OneWorld OneWaterCenter
Metropolitan State University of Denver | Denver Botanic Gardens

Memorandum

To: Ben Wade, Colorado Water Conservation Board

From: Tom Cech and Nona Shipman, MSU One World One Water Center

CC: Melissa James and Amy Volckens, Brendle Group

Date: February 5, 2020

Re: **Final Report: Activating Colorado's Water Plan with Student Driven Innovation**

Competition Overview

The purpose of this memorandum is to summarize the outcomes of the Fall 2019 One World One Water (OWOW) Center Student Design Competition at Metropolitan State University Denver (MSU Denver) and to highlight success metrics, lessons learned, and recommendations for future competitions as well as for other universities interested in holding similar competitions. The main driver of this competition was to activate the Education, Outreach, and Innovation objective of Colorado's Water Plan by increasing student awareness of the plan and by challenging students to design innovative water solutions.

In order to magnify the importance of water across every discipline, all MSU Denver departments were invited to take part in the student design competition to tackle today's water concerns and spread waterwise stewardship on campus and across Colorado. The departments that participated in this competition included Art, Civil Engineering Technology, Geography, Industrial Design, Journalism and Media Production, and Meteorology. On December 4, 2019, the students presented their projects to the Advisory Team made up of water industry professionals. The Advisory Team included Jamie Akens of Wright Water Engineers, Ellen Olson of Travellen Consulting, Inc., Russ Sands of Colorado Water Conservation Board, Jerd Smith of Colorado Foundation for Water Education, Kara Sobieski of Wilson Water Group, and Lacey Williams of Realtime Aquifer Services. The student projects were evaluated based on their ability to:

- **CONNECT** their project to the purpose and objective of Colorado's Water Plan.
- **ENGAGE** students, staff, and the general public regarding water issues.
- **EDUCATE** by creating awareness of water issues through communication and knowledge-sharing.
- **EMPOWER** students, staff, and the general public by providing resources and tools for action on water issues.
- **REALIZE** an established level of feasibility for real-world integration.

The winning projects were:

1. OWOW's Strategic Communications Plan by JMP 3740: Public Relations Research, Planning, and Management
2. Tivoli Brewery Centrifuge by GEG 4720: Sustainability Mitigation Plan
3. Landscape Design by IND 2450: Beginning Industrial Design Studio

As a result, the Journalism and Media Production Department was awarded a cash prize of $1,000, and the Geography and Industrial Design Departments were each awarded $500.

After the students presented their projects and the winners were announced, the event opened into a tabling opportunity for students, faculty, and general public to learn about how the water issues are being addressed in Colorado. In addition to the student project display tables, attendees were also able to connect and network with local water organization representatives. Organizations included Auraria Sustainable Campus Program (ASCP), Brendle Group, Colorado WaterWise, Conservation Colorado, Colorado Water Conservation Board (CWCB), Denver Public Works, Denver Water, Mile High Flood District, the OWOW Center, Trout Unlimited, Water Education Colorado, and Wright Water Engineers.

Flyers used to recruit department participation and to advertise the campus-wide competition can be found in Appendix A: Outreach Materials and Strategies. The student design competition guide used in the initial planning can be found in Appendix B: Student Design Competition Brief.

Competition Outcomes

STUDENT PROJECTS

Student projects were recognized on the OWOW Center website. The top three winning projects will also be featured in local and statewide water organization blogs, newsletters, and other publications. Every project demonstrated innovative thinking and addressed the water challenge from unique perspectives, which illustrates the high level of awareness that students in Colorado have about water. The projects are described below. ART 3637: Socially Engaged Art and MTR 2050: Community Climate Initiatives were unable to continue their projects into the final campus-wide competition and are receiving honorable mentions for their efforts.

OWOW's Strategic Communications Plan by JMP 3740: Public Relations Research, Planning, and Management

To increase awareness and engagement of water conservation activities in and around campus, the JMP 3740 Project Team compiled a strategic communications plan for the OWOW Center. The Project Team measured historic success of the OWOW Center's social media activity by evaluating the number of Likes or Shares in correlation to the content in the posts and the call outs to other organizations or from other organizations. Based on this research, the Project Team determined that Facebook was the most viewed social media outlet and that connections to the Denver Botanic Gardens boosted views. Additionally, hashtag campaigns such as #LikeItLikeYouLoveIt resulted in many reposts and participation. However, in general, students are unaware of the OWOW Center and its efforts. Since the campus population continually cycles through new students, the Project Team suggests the OWOW Center reintroduce itself to the students every two years with events such as open houses, water conservation activities and signage, and partnership events with Denver Botanic Gardens. By increasing visibility of the OWOW Center's many projects and efforts through social media and campus presence, the Project Team predicts that campus water use will decrease as a result of enhanced student and

faculty waterwise stewardship. While the direct correlation of water savings from education and outreach is difficult to quantify, it is critical for successful integration of water conservation initiatives.

Tivoli Brewery Centrifuge by GEG 4720: Sustainability Mitigation Plan

Through the addition of a centrifuge, the on-campus brewery in the student union, Tivoli Brewery, can reduce wastewater, increase compostable outputs, and minimize evaporation. Traditional methods of brewing require yeast to form clumps and drop to the bottom of the fermentation tank over two to three days, which results in measurable evaporative losses and the need for multiple fermentation tanks to maintain a constant beer supply. With a centrifuge, the yeast is separated quickly and efficiently, providing a larger yield, reduced evaporation losses, and maximized compostable output. As a result of the consolidation of the yeast, the tanks can be cleaned with less water in less time and fewer tanks are needed to provide constant output. Overall, the consistency and clarity of the beer will be improved and more easily reproduced. The resulting yeast can be used for educational purposes by the agriculture department as well as for nutritional-rich compost on Auraria Campus. The GEG 4720 Project Team estimates that the investment in a centrifuge will have a payback period of less than a year from the increased beer yield and profits and a water savings of 1,800 gallons per month from the reduced wash water and fewer tanks in use.

Landscape Design by IND 2450: Beginning Industrial Design Studio

By enhancing Auraria Campus' landscape design guidelines with low water using native vegetation and optimized drainage features, outdoor water use on campus can be significantly reduced. The IND 2450 Project Team developed a landscape design guide with suggested vegetation and site layouts that are scalable for any location on campus or in the Denver area. Traditional sprinklers are recommended to be replaced with drip irrigation to maximize root absorption and reduce evaporative losses. Terraces and other variations in ground elevation are suggested to promote adequate drainage. Recommended locations on campus for the landscape design include large turf areas not used for recreation. Interactive art displays and signage explaining the benefits of the landscape design ae recommended to help educate students and faculty about the importance of waterwise stewardship.

Snow Management by CET 4100: Water Resources Senior Project 1

In order to improve the snow management on campus, reduce the amount of water lost through sublimation (evaporation from ice to vapor), and increase the amount of water infiltrating into the ground, the CET 4100 Project Team suggested repurposing existing detention basins on campus to collect and melt snow piles with a geothermal heating element. An existing detention basin would be redesigned to include standard sand and gravel filter layers, a concrete overflow outlet structure, and a duel compressor geothermal heat pump system to accelerate snowmelt. Contaminants from parking lot runoff would be filtered out of the snowmelt through the filter layers before the water percolates into the ground. Educational signs would be installed to increase awareness of water conservation among the students, faculty and staff, and general public.

STUDENT KNOWLEDGE OF STATE WATER PLAN

Prior to the start of the competition, students in each participating classroom were asked to complete a survey about their knowledge of Colorado's Water Plan, their personal conservation actions, and the importance of water conservation on campus. Most of the students were aware

of Colorado's Water Plan, took conservation actions to reduce their water use, and felt that the campus should have water conservation as a top priority. The results showed that a sense of waterwise stewardship exists within the MSU Denver student culture and that campus conservation efforts are supported.

Advisory Team members and a representative from the OWOW Center visited each participating class to share their knowledge and advice about how the projects supported Colorado's Water Plan and about jobs in the water industry. The classroom visit helped students connect their project ideas and future career plans to real-world water issues and opportunities.

After completing the competition, students were asked to complete the same survey to determine if the projects increased their understanding and actions. Unfortunately, due to the proximity of survey distribution to the end of the semester, not many responses were received. Responses that were received showed a notable increase in awareness. For example, students now rated themselves as experts in Colorado's Water Plan. Most respondents continued to consciously reduce their water use to the best of their abilities. Most respondents felt that the campus should focus on easy ways to prevent water waste. Other comments acknowledged how complex water management is, and that even though there are many ways to reduce water use, some are more feasible than others. Overall, students enjoyed the multi-disciplinary nature of and participating in the competition. A summary of the survey responses can be found in Appendix A: Outreach Materials and Strategies.

Competition Debrief

Successes in Holding a Campus Competition and Achieving Outreach Goals

- Successfully executed a first-year event coupling a campus competition with a public showcase event
    - Competition branding, scoring rubric, and other materials can be adapted and reused in future years
    - Advisory Team and OWOW Center classroom visits promoted engagement between students and professionals
- Successfully raised awareness on campus of Colorado's Water Plan
    - 6 participating classrooms (4 of which completed the competition)
    - 40-60 students and faculty members educated about Colorado's Water Plan
    - 80-100 people attending the public showcase event

Lessons Learned and Recommendations for Future Competitions

Task 1: Competition Planning, Partner Building, and Competition Roll-out

- **Executive Team:** Consider inviting ASCP and other Auraria Campus institutions to participate on the competition planning team as appropriate given competition scope.
- **Advisory Team:**
    - Consider strategic connections such as inviting ASCP, other Auraria Campus institutions, service providers (Denver Water, Metro Wastewater, Mile High), and Denver Botanic Gardens to participate as appropriate given competition scope.
    - Reevaluate the role of Advisory Team members, who wanted to play more of an active advising role for the classrooms. In the first-year competition, the Advisory Team did not help with specific projects to avoid favoritism during the judging. Consider alternative approaches such as having all classrooms pitch project ideas to the full Advisory Team for advice. Alternatively, change the name of this group to "Judging Panel" to be clearer about roles.

- **Competition Team:** Incentivize more professors to integrate the competition into their syllabus to expand support and participation across the campus.
- **Competition Brief:** Rather than having one competition brief for all roles, develop separate materials and schedules for separate groups (i.e. Executive Team, Advisory Team, Competition Team, Project Team, tabling organizations). Reference specific sections in the competition brief materials when sending reminder e-mails. The document for tabling organizations should minimize information about the competition to reduce confusion.

Task 2: Implement the Competition

Incentivize Student Participation in Campus-wide Competition

- Evaluate the potential for monetary incentives to go directly to the project teams (rather than participating departments) and/or incentivize student participation through extra credit contributing to their class grade.

Reevaluate Competition Requirements

- Require project teams to structure their presentations to correlate more directly to the evaluation rubric. For example, ask that project teams submit an executive summary to the judges prior to their presentations to self-assess how the project addresses each rubric element.
- Consider asking for video submissions instead of (or in addition to) the final presentations. The videos could be reused for marketing or education purposes.
- Consider requiring projects to relate to a competition theme. As an example, a competition theme of “Earth and Sky” could result in:
    - A mural about the water cycle from the Art Department
    - A low evapotranspiration landscape design from the Industrial Design Department
    - An awareness campaign about how pollutants in the air impact water quality from the Journalism and Media Production Department
    - An innovative cloudseeding device design from the Civil Engineering Technology Department.
- Consider including a “people’s choice award” in addition to the prizes based on the judges’ selections.

Expand Competition to Include More Classrooms

- Invite classrooms from CU-Denver and CCD to participate, in addition to MSU Denver.
- Ask professors to integrate the competition into their course syllabus and grading process (e.g. have the project count as extra credit or a homework).

Tweak the Public Showcase Event

- Order much more pizza! Having the event in the Tivoli Student Union during lunch time was great for pulling hungry students in; however, the amount of pizza needed for the 2-hour event was underestimated.

- Consider reducing the event down to 90 minutes. Two hours felt too long.
- Increase campus media coverage of the event – before, during, and after – to increase attendance and awareness of the event.

Task 3: Highlight Successes: Promotion & the Final Report

- The OWOW Center featured the results of the competition in their winter newsletter. and MSU Denver featured the results in their newsletter that was distributed in February 2020. Future rounds of the competition could involve a bigger push for a larger Auraria Campus media presence such as with photographers, radio, and the campus magazine.
- Consider distributing a press release to local media.
- Create an article featuring the competition before and after the final round of judging to be shared with media outlets both on and off Auraria Campus.
- Arrange for winning team of students to present at a conference such as Colorado Water Congress, Watershed Summit, Greenway Foundation event, and/or Sustaining Colorado Watersheds Conference

Appendix A: Outreach Materials and Strategies

OUTREACH FLYERS

Figure 1. Front side of classroom recruitment flyer

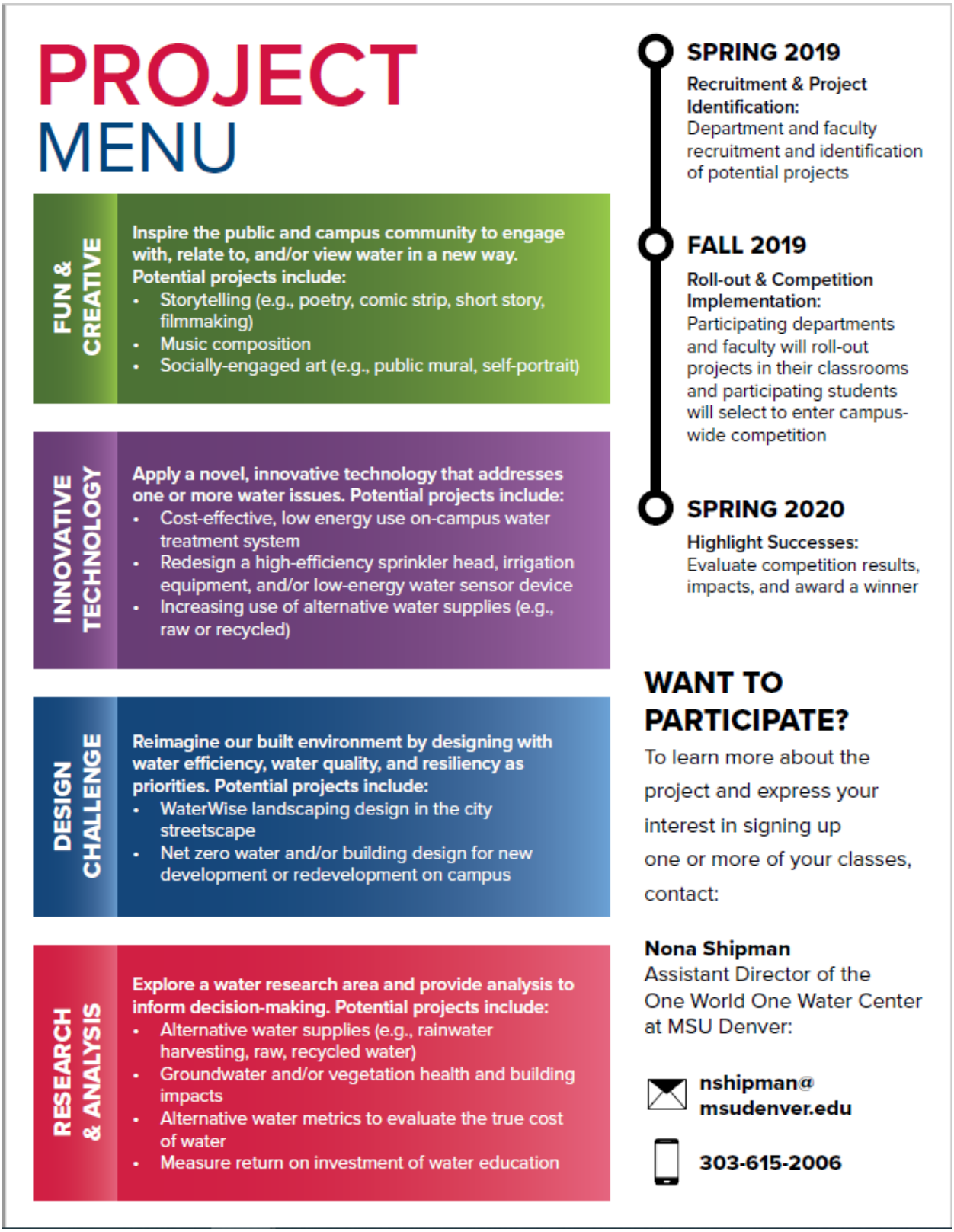

Figure 2. Back side of classroom recruitment flyer

Figure 3. Campus-wide competition flyer

PRE-COMPETITION STUDENT SURVEY RESULTS

1. How would you rank your existing knowledge of Colorado's Water Plan?

Expert – I know about Colorado's Water Plan and am familiar with some of its goals.

Average – I am aware that Colorado has a water plan.

Novice – I have never heard of Colorado's Water Plan.

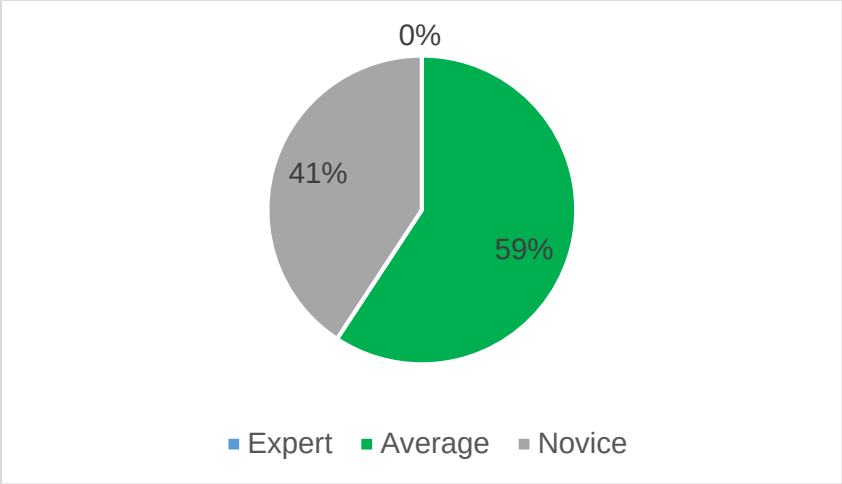

Figure 4. Pre-competition student self-ranking of knowledge regarding Colorado's Water Plan

2. How would you rank your level of water stewardship?

Water Steward – I work to protect and preserve the natural resources and encourage others to do the same.

Water Saver – I am conscious of my own water use and do my best to remember to conserve.

Water Novice – I don't feel knowledgeable about ways that I can protect natural resources or reduce my water use.

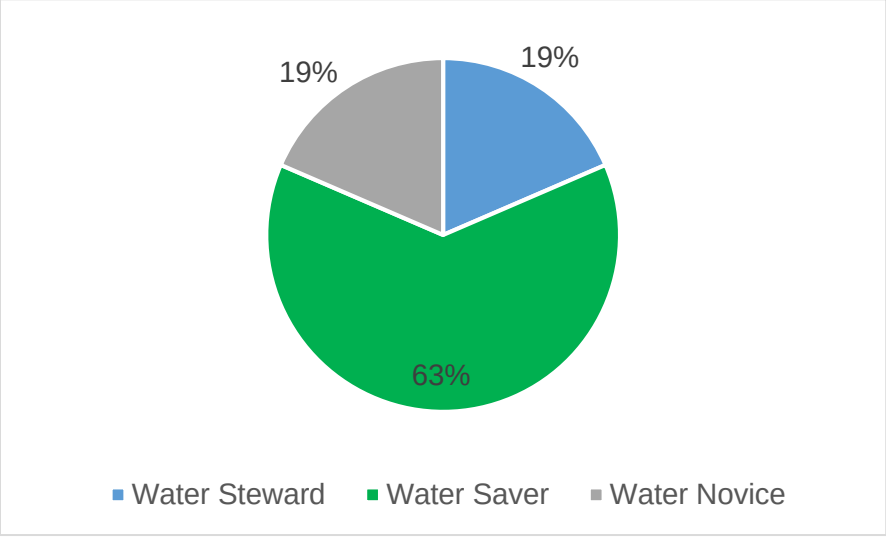

Figure 5. Pre-competition student self-ranking of water stewardship

3. How important do you think it is for MSU-Denver and the Auraria Campus to actively strive to reduce overall water use?

Very Important – It is a top priority to keep reducing water use.

Somewhat Important – Let's focus on easy ways to prevent water waste.

Not Important – We should be focusing on other things.

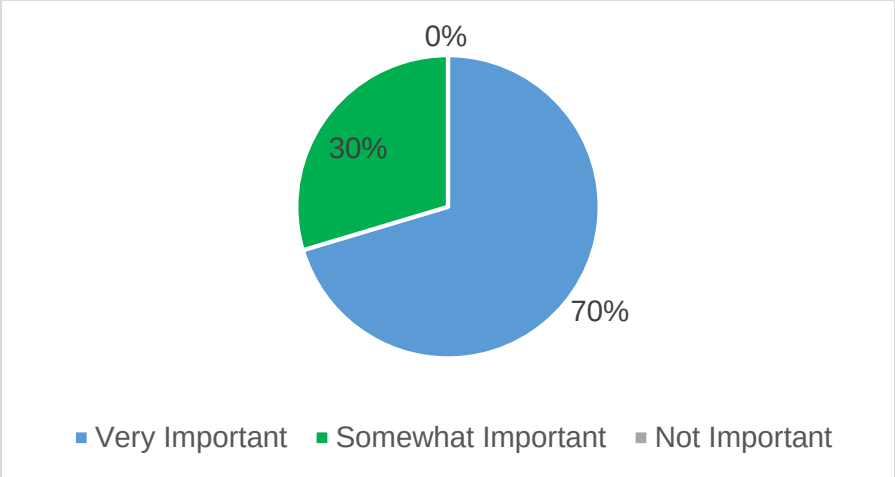

Figure 6. Pre-competition student ranking of water management importance on campus

POST-COMPETITION STUDENT SURVEY RESULTS

1. How would you rank your existing knowledge of Colorado's Water Plan?

Expert – I know about Colorado's Water Plan and am familiar with some of its goals.

Average – I am aware that Colorado has a water plan.

Novice – I have never heard of Colorado's Water Plan.

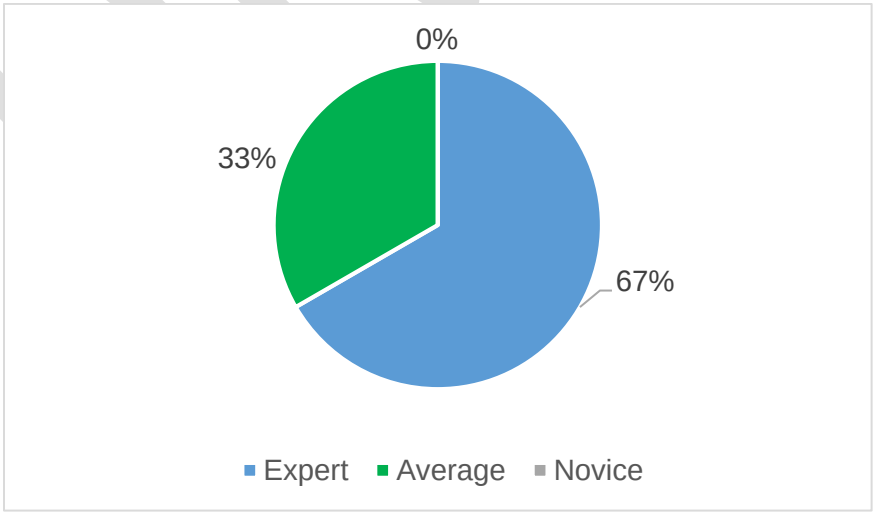

Figure 7. Post-competition student self-ranking of knowledge regarding Colorado's Water Plan

2. Through this competition, what did you learn about Colorado's biggest water challenges and opportunities?

- The state is already good at conserving water that it's getting harder to find new ways to conserve water.
- The biggest challenges are capturing water in the most efficient way possible. The biggest opportunities are being able to work with different parts of campus interested in the same water conservation goal.
- Water rights are a big challenge.

3. How would you rank your level of water stewardship?

Water Steward – I work to protect and preserve the natural resources and encourage others to do the same.

Water Saver – I am conscious of my own water use and do my best to remember to conserve.

Water Novice – I don't feel knowledgeable about ways that I can protect natural resources or reduce my water use.

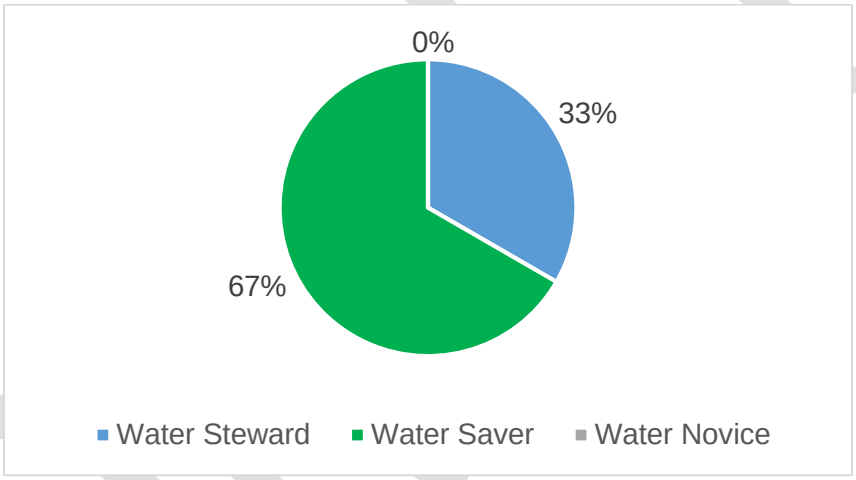

Figure 8. Post-competition student self-ranking of water stewardship

4. Through the competition, what did you learn about how you can personally protect natural resources or better conserve water?

- There are some really creative ways to conserve water.
- I learned a lot from the engineering department who presented on using geothermal technology to melt the snow. From there, it is absorbed into the ground and it goes to rivers.

5. How important do you think it is for MSU Denver and the Auraria Campus to actively strive to reduce overall water use?

Very Important – It is a top priority to keep reducing water use.

Somewhat Important – Let's focus on easy ways to prevent water waste.

Not Important – We should be focusing on other things.

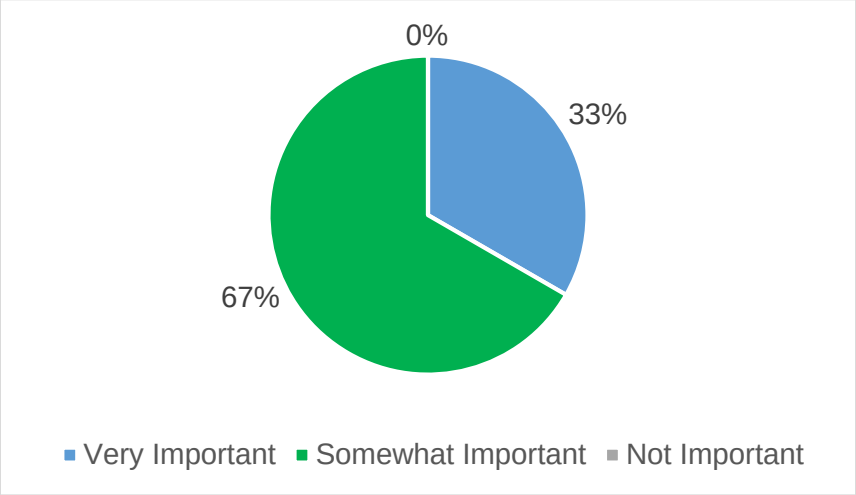

Figure 9. Post-competition student ranking of water management importance on campus

6. Through the competition, what did you learn about Auraria's water use and opportunities for improvement?

- Auraria wastes a lot of water in a lot of different aspects across campus. While they have already done a lot installing low flow features, there are still places like the brewery that waste a ton of water daily, so there is still room for improvement.
- There are many ways to improve water use on campus. Some are more feasible than others. I think it is important to focus on projects that are practical.

7. What other feedback about the student design competition do you have?

- It was interesting seeing students other than EAS students interested in conserving water.
- Keep it going.

Appendix B: Student Design Competition Brief

See following pages.

GET ROWDY TO MEET OUR WATER CHALLENGES

METROPOLITAN STATE UNIVERSITY℠ OF DENVER

SEPTEMBER 2019

Student Design Competition Brief

OneWorld OneWater Center

Metropolitan State University of Denver | Denver Botanic Gardens

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ABOUT THE OWOW CENTER

The One World One Water (OWOW) Center is a collaboration between Metropolitan State University of Denver (MSU Denver) and Denver Botanic Gardens. The partnership presents an opportunity to expand joint initiatives on water and environmental issues through three major collaboration points:

1) Expand the reach and breadth of educational programs.
2) Attract funding for joint research.
3) Raise awareness through collaborative water stewardship.

The OWOW Center offers three program opportunities to MSU Denver students: (1) a water studies minor, (2) a traditional classroom-based water studies certificate, and (3) an on-line water studies certificate. The water studies minor is intended to supplement a bachelor's degree and includes requirements for a capstone project or internship. The water studies certificates can be achieved by degree seekers or non-degree seekers and do not require a capstone project or internship. All offerings allow students to learn about water law, water issues across the country, and water's role in shaping the American west. In addition to academic programs, the OWOW Center works to promote awareness of water stewardship on campus and at home among faculty, staff, and students through programs and partnerships supported by grant funding.

To learn more about the OWOW Center, please visit: https://msudenver.edu/owow/.

ACKNOWLEDGEMENTS

A special thanks to the Colorado Water Conservation Board (CWCB) for providing the grant funding opportunity for this project.

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Thanks also to Jackie Slocombe, Sustainability Coordinator, and Chris Herr, Sustainability Officer, of the Auraria Higher Education Center (AHEC).

AURARIA HIGHER EDUCATION CENTER™

Developed in partnership with the Brendle Group.

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BACKGROUND

Colorado faces many challenges with water resources including drought, wildfire, floods, climate change, and increasing demands from rapid growth. These challenges are placing additional stress on the already-limited water resource supply, necessitating action from the State as well as local governments in order to meet future needs. In response to these challenges, Governor Hickenlooper in a 2013 executive order led the creation of Colorado's first Water Plan, finalized in 2015. The Colorado Water Plan calls on all who have a stake in Colorado's water future to help implement the plan.

Responding to the call-to-action, the OWOW Center received a grant from the Colorado Water Conservation Board (CWCB), the State's water policy planning department, to establish the Colorado Water Collaboratory (Collaboratory). The Collaboratory is a partnership among higher education institutions and their water providers to improve water action planning on Colorado campuses. The Collaboratory at various phases has included MSU Denver, the University of Colorado-Boulder (CU-Boulder), and Colorado Mesa University. Together, the campuses serve as living laboratories for innovating ways to manage water resources and as community stewards of information and resources related to water use and conservation.

The work of the Collaboratory is multi-phased. Phase 1 was completed in 2017 and included data gathering and analysis of water use on participating campuses. In addition, a survey was administered to assess attitudes and perspectives of faculty, staff, and students towards water use and environmental stewardship on campus. Phase 2 will be completed in late 2020. The objective of this phase was to engage with the partner campuses to identify opportunities for sustainable water management strategies that are scalable and measurable in the development of campus-level water action plans. Future phases of the Collaboratory will seek to implement water conservation measures on participating campuses and address the water-energy nexus.

The student design competition outlined in this document will be used to supplement the campus water action plans, gauge public perception and knowledge about the Colorado Water Plan and tap into innovative ideas for addressing water challenges.

COMPETITION INTRODUCTION

The OWOW Center is challenging MSU Denver students to put their creative minds to work to tackle water issues and be water-wise stewards on campus and at home. MSU Denver departments and faculty champions are signing up their classrooms to participate in a campus-wide water competition during the fall semester of 2019. While Auraria campus is home to three universities (University of Colorado Denver [CU Denver], Community College of Denver, and MSU Denver), only MSU Denver classrooms are eligible to participate in this competition. Projects can seek to solve problems across all universities, which leads to branding this competition as campus wide. The competition will be managed by the OWOW Center and will include two rounds: classroom level and campus-wide level. As illustrated in **Figure 1**, the objective of the competition is to provide students an opportunity to create compelling concepts across all disciplines on campus to bridge the gap and overcome water challenges.

Figure 10. Competition Objective

The purpose of this competition brief is to provide full details of the competition process. Any questions that have not been addressed in this brief may be directed to the OWOW Center.

ROLES & RESPONSIBILITIES

EXECUTIVE TEAM

The Executive Team is responsible for developing the competition and guidelines as well as soliciting participation for the Advisory and Competition Teams. The Executive Team will coordinate and guide the competition. The members of the Executive Team include:

- Nona Shipman, Associate Director, OWOW Center
- Tom Cech, Co-Director, OWOW Center
- Hope Bartlett, University Relations & Sustainability Specialist, OWOW Center
- Melissa James, Engineer, Brendle Group
- Amy Volckens, Senior Engineering Manager, Brendle Group

ADVISORY TEAM

The Advisory Team consists of water professionals and is responsible for judging the campus-wide competition and educating the participating classrooms. Team members will participate in at least one classroom visit to offer students insight into a career within the water industry and to provide a connection to Colorado's Water Plan. This team will serve as ambassadors for the competition by spreading the word and connecting the students to professional networks. The members of the Advisory Team include:

JAMIE AKENS

Design Team Coordinator
Wright Water Engineers

Jamie is a water steward by trade with a background in environmental consulting and climate advocacy. He graduated from MSU Denver's Environmental Science program in 2017 and holds the OWOW Center's Water Studies Certificate. Since graduating from MSU Denver in 2017, he has worked in various positions, including as an industrial hygienist aiding in recovery efforts in Puerto Rico after Hurricane Maria shook the island, and performing air pollution compliance testing (stack testing) at major mining, natural gas, and other industrial operations throughout the West. Jamie spends time studying ancient cultures and their relationship with water including the Rajasthani region of India and their "stepwells", and the Ancient Roman water engineering feats of Pompeii and the surrounding Naples Bay region of Italy, such as their aqueduct remnants, lead piping, and flushing toilets.

ELLEN OLSON

Principal
Travellen Consulting Inc

Ellen is currently a water education consultant with Denver Water Youth Education and South Metro Water Supply Authority. She followed a long and circuitous route to her current profession starting with a bachelor's degree from CU-Boulder in Environmental Science and History, which led her to a decade long stint as a whitewater rafting guide. In between summers on the river, Ellen worked in fields as diverse as youth mentoring, marketing, and economic development. In her role as a water educator, she is able to combine her passion for water and working with young people.

RUSS SANDS

Senior Program Manager
Colorado Water Conservation Board

Russ has over 10 years of experience working in water and sustainability in the Denver area. He received his Bachelor of Science degree in Environmental Science from MSU Denver in 2007 and has worked in both the private and public sectors since then. Prior to arriving in Denver, Russ attended international schools in Kenya and the Dominican Republic and was brought to Colorado through volunteer projects with the United States AmeriCorps Disaster and Humanitarian Relief efforts responding to wildfires and floods. Currently, Russ works for the Colorado Water Conservation Board under the Water Supply Planning Section and also serves as the Chief Innovation Officer for the OWOW Center.

JERD SMITH

Digital Content Editor
Colorado Foundation for Water Education

Jerd is the digital content editor at Water Education Colorado (WEco). Prior to joining WEco, she worked as a news editor and reporter for an array of Colorado news outlets including the Rocky Mountain News, the Daily Camera, and several other Colorado news outlets. A former fellow at the Center for Environmental Journalism at the University of Colorado, she has a Bachelor of Science degree in Political Science from the University of Evansville in Indiana and a master's degree in Journalism from Northwestern University. When she isn't reporting and editing, she enjoys hiking, cross country skiing, and mountain biking with her husband and two sons.

KARA SOBIESKI
Principal
Wilson Water Group

Kara has worked in the water resources engineering field for over 15 years. Using her experience in water rights analysis and surface water allocation modeling, Kara helps her clients look at the basin as a whole and understand how other uses in the basin may affect their ability to develop and protect their water supplies. Kara has worked with clients in Colorado, Wyoming, and Nebraska to develop basin-wide planning models and use these models to understand current conditions and investigate future water resources solutions. Kara obtained her degree in Environmental Engineering from Northern Arizona University in 2001 and is a registered Professional Engineer in Colorado and Nebraska.

LACEY WILLIAMS
Principal
Realtime Aquifer Services

Lacey's experience in the water industry goes back more than 25 years. In the early 90's, her initial forays were related to technological innovation in groundwater as she leveraged her broad international business experience by managing a successful commercialization and technology transfer project with the Lawrence Berkeley National Laboratory and a large engineering firm out of Boston. She then worked on an in-situ remediation technology originally developed as a collaborative effort between the USGS and the CO School of Mines. Since that time, her experience includes involvement with many successful entrepreneurial ventures involving water and technology, and she is highly experienced in the facilitation role between technical water experts and general public/community outreach. For the past 5 years, in addition to running a small water business, she has overseen publication of, and is a regular contributor to the Rocky Mountain Water magazine. Within the past year, she judged the Caring For Our Watersheds competition, was a lecturer about water innovation and education at CU Boulder, consulted the Poudre Learning Center and South Platte/Metro Basin Roundtables on Public Education and Outreach, and participated in developing effective learning assessment methods for Water Festivals in the South Platte Basin. She loves to evaluate new technologies from a business perspective and to create opportunities by cross-pollinating ideas from disparate industries. She has an MBA from IMD in Lausanne, Switzerland and a BA in Economics from Stanford University, CA.

COMPETITION TEAM

The Competition Team is made up of faculty whose classrooms will be participating in the competition. The members of the Competition Team and their participating classrooms include the following:

- Patrick Coughlin – CET 4100: Water Resources Senior Project I
- David Klein – IND 2450: Beginning Industrial Design Studio
- Matt Jenkins – ART 3637: Socially Engaged Art

- Richard Wagner and Olive Ann Slotta – MTR 2050: Community Climate Initiatives
- Sara Jackson – GEG 4720: Sustainability Mitigation Plan
- Steven Krizman – JMP 3740: Public Relations Research, Planning, and Management

PROJECT TEAM

The Project Teams include the students working on the competition within the individual classrooms, either by developing projects and/or by judging their peer's projects in the classroom competition. Project Teams will consist of students only; faculty and staff can provide resources, guidance, and advice but will not serve as active Project Team members. The number of students on each project team will be based on the individual discretion of the faculty and staff on a classroom level. Project Teams will conduct classroom-level peer judging. Winning project teams from each classroom will advance to the campus-wide competition.

PLANNING AND IMPLEMENTATION PROCESS

The competition follows a three-phase planning and implementation process that spans June through December 2019. Phase 1 occurs prior to the start of the semester; Phase 2 takes place during the semester; and Phase 3 happens near the end of the semester.

PHASE 1: RECRUITMENT & PROJECT IDENTIFICATION

Phase 1 focuses on the Executive Team actively recruiting the Competition and Advisory Teams and identifying the project requirements and details for the competition. E-mail templates used to recruit the team members can be found in **Appendix A – Recruitment E-mails**. Key dates and milestones of Phase 1 are listed below.

- Competition Team Milestones
    - Recruitment e-mail schedule
        - Introductory e-mail – sent June 14, 2019
        - Reminder e-mail #1 – sent June 28, 2019
        - Reminder e-mail #2 – sent July 12, 2019
        - Reminder e-mail #3 – sent July 23, 2019
    - Faculty sign-up deadline – Friday, July 26, 2019
    - Question/Answer Session with Executive Team – Thursday, August 8, 2019
    - Classroom project plans – sent to Executive Team by Friday, August 16, 2019
- Advisory Team Milestones:
    - Recruitment e-mail schedule
        - Introductory e-mail – sent July 9, 2019
    - Planning meeting with Executive Team – Wednesday, August 28, 2019
- Executive Team Milestones:
    - Team check-ins – monthly from June-December 2019

PHASE 2: COMPETITION ROLL-OUT & IMPLEMENTATION

Phase 2 encompasses the implementation of the competition and began with the fall semester on August 19, 2019. During this phase, students will develop their projects and will compete in up to two rounds of judging. The first round of judging will be held within the classrooms on a peer-to-peer level during the week of November 4, 2019. One winning project will be selected from each classroom to continue on to the campus-wide competition. Classrooms with only one Project Team will not need to hold a classroom-level competition, as the Project Team will move on to the campus-wide competition by default. Students will have approximately two weeks to polish up their projects between rounds of judging. The campus-wide competition will be held on December 4, 2019 and will be judged by the Advisory Team. Three winning projects will be selected as first, second, and third places. Cash prizes will be distributed to the respective departments. At the discretion of the winning departments, prize money can be used to hold a student celebration, to purchase equipment, materials, and other items for future academic use, or can be distributed among the students of the winning team.

During Phase 2, all participating classrooms will be visited by an Advisory Team member who will provide context on Colorado's Water Plan and how it relates not only to the competition but also to his/her/their professional career. A list of topics for the Advisory Team to address during their visits are included in

Appendix B – Advisory Team Classroom Visit Material. A survey evaluating the knowledge and perception about Colorado's Water Plan and current water issues of participating students will be conducted prior to and following the competition. The survey will be delivered using SurveyMonkey. Questions included in the survey can be found in **Appendix C – Competition Survey**. Key dates and milestones for Phase 2 are listed below.

- Project initiation within classrooms – beginning of the semester (at the discretion of the faculty member)
- Pre-competition survey – open online September 2 thru September 13, 2019
- Kickoff meeting with Advisory Team and Competition Team – Tuesday, September 10, 2019
- Advisory Team involvement with classrooms – during the Fall 2019 semester
- Classroom competition – week of Monday, November 4, 2019; winners to be submitted by Friday, November 8, 2019
- Campus-wide competition – Wednesday, December 4, 2019

PHASE 3: HIGHLIGHT SUCCESSES & OUTCOMES

Phase 3 of the competition will highlight competition successes and outcomes. This phase will include the post-competition survey of students to evaluate lessons learned and feedback on the process. The survey will be delivered using SurveyMonkey. Questions included in the survey can be found in **Appendix C – Competition Survey**. Winning projects will receive public recognition through social media and a press release to local media outlets. Based on the characteristics of the winning projects, Project Teams may be offered an opportunity to present their findings in a Colorado Water Wise webinar or another local water education outlet or have their project highlighted in an appropriate newsletter outlet. Key dates and milestones for Phase 3 are listed below.

- Post-competition survey – open online December 4, 2019 thru December 13, 2019
- Public recognition on social media and press release distribution – by December 15, 2019

COMPETITION GUIDELINES

PROJECT CATEGORIES

For this competition, the projects should fall within one of the following categories or across multiple categories. The competition is intended to be open-ended to allow for creative thinking. Potential projects are listed within each category to spark ideas and are not meant to be inclusive of all eligible projects.

FUN & CREATIVE

Inspire the public and campus community to engage with, relate to, and/or view water in a new way. Potential projects include:

- Storytelling (e.g., poetry, comic strip, short story, filmmaking)
- Music composition
- Socially engaged art (e.g., public mural, self-portrait)

INNOVATIVE TECHNOLOGY

Apply a novel, innovative technology that addresses one or more water issues. Potential projects include:

- Cost-effective, low energy use, on-campus water treatment system
- High-efficiency sprinkler head, irrigation equipment, and/or low-energy water sensor device
- Alternative water supplies (e.g., rainwater harvesting, raw water, recycled water)

DESIGN CHALLENGE

Reimagine the built environment by designing with water efficiency, water quality, and resiliency as priorities. Potential projects include:

- Water-wise landscaping design in the city streetscape
- Net zero water and/or building design for new development/redevelopment on campus
- Urban agriculture

RESEARCH & ANALYSIS

Explore a water research area and provide analysis to inform decision-making. Potential projects include:

- Alternative water supplies (e.g., rainwater harvesting, raw water, recycled water)
- Groundwater and/or vegetation health and building impacts
- Alternative water metrics to evaluate the true cost of water
- Return on investment of water education

PROJECT LOGISTICS

With the competition spanning multiple disciplines at MSU Denver, project logistics will be at the discretion of the faculty members within their individual classrooms. The number of students within each Project Team will vary by classroom and could range from individual students to entire classrooms depending on how the faculty member decides to integrate the project into the curriculum. Project outcomes can include concepts, proposals, prototypes, and/or written reports. Funding for project

materials and supplies may be provided by the faculty member and the department; the OWOW Center will not provide any project funding.

PROJECT COMPETITIONS

The first round of the competition judging will take place within the individual classrooms. The presentation method during the first round of judging will be decided by the faculty member for each classroom. One project will move on to the campus-wide competition from each participating classroom regardless of the department or project category being represented. Classrooms with only one participating team will not need to hold the first round of judging and will instead automatically proceed to the campus-wide judging.

The campus-wide competition will be held as a presentation and showcase open to the public from 8:30am to 12pm on December 4, 2019 in the Tivoli Student Union Turnhalle. Each Project Team will be designated a table to display their projects and will be expected to include both visual and verbal aspects. Displays can include a three-panel display board (36 inches tall by 48 inches wide) or another method of the students' choosing. Project Teams will have 30 minutes prior to the competition to set up their tables and 30 minutes following the competition to take down their tables. The first 2 hours of the program will include each Project Team providing a 5- to 10-minute presentation about their projects to the judges and any other attendees with an additional 5 to 10 minutes for the judges to ask questions. During the presentations, the judges will score the projects, and total scores will be tallied up following the presentations. The remaining time will be allotted for people to walk around the showcase, visit the display tables of the Project Teams, and ask any questions they may have. Winning projects will be announced at the end of the showcase.

Local television and other media networks will be invited to the showcase as well as students, faculty, staff, and the general public to expand the outreach and education benefits of the projects. In addition to the Project Team displays, the showcase will offer tables to other water organizations to further the community engagement of water issues. Potential organizations could include Denver Water, CWCB, the OWOW Center, and Colorado Water Wise, just to name a few. Actual tabling participation will be determined prior to the competition.

JUDGING CRITERIA

Classrooms with more than one Project Team will participate in the first round of judging. The first round will take place within each participating classroom and be conducted by the Project Teams. Faculty members will facilitate the classroom-level competitions and will tally the final scores; however, the faculty will not participate in the judging, except in the case of a tie. The method for breaking the tie will depend on the discretion of the faculty member and could include either a class vote or faculty decision. Each participating classroom will select a winner based on the highest score received. The grading for both rounds of judging will use the same evaluation rubric, which can be found in **Appendix D – Grading Rubric**.

The names and contact information of the winning Project Teams will be submitted by e-mail to the OWOW Center by 5 pm on Friday, November 8, 2019.

The second round of judging will take place campus-wide and will be judged by the Advisory Team as described previously.

Projects will be graded on their ability to:

- **CONNECT** their project to the purpose and objective of Colorado's Water Plan.
- **ENGAGE** students, staff, and the general public regarding water issues.
- **EDUCATE** by creating awareness of water issues through communication and knowledge-sharing.
- **EMPOWER** students, staff, and the general public by providing resources and tools for action on water issues.
- **REALIZE** an established level of feasibility for real-world integration.

AWARDS

As this is intended to be a creative competition, there is no requirement that any of the submitted projects will be implemented at MSU Denver. The top three winning projects selected by the Advisory Team will be awarded prize money to the respective departments in the amounts of $1,000 for first place and $500 for each second and third places.

INTELLECTUAL PROPERTY RIGHTS

The OWOW Center is required to adhere to the MSU Denver policy regarding intellectual property as relates to student work entered into the competition (MSU Denver Board of Trustees, 2019):

a. Assigned Tasks. The University will own the copyright to works created (i) by administrative /professional or classified staff members of the University in the course of their assigned duties or employment; (ii) by student employees in the course of their assigned duties ("student employees" includes students who work on a university-funded project, with or without academic credit), or (iii) by faculty members as part of an agreed assignment, when the assignment explicitly states that the work will be owned by the University.

APPENDIX A – RECRUITMENT E-MAILS

E-MAIL SIGNATURE GRAPHICS

DEPARTMENT & FACULTY RECRUITMENT

E-MAIL 1 – SEND BY 6/14

Subject Line: Sign up for Water Competition Fall 2019 – deadline July 26th!

Dear MSU Denver Faculty Members,

Help bridge the gap to meet our water challenges! The One World One Water Center invites you to sign-up your classroom(s) to participate in a campus-wide water competition this Fall semester. We are calling on the best and brightest – our students – to put their innovative, creative minds to work to tackle our water issues and be wise water stewards on campus and across Colorado.

Questions and want to sign up? E-mail Nona Shipman at nshipman@msudenver.edu with your interest, questions, and to sign up your classroom(s).

What kinds of projects? Customize a project that fits with your class's curriculum. This could be in the areas of:

Fun & Creative	Inspire the public and campus community to engage with, relate to, or view water in a new way.
Innovative Technology	Apply a novel, innovative technology that addresses one or more water issues.
Design Challenge	Reimagine our built environment by designing with water efficiency, water quality, and resiliency as priorities.
Research & Analysis	Explore a water research area and provide analysis to inform decision-making.

What is the timeline? Independent classroom projects will be implemented in October and November. The campus-wide, cross-disciplinary competition will be held in December.

Are there prizes? Yes! Prize funds will be awarded to the departments supporting winning projects: 1st - $1,000; 2nd - $500; 3rd - $500.

Get Rowdy!

SIGNATURE

E-MAIL 2 – SEND BY 6/28

Subject Line: Sign up for Water Competition Fall 2019 – deadline July 26th!

Dear MSU Denver Faculty Members,

The One World One Water Center invites you to sign-up your classroom(s) to participate in a campus-wide water competition this Fall semester. We are looking for interested faculty and departments to identify projects to implement in your classroom(s) this October and November that relate to an area of the Colorado Water Plan and/or the Auraria Campus Water Action Plan. Participating classrooms are then encouraged to enter a campus-wide, cross-disciplinary competition. Prize funds will be awarded to the winning departments: 1st - $1,000; 2nd - $500; 3rd - $500.

For more information, reference the attached flyer. E-mail Nona Shipman at nshipman@msudenver.edu with your interest, questions, and to sign up your classroom(s).

Get Rowdy!

SIGNATURE

E-MAIL 3 – SEND BY 7/12

Subject Line: Sign up for Water Competition Fall 2019 – deadline July 26th!

Dear MSU Denver Faculty Members,

Get rowdy to meet our water challenges! Join the One World One Water Center and sign up your classroom(s) to participate in a campus-wide water competition this Fall semester. The deadline to sign-up is Friday, July 26th.

Step 1: Identify potential projects to implement in your classroom(s) that relate to an area of the Colorado Water Plan and/or the Auraria Campus Water Action Plan.

Fun & Creative	Inspire the public and campus community to engage with, relate to, or view water in a new way.
Innovative Technology	Apply a novel, innovative technology that addresses one or more water issues.
Design Challenge	Reimagine our built environment by designing with water efficiency, water quality, and resiliency as priorities.
Research & Analysis	Explore a water research area and provide analysis to inform decision-making.

Step 2: E-mail Nona Shipman at nshipman@msudenver.edu to share your project ideas and sign-up your classroom(s).

Step 3: Roll-out projects in your classroom(s) this October and November.

Step 4: Participate in the campus-wide competition this December. Prize funds will be awarded to the winning departments: 1st - $1,000; 2nd - $500; 3rd - $500.

SIGNATURE

E-MAIL 4 – SEND BY 7/23

Subject Line: Last chance to sign up for Water Competition Fall 2019 – deadline THIS FRIDAY!

Dear MSU Denver Faculty Members,

Friendly reminder that this Friday, July 26, is the deadline to sign-up for our campus-wide water competition this Fall. E-mail Nona Shipman, nshipman@msudenver.edu, with your interest or for help answering any questions. You can find more information about the competition in the attached flyer.

We hope to have your participation. Make this competition a success and help make a difference with the Colorado Water Plan and/or the Auraria Campus Water Action Plan.

SIGNATURE

ADVISORY TEAM RECRUITMENT

E-MAIL 1 – SEND BY 7/9

Dear X,

The One World One Water Center invites you to participate on the Advisory Team for our Metropolitan State University of Denver (MSU Denver) student-driven water competition. We are challenging the best and brightest – our students – to put their innovative, creative minds to work to tackle our water issues and be wise water stewards on campus and across Colorado.

This Fall, MSU Denver Departments and Faculty will implement projects in their classrooms that relate to the Colorado Water Plan and/or the Auraria Campus Water Action Plan in the areas of:

Fun & Creative	Inspire the public and campus community to engage with, relate to, or view water in a new way.
Innovative Technology	Apply a novel, innovative technology that addresses one or more water issues.
Design Challenge	Reimagine our built environment by designing with water efficiency, water quality, and resiliency as priorities.
Research & Analysis	Explore a water research area and provide analysis to inform decision-making.

As an Advisory Team member, we are looking for your support by:

- Participating in at least two competition planning and implementation meetings beginning this August (approximately 2 hours/meeting).
- Supporting at least one water-related learning opportunity in a participating classroom (e.g., in-person visits, panels, videos) with information and materials provided
- Serving as a judge for the campus-wide competition (date tentatively week of 12/2/19) and selecting the final competition winners.
- Serving as an ambassador for the competition to spread the word and tap into your networks.

Get rowdy to meet our water challenges!

SIGNATURE

APPENDIX B – ADVISORY TEAM CLASSROOM VISIT MATERIAL

OUTLINE FOR CLASS VISIT DISCUSSION TOPICS

- Personal Introduction
  - Who are you?
  - What do you do?
  - How did you get there?
  - How does Colorado's Water Plan impact your work?
- Colorado Water Facts
  - Headwater state – no water flows in, all water flows out
  - 5.6 million people use water in Colorado to live, work, and play
  - 80% of Colorado's water flows west of the Continental Divide
  - 90% of Colorado's population live east of the Continental Divide
  - 500,000 ac-ft of water is moved from west to east each year
  - 88% of Colorado's water is used for agriculture/food production, which contributes to $41 billion of the state's economy
- Colorado's Water Plan
  - Plan overview
  - Main objectives (Colorado Water Conservation Board, 2015):
    - Supply – Reduce the projected 2050 municipal and industrial gap from 560,000 acre-feet to zero by 2030.
    - Agriculture – Support agricultural economic productivity and share 50,000 acre-feet using alternative transfer methods by 2030.
    - Funding – Sustainably fund the water plan by raising $100 million in revenue annually starting in 2020 ($3 billion by 2050).
    - Conservation – Achieve 400,000 acre-feet of municipal and industrial conservation of water by 2050.
    - Land Use – Ensure 75 percent of Coloradans live in water-saving communities by 2025.
    - Storage – Attain 400,000 acre-feet of water storage to manage and share conserved water by 2050.
    - **Education – Improve the level of public awareness by 2020 and engage Coloradans on key water challenges by 2050.**
    - Watershed – Cover 80 percent of all prioritized watersheds and rivers with a management plan by 2030.
    - Additional – Respond to and prepare for natural disasters, climate change, and energy needs while protecting interstate matters.
- Connection between competition and State Water Plan
  - Education objective listed above
  - Increasing awareness in young adults can activate change by the next generation
  - Involving young adults allows for new perspectives and ideas

APPENDIX C – COMPETITION SURVEY

The following survey will be used to gage the level of understanding of Colorado's Water Plan and perception of water issues prior to the competition and after the competition of all participants (faculty, staff, students, and professionals). The questions will be delivered through the online platform, SurveyMonkey.

PRE-COMPETITION SURVEY

1. How would you rank your existing knowledge of Colorado's Water Plan?

Expert – I know about Colorado's Water Plan and am familiar with some of its goals.

Average – I am aware that Colorado has a water plan.

Novice – I have never heard of Colorado's Water Plan.

2. How would you rank your level of water stewardship?

Water Steward – I work to protect and preserve the natural resources and encourage others to do the same.

Water Saver – I am conscious of my own water use and do my best to remember to conserve.

Water Novice – I don't feel knowledgeable about ways that I can protect natural resources or reduce my water use.

3. How important do you think it is for MSU Denver and the Auraria Campus to actively strive to reduce overall water use?

Very Important – It is a top priority to keep reducing water use.

Somewhat Important – Let's focus on easy ways to prevent water waste.

Not Important – We should be focusing on other things.

POST-COMPETITION SURVEY

8. How would you rank your existing knowledge of Colorado's Water Plan?

Expert – I know about Colorado's Water Plan and am familiar with some of its goals.

Average – I am aware that Colorado has a water plan.

Novice – I have never heard of Colorado's Water Plan.

9. Through this competition, what did you learn about Colorado's biggest water challenges and opportunities?
10. How would you rank your level of water stewardship?

Water Steward – I work to protect and preserve the natural resources and encourage others to do the same.

Water Saver – I am conscious of my own water use and do my best to remember to conserve.

Water Novice – I don't feel knowledgeable about ways that I can protect natural resources or reduce my water use.

11. Through the competition, what did you learn about how you can personally protect natural resources or better conserve water?
12. How important do you think it is for MSU Denver and the Auraria Campus to actively strive to reduce overall water use?

Very Important – It is a top priority to keep reducing water use.

Somewhat Important – Let's focus on easy ways to prevent water waste.

Not Important – We should be focusing on other things.

13. Through the competition, what did you learn about Auraria's water use and opportunities for improvement?
14. What other feedback about the student design competition do you have?

APPENDIX D – GRADING RUBRIC

See following page for Grading Rubric.

MSU Denver Student Design Campus Water Competition – Project Scoring Rubric

This rubric is to be used to grade the student design projects during both the Round 1 in-class competition as well as the Round 2 campus-wide competition. During Round 1, students will judge each other's projects within their respective classrooms, and one winning project will be selected from each classroom to proceed to Round 2. Round 2 judging will be conducted by the Advisory Team.

Category	5 – Exemplary	3 – Accomplished	1 – Developing	0 - Beginning	Score	Comments
CONNECT Connect to the purpose and objective of Colorado's Water Plan	*The project demonstrates an obvious connection to the purpose/ objective of Colorado's Water Plan and incorporates a solid understanding of Triple Bottom Line (social, economic, and environmental impacts).*	*The project demonstrates a subtle connection to the purpose/ objective of Colorado's Water Plan and incorporates some understanding of Triple Bottom Line (social, economic, and environmental impacts).*	*The project demonstrates a minimal connection the purpose/ objective of Colorado's Water Plan and incorporates a limited understanding of Triple Bottom Line (social, economic, and environmental impacts).*	*The project demonstrates no connection the purpose/objective of Colorado's Water Plan and incorporates an incomplete understanding of Triple Bottom Line (social, economic, and environmental impacts).*		
ENGAGE Get attention and involvement of students, staff, and general public regarding a water issue	*The project distinctly grabs attention and encourages students, staff, and general public to get involved in addressing water issues.*			*The project does not get the attention and involvement of students, staff, and general public to get involved in addressing water issues.*		
EDUCATE Create awareness of water issues through communication and knowledge sharing	*The project transforms how people learn about water issues on a deeper level and increases public understanding about how they can make a difference both on and off campus.*	*The project teaches people about water issues and increases public exposure to how they can make a difference on campus.*	*The project teaches people about the basics of water issues.*	*The project does not teach people about water issues.*		
EMPOWER Provide resources and tools for action on water issues	*The project provides ample recommendations for impactful water actions.*	*The project provides adequate recommendations for impactful water actions.*	*The project provides some recommendations for impactful water actions.*	*The project provides no recommendations for impactful water actions.*		
REALIZE Establish level of feasibility for real-world integration	*The project clearly identifies the level of feasibility required for real-world application based on projected budget, timeline, audience/ stakeholder group, and level of effort.*			*The project does not identify the level of feasibility required for real-world application.*		