1. "Is this a project that you will work on alone, or will you collaborate with others? If you are collaborating with others, list their names, their Tufts affiliation, and their contact emails. Please indicate which member of your team will be the principle contact"

The Tufts Student Garden will be the main group handling this project, with some collaboration from the TPI on plant species and potentially help with the installation of the garden, and the help from Professor Desmarais outlined in the next few questions.

Principle Contact: Alicia Bellido, Alicia.Bellido@tufts.edu, school of Arts and Sciences, President of the Tufts Student Garden

Secondary Contact: Bayley Koopman, Bayley.Koopman@tufts.edu, undergraduate students school of Arts and Sciences

Collaborator: Nick Dorian, graduate student, Nicholas.dorian@tufts.edu, Tufts Pollinator Initiative

Faculty Collaborator: Anne Marie Desmarais, Department of Civil and Environmental Engineering, AnneMarie.Desmarais@tufts.edu

2. What is the problem we're looking to solve:

Green roofs provide a plethora of wide-ranging benefits and solutions to environmental problems. In terms of environmental benefits, green roofs improve stormwater management, especially in heavily built spaces, because vegetation retains rainwater. Vegetation also absorbs less solar radiation than dark, impervious surfaces which, in turn, mitigates the urban heat island effect. In addition, vegetation improves building insulation and, subsequently, energy efficiency which reduces heating and cooling demands and energy costs. Urban spaces typically lack sufficient vegetation to support biodiversity, so the rooftop garden will create habitats for essential biodiversity, namely pollinators, to better sustain the urban ecosystem. In terms of human health benefits, the rooftop garden may be used for urban agriculture opportunities to reduce food insecurity and provide local, fresh food. Natural plant processes also enhance the surrounding air quality. Additionally, vegetation absorbs noise which, in turn, mitigates stress and irritability.[1] Lastly, green amenity spaces have been suggested to reduce stress and boost mental health.[2] In terms of other benefits, the rooftop garden may be used for research and other educational opportunities for students and faculty. A garden visible from Tisch roof beautifies the surrounding area and may also attract prospective students.

(1) General Services Administration. (2011). The benefits and challenges of green roofs on public and commercial buildings. United States General Services Administration. Retrieved from https://www.gsa.gov/cdnstatic/The_Benefits_and_Challenges_of_Green_Roofs_on_Public_and_Commercial_Buildings.pdf

(2) Maas, J., Verheij, R. A., Groenewegen, P. P., de Vries, S., & Spreeuwenberg, P. (2006). Green space, urbanity, and health: How strong is the relation? Journal of Epidemiology and Community Health, 60(7), 587–592. https://doi.org/10.1136/jech.2005.043125

3. Who would maintain the green roof?

Members of the Tufts Student Garden and potentially Tufts Pollinator Initiative

4. Who would maintain the garden over school breaks?

As the garden will contain native pollinators, it will require very little maintenance as the plants will be self-sustaining with only 2-3 days of maintenance required in the Spring and Fall. If a problem occurs/maintenance is deemed to be necessary during the summer, we have a consistent group of members of the student garden every year who volunteer to help maintain our garden in the summer who could go up to provide maintenance with our faculty collaborator (who has also stated she is here fairly often over the summer)

5. What is the phase out plan for the Green Roof? (What would happen once the funding expires?)

We expect the garden to continue to be maintained by future generations of the Tufts Student Garden. As previously stated, the garden is mostly self-sustaining with rainwater. The only maintenance required would be weeding, occasional fertilization, cutting down dead material in the Fall, and occasional replantings. All of these tasks can be completed with either the existing tools in the Student Garden Inventory, or are well within our TCU provided budget of acquiring and using. The funding we need from he Green Fund is mostly for installation/initial purchase costs.

6. We would like to see a letter of support from EHS. Specifically, we would like some reassurances that it could hold the weight of the garden, students, irrigation.

I have had many meetings with Greg Mellett from Facilities, Peter Nowak from EHS, and Mark Keith with Tufts Police. We have all come to the conclusion that the roof can safely support our proposed garden's weight in the proposed area, and that with a layer of water-proof rubber underneath the beds, the roof should be perfectly water-proof from any leakage. The garden will mostly be watered by rain, though if additional water is needed, there is an existing hose in the area. Their letters of support are attached to this email (the letter from facilities will be coming along shortly).

7. We would also like to ensure the safety of anyone going on the roof. If there are HVAC systems/equipment located on the roof, distance from the equipment needs to be considered as well as any work planned for that equipment.

Included in the letters of support are the terms of their support, outlining our plan for safe access to the roof. The roof was surveyed and we all agreed that no student would be allowed on the roof without supervision from our faculty collaborator, Professor Desmarais (her letter of support is also attached), and that no student could go within 15 feet of any sides of the roof. Everyone at facilities and EHS said that the area we plan on having our garden in is not a concern for the HVAC systems or anything like that. The garden we are ordering are the exact same modules used on the previous roof garden, and can be picked up and moved in case any maintenance is needed.

1. The Tufts Student Garden's Green Fund proposal hope to fund the construction of a new rooftop garden on top of the Tisch Library roof. This would be materialized a green roof of 6" tall beds with small herbs, pollinators and ground plants that cover a 20' x 20' area of the roof in the shape of an elephant. We would potentially use the gardens to grow herbs for the community, education purposes that can be carried out from the public Tisch roof space, and potentially partner with the academic departments on studies or projects related to the garden. In any case, it will definitely serve as a means of helping native pollinator populations, reducing stormwater runoff, and absorbing solar radiation. Green roofs provide a plethora of wide-ranging benefits. In terms of environmental benefits, green roofs improve stormwater management, especially in heavily built spaces, because vegetation retains rainwater. Vegetation also absorbs less solar radiation than dark, impervious surfaces which, in turn, mitigates the urban heat island effect. In addition, vegetation improves building insulation and, subsequently, energy efficiency which reduces heating and cooling demands and energy costs. Urban spaces typically lack sufficient vegetation to support biodiversity, so the rooftop garden will create habitats for essential biodiversity, namely pollinators, to better sustain the urban ecosystem. In terms of human health benefits, the rooftop garden may be used for urban agriculture opportunities to reduce food insecurity and provide local, fresh food. Natural plant processes also enhance the surrounding air quality. Additionally, vegetation absorbs noise which, in turn, mitigates stress and irritability.[1] Lastly, green amenity spaces have been suggested to reduce stress and boost mental health.[2] In terms of other benefits, the rooftop garden may be used for research and other educational opportunities for students and faculty. A garden visible from Tisch roof beautifies the surrounding area and may also attract prospective students.

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Community Health, 60(7), 587–592. https://doi.org/10.1136/jech.2005.043125

2. Described in previous question

3. Yes, as a graduate student's research, but not as a Green Fund proposal

- It will differ in that the plant species will be native pollinators and herbs, larger than the previous garden, and in a different shape. Other than that the projects will be almost identical

4. Success will be measured by the survival of the plants over the summer, and their continuance through the years.

5. Everyone on campus can potentially be impacted by our garden. As it will be within view of anyone who goes onto Tisch Roof, it will impact students, faculty, staff, and prospective students and their families all alike by the beautification and additional green space it provides. It sends a message to everyone of Tufts' commitment to sustainability and caring for the environment (especially native pollinators), and can attract prospective students in this way. Currently, the rooftop garden on Tisch is quite minimal, and I (although I admittedly had more environmental knowledge coming in) recall thinking that it was rather measly for the vast amount of space Tisch Roof could provide for more gardens. Having our additional garden would show that Tufts' commitment to conservation and sustainability isn't merely surface level or one-off, but ongoing. It can improve the mentality students have about Tufts as a whole as well, and (with permission, of course) could provide research opportunities for future students and faculty.

6. The environmental impact of this garden will primarily be that additional food sources and shelter will be provided to native and non-native pollinators such as bees, butterflies, birds, ladybugs, and more. Populations of pollinators in cities and around the world have been declining at alarming rates in recent years, and we at the garden club are hoping to do our part in providing hospitable areas for pollinators wherever we can. This is especially important in cities because of the lack of vegetation, especially the lack of native vegetation on which so many native bee species rely.

7. The social impacts of our garden would mainly be mental improvement of the members of the Tufts community. To a lesser extent, our garden will also improve relations between Tufts Facilities and the students that work on the garden as well. It is well proven that increased green spaces in urban environments improve the mental health, physical health. From The World Health Organization's website: "Green spaces also are important to mental health. Having access to green spaces can reduce health inequalities, improve well-being, and aid in treatment of mental illness." And from NASA's website "Green space most strongly protects against mood disorders, depression, neurotic behavior, and stress-related issues, the study found, signaling that psychological restoration may be the strongest protective mechanism that green space offers".

https://earthobservatory.nasa.gov/images/145305/green-space-is-good-for-mental-health
https://www.who.int/sustainable-development/cities/health-risks/urban-green-space/en/

8. Educational impacts will mainly be two. The first will be through a sign we could put up on the current part of Tisch Roof accessible to the public providing information on the garden, the

benefits of native species and pollinators, and the benefits of green roofs in general, which would be viewed by anyone and everyone who views it. The second potential educational benefit would be that students and faculty could work with EHS to do research on our garden/the pollinators that come to it if they'd like to. We even were approached by a group of students earlier this year interested in doing their final project on temperature differences between the rooftop garden and other areas of the roof.

9. Our project, though not very large, could contribute to the campus' emissions reductions goals via the plants' absorption of CO2, and could contribute a bit to the energy reduction consumption goal, as green roofs have been proved to enhance heat retention in winters and absorb heat in the summers, thus reducing the energy usage of Tisch library by a small amount.

10. The up front cost of the installations of the beds would be roughly $900-$1000. As stated on the company we will be ordering from's website, the beds are meant to last for around 20 years. The only future cost I predict would be the replacement of the units (though I would imagine that to be a secondary application to the Green Fund or supplementary funds requested from TCU) because of the management plan previously outlined in my other email.

11. We attempted several times to create a Gannt chart of our timeline, but the program we were using kept coming up with errors. We have this Excel timeline, I hope it is sufficient and sorry if this creates any inconveniences.

12. Yes. Our plan to sustain the project in the future is mostly around the Tufts Student Garden. It would be the responsibility of the students in charge of the club to maintain the garden in the future with the resources the club received from its existing inventory or TCU funded budget. The only maintenance the garden will need is fertilization every year or so, weeding, and replanting. Professor Desmarais will be the continued faculty partner and will be able to help newer members with any issues. We feel that this is feasible because of rising interest in the Tufts Student Garden, and consistent attendance at our events. This year alone, we had 196 new member signups, with around 35 people at our first three events. Since then, we have consistently had between 7-15 students per work event, as students seem to very much like doing garden work as a stress reliever. For this project alone, I have 25 current active students working on it with me from all different grades.

13. No, it is not an event.

14. We are not requesting additional funding from any other sources.
- Module costs: $425
- Installation cost: $230
- Shipping estimate: $100
- Soil costs: $100
- Waterproof tarp cost: $131
- Unforeseen costs: $24
- Total: $1000

Here is the company we will be ordering from: http://greenroofblocks.com/

15. The Tufts Student Garden will be the main group handling this project, with some collaboration from the TPI on plant species and potentially help with the installation of the garden, and the help from Professor Desmarais in gaining access to the roof and while being supervised on the roof.

Principle Contact: Alicia Bellido, Alicia.Bellido@tufts.edu, school of Arts and Sciences, President of the Tufts Student Garden

Secondary Contact: Bayley Koopman, Bayley.Koopman@tufts.edu, undergraduate students school of Arts and Sciences

Collaborator: Nick Dorian, graduate student, Nicholas.dorian@tufts.edu, Tufts Pollinator Initiative

Faculty Collaborator: Anne Marie Desmarais, Department of Civil and Environmental Engineering, AnneMarie.Desmarais@tufts.edu

16. We are expecting letters of support from the Facilities Department and the Tufts Pollinator Initiative soon, and I can send those along when we get them.

17. IMPORTANT INFO:

We have consulted with Steven Markis in Facilities and he has concluded that the roof, based on previous plans he found, will be able to support our garden's weight, as the area we are looking at was originally built to hold a concrete planter. The plans he found are included at the bottom, along with his comments answering questions I had. The picture included at the bottom also shows our idea for what the roof garden would look like (the elephant), though it would be placed directly next to the current TUFTS garden