Andrew Bianco, Felix Dalstein, Julia Feikens, John Post, Leda Rosenthal, Josh Winward

ENST 390 Colgate Campus Forest Offset Team
December 2017

‘Peer-Review’ protocol, which would be closely modelled after the ACR IFM protocol. Choosing an ‘Innovative Offset’ or ‘Peer-Review’ protocol could expedite the development process. However, ‘Peer-Review’ protocol limits usable offsets at 30% of total emissions and, therefore, would not allow us to use the total number of offsets generated by the Colgate forest. In practice, these projects would largely entail the same level of monitoring and management, but would not generate an equivalent number of offsets. Furthermore, ‘Peer-Review’ protocol would forego the option to sell extra offsets on the voluntary market.

Beyond Colgate’s current forest management and monitoring practices, pursuing a forest carbon offset project requires a variety of third-party verifications, applications, and other bureaucratic work. Colgate may choose to contract a project developer such as TerraCarbon to expedite the development process (1 to 2 years from proposal to accreditation). Colgate may also choose an in-house development process to avoid extra cost, possibly increasing the development period (3 to 5 years from proposal to accreditation).

While Colgate has several possible project scenarios, one thing is clear: pursuing an on-campus forest carbon offset program would be cheaper than purchasing offsets off of the voluntary market if Colgate chooses the ACR IFM option. Voluntary market offsets can be purchased for ~$6 to $8 per ton, whereas offsets produced by Colgate’s forest project in the ACR IFM scenarios would cost an estimated $3 to $4 per ton. Going through Second Nature, offsets would cost $5.5 to $8 per ton. Over the course of 9 years, Colgate would have to spend between $376,450 and $778,651[2] to purchase the necessary amount of offsets, off the voluntary market to reach neutrality. Conversely, if the university pursued a forest carbon offset project using the ACR IFM approach, it would only spend between $242,036 to $327,156[3] over the same period for the same number of offsets. Consequently, this research concludes that Colgate could greatly benefit from further developing a forest offset project. Even in the case of Second Nature scenarios, where an additional $199,644 to $330,355 would have to be paid on supplementary offsets, the on-campus carbon offset project could be justified.

In short, from a financial standpoint, the offsets generated from Colgate’s Forest will most likely be more cost effective than acquiring offsets off the voluntary market. From a public relations standpoint, the issuance of offsets for a successful program will reflect objective verification of the university’s commitment to environmental stewardship and a sustainable mode of operation—especially with Second Nature. Hence, this analysis advises Colgate to develop an on-campus forest carbon offset project.

[2] See Table 12: Net Present Value of Future Offsets
[3]

, Certified Forester of Northeast Forests LLC at Colgate University

, Director of Sustainability Integration at Middlebury College

, Assistant Professor of Economics at Colgate University

, Assistant Professor of Environmental Studies at Colgate University

, Director of Sustainability at Colgate University

, Managing Director at Terracarbon LLC

, Director at Terracarbon LLC

, Associate Professor of Economics and Environmental Studies; Chair, Department Of Economics at Colgate University

3	Emissions indirectly associated with business operations from source not owned or controlled by the respective company
B	A Carbon offset company which works with institutions to develop projects and secure offsets. Bluesource keeps all offsets developed by said project, gives the institution the first option to buy back their offsets for a discounted price, and sells the rest on the voluntary market splitting the profits with said institution.
C	A leading environmental advisory firm which develops carbon offset projects to help fund forest and wetland conservation.
C C	Formerly the American College & University Presidents' Climate Commitment (ACUPCC); a commitment by institutions of higher education to strive for carbon neutrality and to educate and lead in climate action. Requires Colgate to follow Second Nature's Principles of High Quality Offsets for the use of any carbon offsets
- C (C)	Peer-reviewed

Colgate recognizes the need for carbon offsets to serve as a near term amelioration for unavoidable carbon emissions and cites the utility and necessity of carbon offsets in the *C* *A* (2011) and *B*
C *C*

(3) *C C*
C *, ,*
?

Considering the complexity of the potential protocols, project development can be both costly and time consuming. Colgate's campus forest offset program only makes practical sense when it is cost effective and would ideally be executed before the university's 2019 neutrality goal. Colgate has already generated a sizable inventory and analysis of its campus forests, but third-party organizations may prove crucial for project development, protocol compliance, and general expediency.

(4) *, C (. .*
),
C ?

Assuming the project is possible and appropriate for Colgate, the university has to decide on how it will use its offsets. The most probable case is that the university retains all offsets to achieve neutrality. If the chosen development strategy generates more offsets than necessary for reaching neutrality, the university can sell extra offsets to bring in revenue. Due to the size of our forest, unless the university decreases gross emissions below the current estimate of

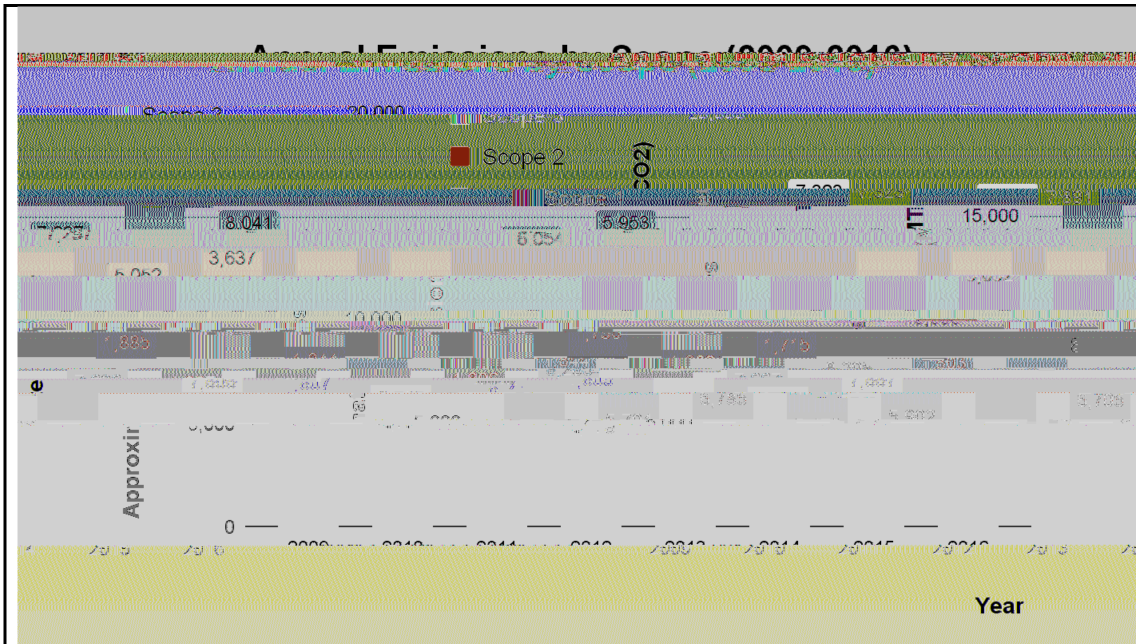

Figure 2: Colgate's annual emission scope is reducing; however, with the increasing rates of recent years, total carbon neutrality from in-house reductions alone is becoming less feasible.

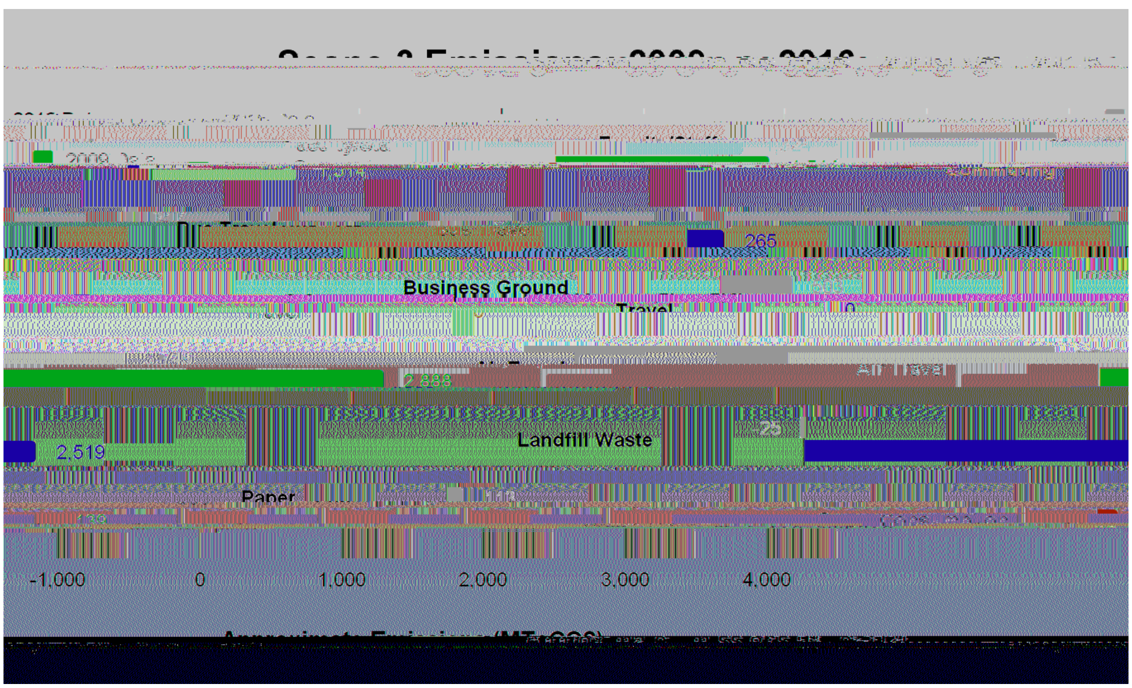

Figure 3: Scope 3 emissions are the hardest to control, due to the overall variability and, in the case of Colgate, increasing rates of travel.

NOTE:
While generally working towards carbon neutrality, there have been instances where Colgate has not followed their guidelines. One example is the remodeling of Stillman: all major new constructions and renovations of buildings should be LEED certified; however, the recent renovation for the Stillman dormitory did not achieve LEED certification. These inconsistencies, while perhaps not major, do impact the overall progress of Colgate’s commitment to sustainability and overall carbon neutral goal.

	( )	( )	( )
(Baseline)	16,815	16,806	9
	14,807	14,807	0
	16,520	16,520	0
	15,333	10,219	5,114
	12,759	4,374	8,385
	13,631	5,263	8,368
	14,562	7,984	6,578
	15,361	8,783	6,578
(Estimate)	13,961[1]	8,961[2]	5,000[3]

improval of the forest stock and health beyond business as usual practices. Timing was incredibly important with respect to this project, after the easement was placed on the land Middlebury only had one year to complete the project and claim the carbon credits otherwise these offsets would not have been seen as additional. After the easement was in place, Middlebury registered their project with Bluesource and hired third party verifiers to quantify the amount of carbon sequestered in the forest. The total amount of carbon that was sequestered by the forest was roughly 25,000 MTeCO2 per year for the first six years. After the initial six years the number of carbon offsets available to Middlebury drops to 7,000 MTeCO2 per year representing the amount of carbon sequestered each year by the forest not the avoided harvesting credits.

Since Middlebury only needed to offset 12,905 MTeCO2 per year to mitigate their total carbon emissions, the rest of the carbon credits were sold through Bluesource to reduce the net cost of the project. Bluesource retains all offsets issued by ACR, and gives Middlebury the option to buy back up to 15,000 offsets per year at $10 per per offset. Bluesource splits the profits from offsets sold, 60% to Middlebury, 40% to Bluesource, effectively giving Middlebury a 40% discount on their own offsets giving them a net cost of $6 per offset. The remaining credits not purchased by Middlebury are sold on the voluntary market for $10 per offset. It is impossible for Middlebury to have an exact figure for how much they stand to profit as they do not know how much carbon they will need to offset in the future. However, conservative estimates show that Middlebury would earn anywhere between $250,000-$400,000 through selling their excess offsets. While these numbers will constantly be in flux due to the uncertainty of Middlebury's exact future carbon offset needs, this projects demonstrates that, by using their own forest, they were effectively able to profit from achieving carbon neutrality.

The potential of using a forest to offset carbon is almost identical to the situation Colgate is currently in, which makes Middlebury a prime case study on which to base Colgate's potential

In order to qualify as an official ACR's Improved Forest Management proje

7.1.5 C C

With the interest in reaching carbon neutrality gaining support among universities, many look towards investing alternative forms of carbon sequestration to offset emissions. Urban Offset's Community Carbon projects (CCP's) focus on implementing tree-planting initiatives in local cities and communities in exchange for verified carbon credits. In an attempt for universities to reach their climate commitments, the Urban Offsets Registry provides a way to positively impact local communities, while simultaneously sequestering enough carbon to offset Scope 3 emissions. Whereas many forest sequestration projects are based internationally and remain disconnected from the everyday workings of the university, the Urban Offsets Registry promotes a tangible and highly visible option to help reach carbon neutrality. By implementing a local forest tree-planting program, it provides research opportunities to both students and faculty. At the same time, it strengthens the relationship between Colgate and the community.

For every tree planted, the CPS provides 10 certified carbon credits from participating in high-quality Climate Action Reserve and Verified Carbon Standard projects. The credits are transferred within 30 days of the purchase and count towards offsetting scope 3 emissions. The trees planted in Community Carbon projects require lifetime care and maintenance which provides the opportunity to continue supporting the program each year to receive the same benefits as well as additional credits. Community Carbon projects can be supported and funded by anyone, making them highly accessible and versatile.

Community Carbon projects organized by Urban Offsets require Planting Partners to provide on-the-ground planting and maintenance for the program. Planting Partners are classified as municipalities and nonprofits, whose urban foresters, arborists, master gardeners, and experts who agree to follow industry best care practices for existing tree inventories. The planting season usually runs from October through April, providing volunteer and educational opportunities for students, faculty, and community members. Planting Partners are responsible for maintaining the health of the trees for the full project term, which is typically 40 years. The goal is to keep at least 85% of the trees alive for the full term, while replacing those that die.

A tree inventory is complete 30 days after planting by approved arborists and foresters using software designed by Urban Offsets. The inveTve

(AC)		
	Non-marketable; but goal to be same quality	Non-marketable

&

((

be accounted for. After our final calculations, we will either find that the project proves profitable or unprofitable. If the project proves unprofitable, for instance, then ecological and campus promotion value must provide monetary benefits that are at least as high as the project is net negative. In short, if the project's costs outweigh the benefits by $15,000, for example, then the monetary value of ecological and campus promotion value would have to be at least $15,000 to justify the development of the project. On the other hand, if the benefits exceed the costs, ecological and campus image value will simply stand as an additional argument in favor of an on-campus carbon offset project.

Money today and money tomorrow are not equivalent in value; that is, receiving a dollar today is more desirable than receiving a dollar tomorrow, or a year from now. When comparing costs and benefits of a proposed project over an extended period, the time component of money must be accounted for. Such an extension of prior analysis allows for comparison of both the magnitude and timing of the potential costs and benefits.[xliv] Discounting, thus, permits us to analyze the benefits in current dollar values [xlv]regardless of when they occur; considering that a on the time dependant variables. For all discounting calculations, it was assumed that costs in the first year would occur in the beginning of the year such that the discounting factor would not apply in year 1. Hence, discounting would, technically, commence in year 2.

A :

This type of cost only applies in the Second Nature scenarios (E and F) as ACR IFM protocol would allow the university to use all of the offsets generated by the forest. In the former case,

5

.

offset project were developed. Using the ACR IFM protocol, we could sell these offsets for $6 to $8 on the voluntary market, generating revenue of $6,000 to $8,000. Such revenue would immediately counter costs required to verify this project ($6,516 to $7,356). If Colgate were to choose a peer-reviewed protocol, selling leftover offsets would not be possible.

The highest estimated costs of the ACR IFM project scenario came out to $327,156. Even with this generous prediction, the project's benefits would still outweigh its costs (by $59,294), as total benefits are predicted to be at least $386,450. Hence, the ACR IFM project would prove to be unprofitable from a strictly economic standpoint only if total costs would end up exceeding a value of $386,450. This is because it could be possible to buy offsets from the voluntary market for $6. Using a 7% discount rate over 9 years, purchasing such offsets would cost $376,450. Such a scenario would be cheaper than implementing an on-campus carbon offset project if the costs of such an undertaking would somehow accumulate to ~$400,000, which is unlikely. On the other hand, a baseline scenario may be cheaper in comparison to a peer-reviewed project such as Scenarios E and F. This is because either of those scenarios may cost up to $656,671, which is more expensive than 13 out of the 16 baseline scenarios. However, if Scenarios E and F would only end up costing $441,689, the lowest amount we calculated for the total costs of Scenarios E and F, only 3 baseline scenarios would turn out to be cheaper.

Ultimately, by choosing the ACR IFM protocol, savings in comparison to the baseline scenarios would fall in the range of $49,294 and $380,884. These savings are calculated by subtracting the costs of the cheapest baseline scenario from the costs of most expensive ACR IFM scenario ($376,450.1 - $327,156), and the most expensive voluntary market baseline minus cheapest ACR IFM scenario ($622,920.8 - $242,036). For a peer-reviewed project, such savings would be negative, in the range of -$36,450 and -$66,870; suggesting that baseline scenarios are cheaper than peer-reviewed projects. To arrive at these numbers, one subtracts the costs of generating 4,188 campus forests offsets from the costs of purchasing the same amount of offsets off of the voluntary market (for example, $175,175 - $242,045 = -$66,870).

It is important to emphasize the additional benefits obtained through an on-campus offset project. As ex

Colgate University’s bicentennial goal of reaching carbon neutrality by 2019 is a powerful testament to it’s commitment of environmental stewardship and ensuring its students are progressive thinkers and future leaders. While its carbon footprint has been reduced from multiple projects, such as its Green Bikes Program, the university’s rising GHG trajectory, due to its increase in construction and scope 3 emissions, signify that this goal cannot be met with projects alone. Therefore, carbon offsets that reduce, sequester, or mitigate Greenhouse Gas (GHG) emissions elsewhere, are necessary for Colgate to achieve carbon neutrality. The university is currently sequestering ~1,500 MTeCO2 through its own forest, and is involved in the Patagonia Project in Chile which provides Colgate with 5,000 carbon credits annually until 2027. Colgate’s forest is a strong candidate for additional carbon offsets, and could be the solution for achieving the university’s goal. Other on-campus offset projects from Middlebury University, among other institutions, proves that this project is theoretically possible, and cost calculations in this report signify that the forest offset project has the potential to be profitable, both in reimbursing its overall cost, potentially generating future revenue for the university.

(1) C

American Carbon Registry. (2016). [redacted]

Pirikiya, M., Amirnejad, H., Oladi, J. & Ataie Solout, K. (2016). Determining the recreational value of forest park by travel cost method and defining its effective factors. , 62: 399-406. doi:10.17221/12/2016-JFS
Pumilio, J. (2017). “The Bicentennial Plan: ENST 390”. *C* *C* *A*
Rivera, J., & de Leon, P. (2004). Is greener whiter? voluntary environmental performance of western ski areas. *, 32*(3), 417-437. Retrieved from https://search.proquest.com/docview/210560800?accountid=10207
Second Nature. (2017). Carbon Management

Forestlands,” by J. Bushnell, 2016

[lviii] From “Uganda Carbon Offset Program,” by Offset Network, . Retrived from http://offsetnetwork.org/uganda-carbon-offset-program/. Copyright by Copyright holder.

[lix] From “How to Maintain Biodiversity in the Forest's Ecosystems by K. Norborg Carter, 2017, . Retrived from https://sciencing.com/maintain-biodiversity-forests-ecosystems-13436.html. Copyright 2017 by Copyright holder.

[lx] From “Uganda Carbon Offset Program,” by Offset Network, . Retrived from http://offsetnetwork.org/uganda-carbon-offset-program/. Copyright by Copyright holder.

[lxi] From “The Most Beautiful College Campuses In 20sJsPLFJhxJuLuFPkDI&06JuxxJuxx6&hm 6’xxx?I”xFsJx