

Campus RainWorks Challenge

A Green Infrastructure Design Challenge
for Colleges and Universities



2016 Campus RainWorks Challenge

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Cover Images:

Excerpts from the winners of the 2015 Campus RainWorks Challenge.

Introduction

The US EPA's Office of Water is pleased to announce the 5th annual Campus RainWorks Challenge for undergraduate and graduate students. EPA is inviting student teams to design an innovative green infrastructure project for a location on their campus. Student teams will collaborate with a faculty advisor to develop a project narrative and design boards describing the project. Winning teams will be awarded a student prize to be divided evenly among student team members, as well as a faculty prize to support green infrastructure research or training.

The Campus RainWorks Challenge is designed to engage students in reinventing our water infrastructure. In most developed areas, stormwater is drained through engineered collection systems and discharged into nearby waterbodies. This stormwater carries trash, bacteria, heavy metals, and other pollutants from the urban landscape, degrading water quality. Higher flows can also cause erosion and flooding in nearby streams, damaging habitat, property, and infrastructure. As our cities and towns grow, more of our streams, lakes, and bays will be at risk. At the same time, these cities and towns will demand even more clean water to meet household and industry needs.

Green infrastructure refers to systems and practices that use or mimic natural processes. While "gray" stormwater infrastructure is largely designed to convey stormwater away from the built environment, green infrastructure uses soils, vegetation, and rainwater harvesting to manage rainwater near to where it falls. By weaving natural processes into the built environment, green infrastructure can also provide many community benefits, including improving air quality, reducing urban heat island impacts, reducing energy consumption, enhancing wildlife habitat, and providing community amenities.

As communities develop and climate patterns shift, both urban stormwater impacts and urban water needs are expected to grow. Our nation and our planet need innovative planners, designers, engineers, and other professionals to create resilient and affordable solutions. The Campus RainWorks Challenge is designed to encourage college and university students to become part of these solutions.

In the fifth year of the Campus RainWorks Challenge, EPA hopes to:

- Continue to engage students in assessing the technical and economic potential of green infrastructure solutions at a range of spatial scales and in a range of physical contexts;
- Provide a hands-on, interdisciplinary learning experience through which students and faculty can gain practical experience that may be applied in their future practice;
- Promote the use of green infrastructure practices that provide multiple environmental, social, and economic benefits on college and university campuses; and
- Encourage students to learn about the impacts of climate change on their college or university communities and demonstrate how the use of green infrastructure practices can build resiliency to those impacts while effectively managing stormwater runoff.

Calendar

Registration:

September 1, 2016 – September 30, 2016

Entries Due:

December 16, 2016

Winners Announced:

April 2017

Awards

EPA will award a total of \$16,000 to first and second place winners in each of two categories: a Demonstration Project category and a Master Plan category (see Submission Categories section). Winning teams will earn both a student prize to be divided evenly among student team members, and a faculty prize to support green infrastructure research or training. Prizes will be distributed as follows:

	<i>Student Prize</i>	<i>Faculty Prize</i>
1 st Prize Demonstration Project	\$2,000	\$3,000
1 st Prize Master Plan	\$2,000	\$3,000
2 nd Prize Demonstration Project	\$1,000	\$2,000
2 nd Prize Master Plan	\$1,000	\$2,000

Winners will be notified in April 2017 via email. After consultation with the winners, winning teams will be announced publicly, and winning entries will be posted on EPA's Green Infrastructure [website](#).

Eligibility

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

Participating Institutions

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

- a. A public nonprofit institution/organization (limited to degree-granting public institutions of higher education¹) located in the U.S., state and local governments, Federally Recognized Indian Tribal Governments, and U.S. territories or possessions.
- b. A private nonprofit institution/organization (limited to degree-granting private institutions of higher education²) located in the U.S., state and local governments, 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 could be found at <http://www.ed.gov/edblogs/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. Sec. 1059(c)). A list of these schools could be found at <http://www.ed.gov/edblogs/whiaiane/tribes-cus/tribal-colleges-and-universities/>
3. Hispanic-Serving Institutions (HSIs), as defined by the Higher Education Act (20 U.S.C. Sec. 1101a(a)(5)). There is no list of HSIs. 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% Hispanic students at the end of the award year immediately preceding the date of application for this Challenge; and
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)). There is no list of AANAPISIs. 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 % students who are Asian American or Native American Pacific Islander.

Participating Teams

Each student team must be sponsored by a faculty advisor.

¹ See 20 USC 1001 for a definition of “institution of higher education”

² *ibid*

Team composition and size is at the discretion of the team submitting an entry. However, interdisciplinary teams are strongly encouraged, given that interdisciplinary collaboration is part of the judging criteria. 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.

Teams may be composed of students from more than one academic institution if the team meets all of the following criteria:

1. All institutions represented by the team are eligible per the Participating Institutions section above.
2. All participating students are eligible per the Participating Student section below.
3. The submission is based on a project designed for one of the institutions represented by the team.
4. The faculty advisor is associated with the same institution as the submission design.

Participating Students

All team members must meet one or more of the following criteria:

1. Be enrolled in a degree program (undergraduate or graduate) at a college or university eligible to participate in the U.S. Environmental Protection Agency's Campus RainWorks Challenge (participating institution) as of August 31, 2016.
2. Have received a degree (undergraduate or graduate) from a participating institution within 12 months prior to August 31, 2016.
3. Have received a degree (undergraduate or graduate) from a participating institution within the past 24 months and be enrolled in at least one class (live or online) at a participating institution as of August 31, 2016.

Registration

To compete in EPA's Campus RainWorks Challenge, student teams must first complete an online registration form found on the website: <https://www.epa.gov/campusrainworks>. The intent of the registration form is to allow EPA to confirm the eligibility of each team. Once a team has submitted a registration form to RainWorks@epa.gov the team will receive a registration number via email.

Registration opens September 1, 2016 and closes September 30, 2016. Once registration opens, the registration form will be posted on the Campus RainWorks website.

Submission Categories

To encourage participating teams to assess the environmental, economic, and social benefits of green infrastructure at a range of spatial scales, EPA is accepting submissions in two design categories: a Demonstration Project category and a Master Plan category.

- An individual team may submit to both categories but must submit a full and substantially different submission for each category (i.e., teams cannot reuse their entire submission for another category). Additionally, work from one team's submission cannot be reused in another team's submission.
- After registering, teams may switch categories at any time up until the submission due date of December 16, 2016 by sending an email to RainWorks@epa.gov requesting the switch with the current registration number.

Demonstration Project Category

For submissions in the Demonstration Project category, EPA is seeking proof-of-concept level designs that examine how green infrastructure could be integrated into a particular site on the team's campus to meet multiple environmental, educational, and economic objectives. Entries in this category should include detailed information on the design and performance of the proposed demonstration project, and should reflect extensive consultation with the facilities planning department to assess project feasibility.³

Master Plan Category

For submissions in the Master Plan category, EPA is seeking conceptual designs that examine how green infrastructure could be integrated into a broad area of the team's campus. Entries in this category should be coordinated with existing campus master plans and should describe how green infrastructure could be used to enhance the long-term sustainability of the campus.

For Both Categories

This year's competition asks student teams to incorporate climate resiliency considerations into their stormwater management designs. For both submission categories, teams should examine and describe the current and/or potential impacts of climate change on their college or university communities. Entries should qualitatively and/or quantitatively demonstrate how the predicted performance of the team's proposed green infrastructure project can mitigate and build resiliency to those impacts while effectively managing stormwater runoff (e.g., manage localized flooding, prepare for drought, reduce or eliminate irrigation, reduce urban heat impacts, lower energy demands).

Submission Requirements

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

- One (1) Project Narrative,
- Two (2) Design Boards, and
- One (1) Letter of Support

Submissions should provide information of sufficient quality to enable the judges to evaluate the design. Submissions should describe the overall project goals, project context within the campus or watershed,

³ In contrast to the Master Plan category, which looks at broader campus planning, the Demonstration Plan category focuses on site-scale green infrastructure intervention.

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 addressing the challenge criteria (see Judging section).
- Each team must prepare a Project Narrative not exceeding ten (10) 8.5" x 11" pages (including images, graphics, and tables; excluding cover page, abstract, and an additional allowance of two pages for calculations and references only). Note that pages in excess of ten 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 (including registration number, project title, first and last names and disciplines of team members, and name and discipline of faculty advisor) and a project abstract (250 word maximum).
- Teams must provide 1 electronic copy of the Project Narrative in Adobe Acrobat® PDF format. Instructions on submitting deliverables are provided below.

Two Design Boards

- The intent of the Design Boards is to provide a visual explanation of the site context, design elements, and design performance.
- The design boards must focus on visual elements and limit the amount of excess text. The design boards should supplement, not duplicate, graphics within the Project Narrative.
- Each team must prepare two 24" x 36" design boards. Each board must include the team's registration number (see Registration section) in the upper right hand corner.
- The design boards must include a site plan. Additional elements might include cross sections, conceptual drawing(s), or graphics representing anticipated benefits.
- Teams must provide electronic copies of each design board in Adobe Acrobat® PDF format. Instructions on submitting deliverables are provided below.

Letter of support

- The intent of the letter of support is to demonstrate consultation with the college or university's facilities planning department to develop a feasible design.
- The letter of support does not count against the ten (10) page limit of the Project Narrative.
- Each team must submit a letter from a member of the college or university's facilities planning department demonstrating support for the proposed design. Letters of support are not to exceed two 8.5" by 11" pages. Note that pages in excess of two will not be reviewed.

- The letter of support must be on appropriate letterhead, must be signed by a member of the facilities planning department, and must include the registration number and project title.
- Letters of Support must be provided in Adobe Acrobat PDF format. Instructions on submitting project files are provided below.

Submission Instructions

EPA will collect submissions to the Campus RainWorks Challenge via email. Participating teams must email their submissions to RainWorks@epa.gov by Friday, December 16 at 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. Note that the total size of all files must not exceed 15 MB:

1. Project Narrative (saved as “###-Project Narrative.pdf”)
2. Design Boards (saved as “###-Design1.pdf” and “###-Design2.pdf”)
3. Letter of Support (saved as “###-Letter.pdf”)

Judging

Judges

Qualifying submissions will be judged by two rounds of reviewers that may include EPA staff, landscape architects, engineers, public officials, and/or academics from noncompeting colleges or universities. 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.

Demonstration Project Criteria

1. DOCUMENTATION (10)

- Are the documents well-written and free of errors?
- Are the documents of sufficient quality to enable the judges to evaluate the design?
- 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 references effectively utilized?

2. PERFORMANCE (20)

- Will the design retain and treat stormwater runoff on-site (e.g., through infiltration, evapotranspiration, or harvest and use) to improve water quality?

- Will the design address multiple water resource goals (e.g., water conservation, flood mitigation, groundwater recharge, water harvesting and use, water reuse)?
- Is the predicted performance quantified and supported by appropriate modeling and calculations? Calculations should include the design storm managed and/or the annual reduction in runoff volume.

3. **RESILIENCY (20)**

- Did the team examine and describe the current and/or potential short-term impacts of climate change on their college or university community?
- Does the project demonstrate how the use and predicted performance of green infrastructure practices can mitigate and build resiliency to those impacts while effectively managing stormwater runoff?

4. **INNOVATION AND VALUE TO CAMPUS (15)**

- To what extent were innovative approaches developed to simultaneously address campus environmental, social, and/or economic objectives?
- Will the design protect and improve ecosystem services (e.g., those provided by soil and vegetation)?
- Does the project describe how the design will be integrated into campus life and how the design will serve to benefit the campus community (e.g., by providing educational or recreational opportunities)?
- Are the predicted benefits quantified and supported by appropriate assumptions?

5. **INTERDISCIPLINARY COLLABORATION (10)**

- Does the project demonstrate collaboration between different disciplines (e.g., landscape architecture, architecture, engineering, environmental science, biology, economics, public administration, business administration, communications)?
- Does the project cohesively communicate the functionality and value of the design from both an engineering and design perspective?

6. **LIKELIHOOD OF IMPLEMENTATION (10)**

- Did the team collaborate with the Facilities department in developing the design?
- Does the design complement existing master plans or serve as a model for new long-term planning efforts?
- Does the project include a reasonable timeframe and a description of how the design would be phased/implemented?
- Does the team present a feasible cost estimate (i.e., did the team look into available funding options, such as grant funding or campus capital improvement funds, for implementation of the project)?

7. **COMMUNITY ENGAGEMENT (5)**

- Does the project contemplate public involvement with the local community (city, county, state, or other organizations) or partnerships that could help support the proposed project?
- Does the project contemplate public outreach and education (e.g., signage, events)?

8. **MAINTENANCE (10)**

- Does the design allow for easy and effective maintenance?

- Did the team develop an operations and maintenance (O&M) plan to maintain the system performance and aesthetics?
- Did the team collaborate with the Facilities department in developing the O&M plan?

Master Plan Criteria

1. DOCUMENTATION (10)

- Are the documents well-written and free of errors?
- Are the documents of sufficient quality to enable the judges to evaluate the design?
- 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 references effectively utilized?

2. PERFORMANCE (20)

- Will the design retain and treat stormwater runoff on-site (e.g., through infiltration, evapotranspiration, or harvest and use) to improve water quality?
- Will the design address multiple water resource goals (e.g., water conservation, flood mitigation, groundwater recharge, water harvesting and use, water reuse)?
- Is the predicted performance quantified and supported by appropriate modeling and calculations? Calculations should include the design storm managed and/or the annual reduction in runoff volume.

3. RESILIENCY (20)

- Did the team examine and describe the current and/or potential long-term impacts of climate change on their college or university community?
- Does the project demonstrate how the use and predicted performance of green infrastructure practices can mitigate and build resiliency to those impacts while effectively managing stormwater runoff?

4. INNOVATION AND VALUE TO CAMPUS (15)

- To what extent were innovative approaches developed to simultaneously address campus environmental, social, and/or economic objectives?
- Will the design protect and improve ecosystem services (e.g., those provided by soil and vegetation)?
- Does the project describe how the design will be integrated into campus life and how the design will serve to benefit the campus community and if appropriate, the community directly adjacent to the campus (e.g., by providing educational or recreational opportunities)?
- Are the predicted benefits quantified and supported by appropriate assumptions?

5. INTERDISCIPLINARY COLLABORATION (15)

- Does the project demonstrate collaboration between different disciplines (e.g., landscape architecture, architecture, engineering, environmental science, biology, economics, public administration, business administration, communications)?
- Does the project cohesively communicate the functionality and value of the design from both an engineering and design perspective?

6. LIKELIHOOD OF IMPLEMENTATION (15)

- Did the team collaborate with the Facilities department in developing the design?
- Does the design complement existing master plans or serve as a model for new long-term planning efforts?
- Does the project include a description of how the design would be phased/implemented?

7. COMMUNITY ENGAGEMENT (5)

- Does the project contemplate public involvement with the local community (city, county, state, or other organizations) or partnerships that could help support the proposed project?
- Does the project contemplate public outreach and education (e.g., signage, events)?

Documentation Guidelines

For both the Demonstration Project and Master Plan categories, the design performance and value to campus are very important criteria. The following table provides examples of metrics that teams may use to document how their projects meet these criteria. These metrics are not required, and not all of these metrics may be relevant to a particular design. To the extent that these metrics are 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 metrics listed below are encouraged to use the suggested units to facilitate the judging process. Teams are also encouraged to describe the methodologies used and to provide references, as appropriate. An additional two pages are allowed for references and calculations in addition to the ten pages allotted for the project narrative.

Outcomes	Example Metrics
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)

Outcomes	Example Metrics
Other Ecosystem Services	Area of protected soils (acres, sq. ft.)
	Area of restored soils (acres, sq. ft.)
	Area of protected native plant communities (acres, sq. ft.)
	Area of 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 (CO ₂) 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 diversity (list of pollinators supported by plants before and after project)

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 and Design Boards 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](#).

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.