# CAMPUS RAINWORKS CHALLENGE

A Green Infrastructure Design Challenge for Colleges and Universities

Office of Water
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EPA

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Cover Images: Excerpts from University of Pennsylvania's and University of Texas at Austin's entries in the 2020 Campus RainWorks Challenge.

# INTRODUCTION

The U.S. Environmental Protection Agency's (EPA) Office of Water is pleased to announce the tenth annual Campus RainWorks Challenge (hereafter referred to as "the Challenge"), a design competition that is open to colleges and universities in the United States and its territories. Through the Challenge, EPA engages with undergraduate and graduate students to foster responsible stormwater management and showcase the environmental, economic, and social benefits of green infrastructure practices.

Stormwater runoff is a major source of water pollution in urban communities across the United States. Traditionally, stormwater is drained through engineered collection systems, or "gray infrastructure," and discharged into nearby waterbodies. As stormwater moves through the landscape, it transports trash, bacteria, heavy metals, and other pollutants from the urban environment—contaminants that degrade water quality and threaten public health. Stormwater also causes erosion and flooding, damaging habitat, property, and infrastructure. Green infrastructure offers flexible solutions for managing stormwater runoff.

The term "green infrastructure" refers to a variety of practices that restore or mimic natural hydrological processes. While "gray" stormwater infrastructure moves stormwater away from the built environment, green infrastructure uses soils, vegetation, and other media to manage rainwater

Runoff contaminated with oil and other debris is washed down a storm drain, where it will feed into local waterbodies.

A "green street" uses practices such as porous pavement and bioretention to capture, infiltrate, and evapotranspire stormwater, preventing contaminated runoff from reaching local waterbodies.

where it falls—through capture and evapotranspiration. By integrating natural processes into the built environment, green infrastructure provides a wide variety of community benefits, including improving water and air quality, reducing urban heat island effects, creating habitat for pollinators and other wildlife, and providing aesthetic and recreational value. Green infrastructure solutions can also be cheaper to install and maintain than traditional gray infrastructure.

Water pollution associated with stormwater runoff is a growing problem in communities across the country. Communities need planners, designers, engineers, and other professionals to create dynamic, resilient,

and affordable solutions for stormwater management. EPA's Campus RainWorks Challenge invites students to apply their creativity, knowledge, and energy to solve these challenges. Together, regulators, communities, and the next generation of environmental professionals can solve the challenges of stormwater management and protect public health and the environment for all Americans.

As with previous years, EPA will:

- Work with students to assess the multiple environmental, economic, and social benefits of green infrastructure solutions over a range of spatial scales and geographic contexts across the country.
- Provide a hands-on, interdisciplinary learning experience for students to gain real-world skills that can be applied to future careers.
- Facilitate stakeholder engagement across college campuses and their surrounding communities to promote green infrastructure practices and forge meaningful connections between students and practitioners.

## CALENDAR

Registration:
September 1 - October 1, 2021

Entries Due:
December 10, 2021

Winners Announced:
Spring 2022

## AWARDS

EPA will award a total of $30,000 to first and second place winners in the demonstration project and master plan categories (see submission categories). Winning teams will earn a student prize to be divided evenly among student team members and a faculty prize to support green infrastructure research and/or training. Prizes will be distributed as follows:

| | Student Prize | Faculty Prize |
|---|---|---|
| **1st Prize Demonstration Project** | $7,000 | $3,000 |
| **1st Prize Master Plan** | $7,000 | $3,000 |
| **2nd Prize Demonstration Project** | $3,500 | $1,500 |
| **2nd Prize Master Plan** | $3,500 | $1,500 |

Winners will be notified in Spring 2022 via email. After notifying the winners, EPA will announce the winning teams publicly and will post the winning entries on EPA's green infrastructure website at: https://www.epa.gov/greeninfrastructure.

## ELIGIBILITY

To compete in the Challenge, student teams must meet all the following eligibility requirements:

### Participating Institutions

Student teams must be affiliated with an academic institution that meets one of the following descriptions:

1. A public nonprofit institution/organization (limited to degree-granting public institutions of higher education[1]) located in the U.S., Federally Recognized Indian Tribal Governments, and U.S. territories or possessions.
2. A private nonprofit institution/organization (limited to degree-granting private institutions of higher education[2]) located in the U.S., Federally Recognized Indian Tribal Governments, and U.S. territories or possessions.

Student teams affiliated with a community or technical college that meet one of the descriptions above are also eligible.

EPA particularly encourages Minority Academic Institutions (MAIs) to apply. For purposes of this Challenge, the following are considered MAIs:

1. Historically Black Colleges and Universities, as defined by the Higher Education Act (20 U.S.C. Sec. 1061). A list of these schools can be found at: https://sites.ed.gov/whhbcu/one-hundred-and-five-historically-black-colleges-and-universities/
2. Tribal Colleges and Universities, as defined by the Higher Education Act (20 U.S.C.

[1] See 20 USC 1001 for a definition of "institution of higher education"

[2] ibid

Sec. 1059(c)). A list of these schools can be found at: https://sites.ed.gov/whiaiane/tribes-tcus/tribal-colleges-and-universities/

3. Hispanic-Serving Institutions (HSIs), as defined by the Higher Education Act (20 U.S.C. Sec. 1101a(a)(5). HSIs are institutions of higher education that, at the time of application submittal, have an enrollment of undergraduate full-time equivalent students that is at least 25 percent Hispanic students at the end of the award year immediately preceding the date of application for this Challenge. A list of these schools can be found at: https://www2.ed.gov/programs/aanapi/index.html
4. Asian American and Native American Pacific Islander-Serving Institutions (AANAPISIs), as defined by the Higher Education Act (20 U.S.C. Sec. 1059g(a)(2)). AANAPISIs are institutions of higher education that, at the time of application submittal, have an enrollment of undergraduate students that is not less than 10 percent students who are Asian American or Native American Pacific Islander. A list of these schools can be found at: https://www2.ed.gov/programs/aanapi/index.html

## Participating Students

At the time the team registers, all team members must be enrolled at an eligible institution of higher education. Participating team members may be enrolled in a degree program or taking classes part time.

## Participating Teams

Each student team must be sponsored by a faculty advisor. The faculty advisor must be a professor at the participating academic institution. Current graduate students and staff that are not considered faculty are not eligible to act as faculty advisor.

Team composition and size are at the discretion of the team submitting an entry. However, interdisciplinary teams are strongly encouraged given the relevance of green infrastructure to multiple disciplines. Relevant disciplines include, but are not limited to landscape architecture, architecture, planning, engineering, conservation biology, landscape ecology, hydrology, soil science, economics, public administration, business administration, and communications.

Students from more than one academic institution may participate on the same team if all the following criteria are met:

1. All participating institutions are eligible per the Participating Institutions section above.
2. All participating students are eligible per the Participating Students section above.

3. The project submitted is designed for one of the institutions represented by the team.
4. The faculty advisor is associated with the same institution as the submission design.

## REGISTRATION

To compete in the Challenge, teams must first complete and submit an online registration form during the registration period: https://www.epa.gov/green-infrastructure/campus-rainworks-challenge-0

The intent of the registration form is to allow EPA to confirm the eligibility of each team. Once a team submits the registration form to RainWorks@epa.gov it will receive a registration number via email. EPA processes Campus RainWorks registrants in bi-weekly batches. Registration numbers are typically sent out on Mondays and Wednesdays during the registration period. Registration opens September 1 and closes October 1, 2021.

## SUBMISSION CATEGORIES

EPA is accepting submissions in two design categories:

- **Demonstration Project**
- **Master Plan**

Individual teams may submit entries for both categories but must submit a different design for each. Work from one team's submission cannot be reused in another team's submission. Additionally, submissions from prior years cannot be resubmitted.

After registering for the Challenge, teams may switch categories at any time up until the submission due date of December 10, 2021. Requests to switch categories should include the current registration number and should be sent to RainWorks@epa.gov.

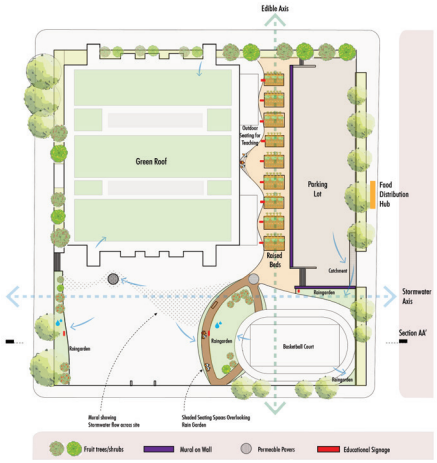
### Demonstration Project Category

For submissions in the demonstration project category, EPA seeks proof-of-concept level designs that examine how green infrastructure could be integrated into a **specific site** on the team's campus. If desired, demonstration projects can also be located at a nearby elementary, middle, or high school. If teams elect to pursue this alternative option, the selected site must be located within the same community as the academic institution, or in a community that is directly adjacent (sharing a border).

Demonstration project entries must include individual or grouped (e.g., a treatment train)

green infrastructure practices that manage stormwater within smaller drainage areas. The design must cover an area no larger than 15 acres, and the design area should be documented in the project narrative. Designs should be realistic: a) can be built within a reasonable, near-term time frame, and b) offer one or more local stormwater management solutions that provide multiple environmental, economic, and social benefits. Entries must include information on the green infrastructure design and performance and should reflect consultation with the facilities planning department to assess project feasibility. Where applicable, the appropriate local or state design standards should be referenced.


Source: Florida International University's second place entry in the 2020 Campus RainWorks Challenge.




Source: University of Pennsylvania's first place entry in the 2020 Campus RainWorks Challenge.

EPA encourages all demonstration project teams to consult with local green infrastructure practitioners in developing their design. Consulting with community and regional experts will bolster stakeholder engagement and may result in replicable designs that offer solutions to local and regional concerns.

## Master Plan Category

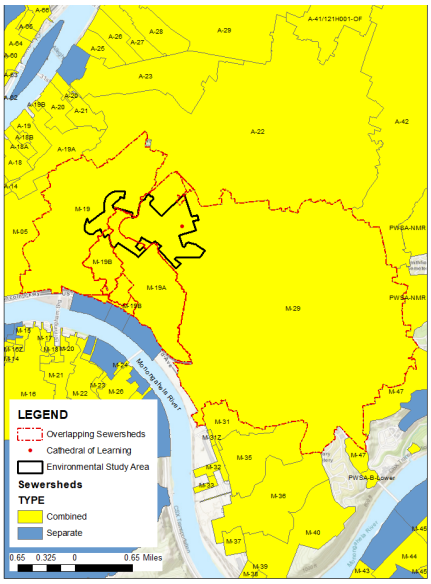
For submissions in the master plan category, EPA seeks conceptual designs that examine how green infrastructure could be integrated into a broad area of the team's campus. Master planning is a discipline that connects buildings with their surrounding environments through analysis of and recommendations for community facilities, land use, and more. A master plan is a long-term planning document that guides future growth and development. Master plans are based on public input, surveys, planning initiatives, existing and future development, physical characteristics, and social and economic conditions.

Master plan entries should provide a cohesive vision for how green infrastructure could be further integrated into a campus, providing long-term environmental, economic, and social benefits. Entries should also explain how green infrastructure will be implemented in the near-, mid-, and long-term. Implementation strategies should be flexible and adaptable over time as needed. Entries should align with existing campus master plans; these

documents help identify real-world assumptions that should be addressed (e.g., student population growth or impervious surface increase over time).

Master plan designs must cover an area of at least 15 acres within the campus footprint. The design area should be documented within the project narrative. If the participating school's campus is under 15 acres, the team's entry must cover the entire campus. Entries from schools with larger campuses can cover an area ranging from 15 acres to the entire campus. The area requirement for the master planning category is meant to convey a sense of scope. The selected area should be meaningful in terms of size and/or impact on campus. Connectivity should play a role in defining the scope of the design. Large drainage basins or circulation routes may help the team determine where green infrastructure should be located. Successful entries in this category will also demonstrate long-term vision and commitment. Where applicable, the appropriate local or state design standards should be referenced.

All master plan teams are encouraged to consult with local green infrastructure practitioners in developing their design. Consulting with community and regional experts will bolster stakeholder engagement and may result in replicable designs that offer solutions to local and regional concerns.




Source: University of Pittsburgh's second place entry in the 2020 Campus RainWorks Challenge.


Source: University of Texas at Arlington's first place entry in the 2020 Campus RainWorks Challenge.

## SUBMISSION REQUIREMENTS

To compete in the Challenge, registered teams must submit the following, which describe an innovative green infrastructure project for a location on their campus:

- **One (1) Project Narrative**
- **One (1) Design Board**
- **One (1) Video Pitch**
- **One (1) Signed Letter of Support**

Incomplete entries will be disqualified. Submissions should provide detailed information of sufficient quality to enable the judges to evaluate the design based on the challenge's judging criteria. A description of the Challenge judging criteria begins on page 12 of this document. Submissions should describe overall project goals, how the project fits within the context of the campus or watershed, existing conditions along with the problem to be solved, proposed green infrastructure approaches, and expected outcomes.

## Project Narrative

The intent of the project narrative is to provide a summary of each team's approach to meeting the challenge criteria (see Judging section).

- Each team must prepare a project narrative not to exceed eighteen (18) 8.5" x 11" pages (including a cover page, images, graphics, tables, calculations, and references). **Any additional pages that exceed the 18-page limit will not be reviewed**. Pages should be consecutively numbered with 1" margins, and text should be single-spaced in standard 12-point font. Headings may be larger than 12-point font; text labels for graphics or images may be smaller than 12-point font; page numbers may be outside of the 1" margin.
- The project narrative must include a cover page. The cover page must display the team's registration number, project title, names and academic majors of team members, and the name and academic department of the team's faculty advisor.
- The project narrative must include a project abstract of no more than 250 words.
- Teams must provide an electronic copy of the project narrative in Adobe Acrobat® PDF format. Instructions on submitting deliverables are provided below. Alternative formats will not be accepted.

## Design Board

The design board should:

- Provide a visual understanding of the site context, design elements, and design performance.
- Focus on visual elements and limit the amount of text. The design board should supplement, not duplicate, graphics within the project narrative.
- Include the team's registration number (see Registration section) in the upper right-hand corner and be 24" x 36".
- Include a site plan. Additional elements might include cross sections, conceptual

drawings, or graphics representing anticipated benefits.

- Be provided in an electronic copy in Adobe Acrobat® PDF format. Submission instructions are provided below. Alternative formats will not be accepted.

## Video Pitch

- Each team must prepare a video pitch about the project not to exceed 3 minutes. Videos longer than 3 minutes will not be viewed.
- Teams should develop a video pitch that is persuasive in illustrating the potential environmental, economic, and social benefits of the project.
- The video pitch could include but is not limited to: a tour of the potential site; discussion of design components; interviews with team members, faculty, or practitioners; or financing options. Content and style are at the discretion of the student team. Creativity and enthusiasm are encouraged and appreciated. Show us what sets your entry apart from the rest.
- Video pitches must be created from original content. Using copyrighted footage without attribution of the original source will result in disqualification. You represent and warrant that the work submitted is your own original work and that it does not infringe upon the intellectual property rights of any other person.
- Teams must upload their video pitch to YouTube or a similar video-sharing website and provide a link with their submission (see submission instructions). Videos should be set as "unlisted" or "private" so that entries cannot be detected by search engines prior to the submission deadline. Once the submission deadline has passed, it's crucial that teams set their videos to "public" so judges can access them during their review period. Instructions on how to upload a video on YouTube and how to change a video's privacy settings on YouTube are available online. The inability to review a video will result in disqualification.

## Letter of Support

- The letter of support demonstrates that the team has consulted with the college or university's facilities planning department to develop a feasible design. **The letter of support cannot be written by the team's faculty advisor**. Each team must submit a letter from a member of the college or university's facilities planning department demonstrating support for the proposed design. If a demonstration project design is located off-site at a nearby school within the community, the letter of support must come from facilities staff at the selected school, school district, or

municipal planning department.

- The letter does not count against the 18-page limit of the project narrative. Letters of support are not to exceed two 8.5" x 11" pages. Pages that exceed the limit will not be reviewed.
- The letter must be on appropriate letterhead. Additionally, the letter must be signed by a member of the facilities planning department and include the registration number and project title.
- The letter must be provided in Adobe Acrobat® PDF format. Instructions on submitting project files are provided below. Alternative formats will not be accepted.

## SUBMISSION INSTRUCTIONS

EPA will collect submissions to the Challenge via email. Participating teams must email their submissions to RainWorks@epa.gov by December 10, 2021 by 11:59 PM EST.

Email submissions must include the registration number (###) in the email subject and in attached file names. Email submissions must include the following components:

1. Project Narrative (saved as "###-Project Narrative.pdf")
2. Design Board (saved as "###-Design Board.pdf")
3. Video Pitch (video URL)
4. Signed Letter of Support (saved as "###-Letter.pdf")

## JUDGING

Two rounds of reviewers that include EPA staff, industry professionals, and/or academics from noncompeting colleges or universities will judge qualifying submissions. First round judges will score submissions on a scale of 0 to 100 using the criteria identified below. Based on the average of all scores for each submission, the top submissions will be recommended to a Final Panel of judges. The Final Panel will then rank the top submissions based on the criteria identified below and recommend finalists in each category to a lead judge in EPA's Office of Water. The lead judge will assess the recommendations using the criteria below and select the first and second place winners in each category.

### Judging Criteria

The criteria listed below apply to both competition categories, except for specific criteria that are highlighted **green**. Please note that these **green** criteria are unique to the master

plan category and are not considered for demonstration project entries.

Points will be awarded across five criteria:

- Performance (30)
- Design (30)
- Implementation (15)
- Communication (15)
- Resilience (10)

| PERFORMANCE (30) | |
|---|---|
| Does the design effectively use green infrastructure practices to capture and treat stormwater runoff on site (e.g., through infiltration, evapotranspiration, or harvest and reuse) and improve local water quality? | ☐ |
| Is the predicted performance quantified and supported by modeling and calculations? Calculations should include the design storm managed and/or the annual reduction in runoff volume. | ☐ |
| Are additional benefits (water/energy conservation, flood management, heat island reduction…) identified and in any way quantified? | ☐ |
| Does the design reference the appropriate local and/or state design standards? | ☐ |

| DESIGN (30) | |
|---|---|
| Does the design adhere to the area requirements for its respective category? | ☐ |
| Do the design components convey the functionality and value of the design with a cohesive, multi-disciplinary perspective? | ☐ |
| Do visual media and graphics in the design board, project narrative, and video pitch complement one another and give the viewer a cohesive, visual understanding of the design context, elements, and desired performance? | ☐ |
| Did the team collaborate with the university facilities department or external stakeholders to develop a design that is feasible and replicable either locally or regionally? For example, does the proposed project align with local stormwater management requirements? | ☐ |
| Do the selected green infrastructure approaches address multiple campus environmental, social, and economic objectives (e.g. water resource management goals, public health benefits, educational and recreational opportunities)? | ☐ |

| | |
|---|---|
| Does the design complement efforts to address areas of environmental, economic, and social need within the broader community or region? | ☐ |
| **Master Plan entries only:** Does the design incorporate and complement existing features such as drainage basins, water bodies, circulation routes, or other connective features? | ☐ |
| **Master Plan entries only:** Does the design convey a theme for the application of green infrastructure across campus, complement existing master plans, or serve as a model for new long-term planning efforts? | ☐ |
| **Master Plan entries only:** Do project components detail how future growth and development will impact the design? Does the design incorporate flexible implementation strategies that allow planning efforts to adapt to changing circumstances over time? | ☐ |

| IMPLEMENTATION (15) | |
|---|---|
| Does the entry detail how the design could be implemented/phased over the near-, mid-, and long-term time horizons? Are the selected time frames for project implementation reasonable? | ☐ |
| Does the entry include a cost estimate for the proposed project? | ☐ |
| Did the team research grants, loans, and other sources of financing capable of covering or supplementing the cost estimate? Information included in the narrative must represent a viable financing path to project construction. | ☐ |
| Does the narrative contain information on how the project will be operated and maintained over time (e.g. maintenance requirements and schedules, sourcing labor, covering costs)? | ☐ |
| **Master Plan entries only:** Do project components detail how future growth and development will impact the design? Does the design incorporate flexible implementation strategies that allow planning efforts to adapt to changing circumstances over time? | ☐ |
| **Master Plan entries only:** Did the team explore long-term funding strategies? Does the project or academic institution have a sustainable revenue stream or funding sources capable of paying for multiple implementation phases? | ☐ |

| COMMUNICATION (15) | |
|---|---|
| Does the project include a description of the overall project goals, project context, existing conditions along with the problem to be solved, proposed green infrastructure approaches, and expected outcomes? | ☐ |

| | |
|---|---|
| Are documents well written, error-free, and of sufficient quality to enable judges to evaluate the design? | ☐ |
| Is the video pitch original and creative? Does it illustrate the environmental, economic, and social potential of the project in plain language? | ☐ |
| Does the project contemplate public outreach and education (e.g., examples of signage, infrastructure tours, or other learning opportunities)? | ☐ |
| Did the team forge partnerships and/or identify stakeholders (e.g., university staff, alumni networks, city, county, state, non-profit, private entities) that could help support the proposed project? The purpose of such partnerships or stakeholder involvement could include, but is not limited to, financial support, operations and maintenance, design consultation, or environmental education. | ☐ |

| RESILIENCE (10) | |
|---|---|
| Does the design incorporate priorities included in local, state, regional, or national climate resiliency initiatives, sustainability plans, adaptation plans, or climate action plans? | ☐ |
| Where applicable, does the project include regionally appropriate, native vegetation that will provide ecosystem services that integrate the natural and built environments? | ☐ |
| Does the design incorporate elements of stormwater capture and use for non-potable water applications to offset and replace potable water demand? | ☐ |

## Documentation Guidelines

The following table provides examples of metrics or resources that teams may use to document how their projects meet these criteria. This information is not required, as not all of it may be relevant to a design. To the extent that this information is relevant, however, quantitative information on the anticipated outcomes of a team's design will be more compelling to the judges than narrative descriptions. Teams that opt to present any of the information listed below are encouraged to use the suggested units to facilitate the judging process. Teams are also encouraged to describe the methodologies used and provide references, as appropriate. Entries should adhere to appropriate state and local design standards.

| Outcomes | Example Metrics and Terminology |
|---|---|
| Stormwater Management | Reduction in impervious area (sq. ft., %) |
| | Reduction in directly connected impervious area (sq. ft., %) |
| | Reduction in runoff depth from existing and/or natural condition (in/year, %, or size of design storm managed) |
| | Change in annual stormwater pollutant load from existing condition (pounds/acre/year) |
| | Change in stormwater peak flow from existing and/or natural condition (based on 1-year, 24-hour design storm and expressed as cubic feet/second/acre, %) |
| Integrated Water Management | Reduction in landscape water requirement (may be attributed to change in plant species or change in irrigation efficiency) (gallons/year, %) |
| | Reduction in potable water use for irrigation (may be attributed to reduction in landscape water requirement or use of captured rainwater or recycled gray water) (gallons/yr., %) |
| | Reduction in potable water use for indoor uses (gallons/yr., %) |
| | Annual groundwater recharge (gallons/year) |
| Other Ecosystem Services | Area of protected or restored soils (acres, sq. ft.) |
| | Area of protected or restored native plant communities (acres, sq. ft.) |
| | Increase in canopy cover (10 years after installation) (% of site area) |
| | Increase in roof area shaded by vegetation (% of roof area) |
| | Increase in hardscape area (roads, sidewalks, parking lots, courtyards) shaded by vegetation (% of hardscape area) |
| | Map showing locations of windbreak vegetation relative to buildings |
| | Reduction in building electricity consumption due to vegetation roof insulation/evapotranspiration or tree shading (Kwhs, %) |
| | Air pollutant removal by trees, also known as dry deposition (lbs/yr) |

| | |
|---|---|
| | Carbon dioxide (CO2) sequestered by new trees (lbs/year) |
| | Change in plant diversity (plant list before and after project; use of native plants; use of minimum input minimum maintenance plants; % of plants in specified category) |
| | Change in pollinator and/or wildlife diversity (list of species supported by plants before and after project) |
| **Financial Viability** | Total Project Cost Estimate: an itemized estimate of the project cost based on the projected period of construction.<br><br>Operations and maintenance: Appropriate operation and maintenance activities ensure that green infrastructure will continue to function properly and yield expected water quality and environmental benefits, protect public safety, meet legal standards, and protect communities' financial investments. The cost of maintaining infrastructure over time is an important consideration when planning a project.<br><br>Useful life: The period of service for an infrastructure asset. Projects should have funding sufficient to operate and maintain assets throughout their period of service.<br><br>For more information on sources of funding for green infrastructure visit:<br><br>**EPA's Green Infrastructure Program**<br>https://www.epa.gov/green-infrastructure/green-infrastructure-funding-opportunities<br><br>**EPA's Water Infrastructure Finance and Resiliency Center**<br>https://www.epa.gov/waterfinancecenter<br><br>**EPA's Water Finance Clearinghouse**<br>https://ofmpub.epa.gov/apex/wfc/f?p=165:1 |

## COPYRIGHT

You represent and warrant that the work submitted is your own original work and that it does not infringe upon the intellectual property rights of any other person. By submitting your work, you grant EPA a royalty-free license to copy, distribute, modify, publicly display, and otherwise use and authorize others to use your project narrative, design boards, or video pitch for any educational purpose and in any media.

## PRIVACY

The information collected for this Challenge will only be used to contact student teams in direct relation to the competition. After consultation with the winners, winning teams will be announced publicly, and winning entries will be posted on EPA's Green Infrastructure website at: https://www.epa.gov/greeninfrastructure.

## CONTACT US

To sign up for email updates or ask a question about the Campus RainWorks Challenge, please send an email to RainWorks@epa.gov.

Source: University of Pittsburgh's second place entry in the 2020 Campus RainWorks Challenge.