as mentioned by the additionality checklist as found in the Urban Forestry Protocol:
    - i. Do you have historical data for the number of trees you have planted in the past 5 years?
    - ii. Are you or your organization bound by law, regulation, statute, or court order to plant trees in the same manner as the UTP Project?
      1. Provide explanation of any relevant required actions.
      2. Attest via signature to the validity of your response.
    - iii. Do implementation barriers, such as budget, staffing, capacity, knowledge gaps, local resistance, or other factors exist to limit your ability to plant trees beyond current business-as-usual levels?
      1. Provide detailed explanation of existing barriers.
      2. Provide written support for the legitimacy of these barriers when possible.
      3. Refer to Procedure for "Determining a Baseline" for guidance in establishing the business-as-usual scenario.
    - iv. Can you demonstrate that the reductions and removals from your offset project are above the business-as-usual scenario?
      1. Provide explanation of the business-as-usual scenario.
      2. Provide proof of a planting program.
    - v. Is your organization willing to sign an agreement that states you will minimize project leakage by maintaining efforts to pursue and obtain baseline tree planting funding?
      1. NOTE: Leakage can also diminish the staff capacity to maintain established trees due to the increase of trees planted. To account for this, it is important to establish a leakage buffer to account for any losses.

Regardless of which path is chosen, monitoring and verification should still occur. DCOI encourages following the guidelines listed below to ensure that the sequestration is correctly calculated and appropriately included in GHG accounting.

- Engage students, faculty, and staff to monitor and measure tree growth over time.
- Calculate carbon sequestered annually.
- Count the carbon sequestered as a carbon sink – as negative emissions under Scope One in GHG accounting.

As mentioned previously, for general aesthetic purposes, many campuses replace trees as part of their BAU scenario. The replacement policy ensures a standard BAU scenario, so that any additional plantings can be counted as carbon sinks. The second option's requirement to create a learning forest and plant a minimum number of trees helps ensure additionality by creating a specific and significant action for the institutions to undertake that contrasts with their BAU campus management plans.

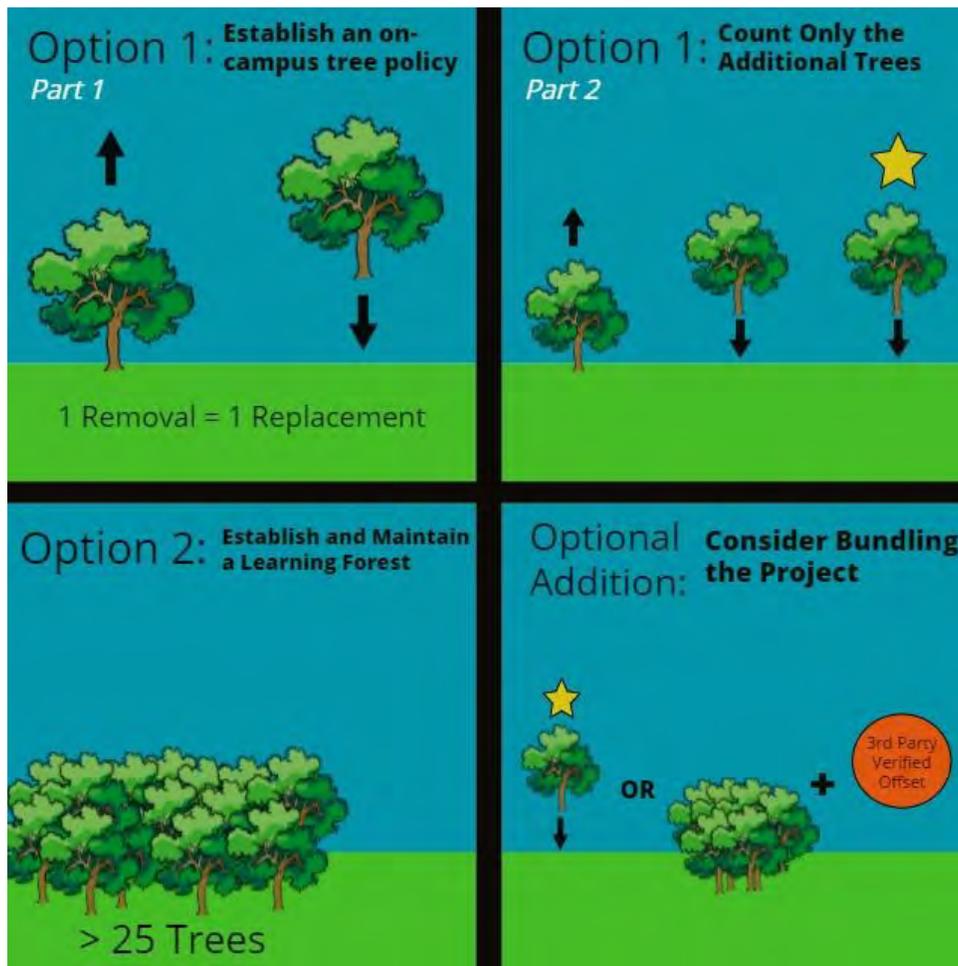
## Meeting PAVER Requirements

In addition to establishing additionality through the steps above, it is also important to ensure that the other PAVER requirements are met. Thus, plantings on campus should follow the same set of rules for PAVER as outlined in the DCOI Urban Forest Protocol. These are summarized below, with references to the DCOI Protocol:

- **Permanent:** Ensure the trees exist in perpetuity, including guaranteed protection through the end of the verification period. Should the project be reversed, appropriate recourse should be followed to ensure that the unintended carbon emissions are paid for or covered by previous buffer pool contributions.
- **Verifiable:** Tree data should be collected every five years and this data should be well managed and verified through peer review. Verification through a 3<sup>rd</sup> party, as described in the protocol, would not apply here as carbon sinks count as negative emissions under Scope 1, not as carbon offsets. Instead, institutions are encouraged to present their tree growth data in a transparent and accessible manner.
- **Enforceable:** Because carbon sinks are not counted as offsets, the approach to meeting the “enforceable” requirement is slightly different than entailed in the DCOI protocol. Plantings are occurring on campus, so the project owner and project operator are the same entity, reducing the likelihood of double-counting. For carbon sinks, it is important that only additional trees are counted as negative emissions, and that these negative emissions are not also being claimed as offsets by the university or by any other entity.
- **Real:** Tree locations, measurement data, and carbon sequestration calculation methodology should be transparent and available to the public.

## Incorporating Offset Bundling

As with other urban tree plantings, the time to maturation and acquisition of emissions reduction is significant, generally ranging from 20-40 years. While there is greater accountability on-campus to ensure the health and longevity of the additional trees, the carbon sequestration will still require time and is a function of the tree's growth. Colleges and Universities can choose to bundle these carbon sinks with 3<sup>rd</sup> party verified offsets, to ensure both emission reductions now and carbon sequestration in the future. Bundling these carbon sinks with 3<sup>rd</sup> party verified offsets allows institutions to mitigate and adapt to climate change and remain climate leaders. Bundling also allows institutions to bypass the PAVER requirements of the on-campus project, as long as the institution only counts the 3<sup>rd</sup> party offset from the bundle towards their GHG accountings. For more information on offset bundling, see the [Carbon Offset Bundling guidance document](#).



## Conclusion

There is an opportunity for colleges and universities to conduct urban tree plantings on-campus and, while strict guidelines must be followed to ensure PAVER requirements are met and the plantings are having a meaningful climate impact, the challenges outlined can be reasonably overcome by following the standards set forth in the preceding paragraphs. "The Compromise for Additionality" is likely the most accessible route for most universities. Institutions are encouraged to consider bundling these on-campus tree plantings, or establish a system like Colgate University if necessary resources are available. Carbon sinks, if created in a thoughtful and calculated manner, can be a valuable addition to mitigating and adapting to climate change, and meeting impending climate neutrality goals.

*For questions, comments, or general  
offset guidance, please contact DCOI at:*

[carbonoffsets@duke.edu](mailto:carbonoffsets@duke.edu)

For more information on the  
Duke Carbon Offsets Initiative, please visit  
[sustainability.duke.edu/offsets](https://sustainability.duke.edu/offsets)