

The REU on Sustainable Land and Water Resources 2020: a (Virtual) Tribal and Community-Based Participatory Research Experience

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Abstract

Like most NSF-funded Research Experience for Undergraduates (REU) programs, the REU on Sustainable Land and Water Resources (REU SLAWR) had to choose between a virtual experience in summer 2020, or cancellation of the program due to the Covid19 pandemic. The REU SLAWR was restructured into a modular online program designed to meet the same program goals that have shaped the REU SLAWR over the past 11 years. Using program evaluations from 2011-2019, the authors will compare the results from 2020 to build knowledge on how the REU experience in 2020 was differently structured to meet the need for a virtual program, the impact this had on participant and mentor outcomes, and what can be learned for future REU programs. This provides valuable information for creating accessibility to the REU experience. The REU usually takes place at three locations (Salish Kootenai College, MT; at the Univ. of Minnesota in Mpls. and Duluth, MN). The program is centered on tribally-focused Community-based Participatory Research (CBPR), and is a place-based REU. The REU SLAWR has always incorporated a virtual experience designed to create cross-team socialization, community-building, and widen participants' interest and knowledge about projects incorporating tribal CBPR. Summer 2020 immersed students, mentors, and tribal partners in a virtual learning environment. The PIs explored new methods for running an REU with virtual technology that will be incorporated in future programs for richer cross-team collaboration. A focus of the REU SLAWR has been to increase participants' abilities to work on diverse teams. Collaborating virtually across distances is a skill all researchers need. Training in this can benefit next-generation researchers and STEM workers. One aspect of concern and interest is the impact of redesigning the research projects to make them possible to conduct in a virtual space. The projects were fundamentally different than previous years, with many focusing on using pre-existing data. While there were negative impacts in some aspects of building research skills (i.e., little exposure to field or lab work), other aspects (i.e., computational modeling, communicating science) showed gains. The authors explore both the limits and possibilities inherent in virtual collaboration in research for undergraduate students.

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About the REU SLAWR
 The REU SLAWR is a tribally-focused REU program that emphasizes community-based research projects developed in

The 2020 Virtual REU
 The virtual REU was developed to maintain the feel of a regular REU SLAWR experience while keeping all participants safe and healthy. Every effort was made to

Elements of Place and Culture
 The REU SLAWR is centered on place and culture. The benefits of research that students can relate to their own culture or a place they love is well-documented (Samsen et al., 2019). The community-based research projects reinforce this aspect.

Implications
 The experience offered to students through an online or virtual Research Experience for Undergraduates is not an optimal research experience if the primary goal is seen as giving students hands-on experience in laboratory and field techniques. However, most REU

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2020 - The Year of Covid-19
 The challenge—how do we meet the REU's goals via a virtual REU experience?

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PRESENTED AT:



ABSTRACT



Like most NSF-funded Research Experience for Undergraduates (REU) programs, the REU on Sustainable Land and Water Resources (REU SLAWR) had to choose between a virtual experience in summer 2020, or cancellation of the program due to the Covid19 pandemic. The REU SLAWR was restructured into a modular online program designed to meet the same program goals that have shaped the REU SLAWR over the past 11 years. Using program evaluations from 2011-2019, the authors will compare the results from 2020 to build knowledge on how the REU experience in 2020 was differently structured to meet the need for a virtual program, the impact this had on participant and mentor outcomes, and what can be learned for future REU programs. This provides valuable information for creating accessibility to the REU experience. The REU usually takes place at three locations (Salish Kootenai College, MO; at the Univ. of Minnesota in Mpls. and Duluth, MN). The program is focused on tribally-focused Community-based Participatory Research (CBPR) and is a place-based REU. The REU SLAWR has always incorporated a virtual experience designed to create cross-team socialization, community-building, and widen participants' interest and knowledge about projects incorporating tribal CBPR. Summer 2020 immersed students, mentors, and tribal partners in a virtual learning environment. The PIs explored new methods for running an REU with virtual technology that will be incorporated in future programs for richer cross-team collaboration. A focus of the REU SLAWR has been to increase participants' abilities to work on diverse teams. Collaborating virtually across distances is a skill all researchers need. Training in this can benefit next-generation researchers and STEM workers. One aspect of concern and interest is the impact of redesigning the research projects to make them possible to conduct in a virtual space. The projects were fundamentally different than in previous years, with many focusing on using pre-existing data. While there were negative impacts in some aspects of building research skills (i.e., little exposure to field or lab work), other aspects (i.e., computational modeling, communicating science) showed gains. The authors explore both the limits and possibilities inherent in virtual collaboration in research for undergraduate students.

ABOUT THE REU SLAWR



The REU SLAWR is a tribally-focused REU program that emphasizes community-based research projects developed in collaboration with tribal partners. We have three teams in three locations, but make up a single community of support and encouragement.

Team SPAW



Team SPAW works with Salish Kootenai College on the Flathead Reservation near Pablo, Montana. Projects are developed in partnership with the Natural Resource Department of the Confederated Salish and Kootenai Tribes.

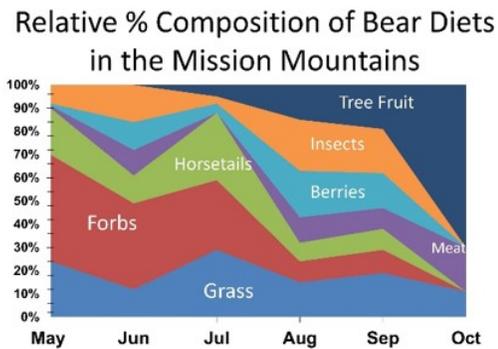
Project are developed in collaboration with the Confederated Salish and Kootenai Tribes of he Flathead Reservation.



Participants are encouraged to incorporate their families into the experience whenever possible.



Projects are often focused on traditional foods, and the relationship between humans, pollinators, and wildlife, such as the local bear population.



Team Zaaga'igan ("Lake" in Ojibwe)

Team Zaaga'igan works at the University of Minnesota in Duluth, Minnesota. Projects are developed in partnership with the Natural Resources Department of the Fond du Lac Band of Lake Superior Chippewa, and students spend several weeks on the FDL reservation shadowing the resource managers.



The projects are developed by Nancy Schuldt, Water Projects Coordinator for Fond du Lac Environment Division, and Nathan Johnson, Assoc. Professor of Civil Engineering at the University of Minnesota, Duluth.



Fond du Lac Resource Management



Team Zaaga'igan studies the impact of sulfides and sulfates on the development of manoomin (wild rice), an important cultural and food source for the Ojibwe people.



Team Stream



Team Stream works at the University of Minnesota with projects developed by faculty at the St. Anthony Falls Laboratory and other labs on campus. In the past few years, Team Stream projects have been mentored by scientists from the Department of Earth and Environmental Sciences and the

Department of Forest Resources, who are collaborating on the project Kawe Gidaa-naanaagadawendaamin Manoomin (First we Must Consider Manoomin - wild rice). This project is a collaboration with Minnesota and Wisconsin tribes to study wild rice but is focused on the process of collaboration as much as on the research itself (see Matson, et al., 2020 (<https://www.sciencedirect.com/science/article/pii/S1462901120313599>)). Students spend time in the laboratory, in the field, and visit our partner tribal communities.



THE 2020 VIRTUAL REU



The virtual REU was developed to maintain the feel of a regular REU SLAWR experience while keeping all participants safe and healthy. Every effort was made to maximize team building, support networking, and create a supportive advising structure. We wanted to make sure students were fully engaged while cognizant of the stresses inherent in a fully online program.

	A	B	C	D	E	F	G	H	I	J
1	STUDENT ZOOM									
2	Eastern	Times	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
3	ZOOM Monday	11-12noon		Between 11-2 pm			Between 11-2 pm			
4	11:00 AM-2:00 PM by appointment with science mentor	12-1pm		VC: Science/Team (1-3 hrs)	VC: All Team Meeting (2 hrs)	VC: All Team Meeting (2 hrs)	VC: Science/Team (1-3 hrs)	Independent Work Day		
5	WG 1, 2 & 3	1-2pm		science meetings scheduled by mentor during this time	12-1 Team presentations	1-2 Professional Development	1-2 science meetings scheduled by mentor during this time			
6	3:00-4:00 pm	2-3pm		break 1 hour 2-3pm	break 1 hour 2-3pm	break 1 hour 2-3pm	break 1 hour 2-3pm			
7	WG 3, 4 & 5	3-4pm		VC: WG 1,2,3: Student/Groups (Native) (1 hr) 3-4pm	VC: All Teams Fun explorations of place (1 hr) 3-4pm	VC: All Teams Seminar (1 hr) 3-4pm	VC: WG 7,8,9: Student/groups (Tech) (1-2 hrs) 3-5 pm			
8	ZOOM Tuesday	4-4:30 pm		break 30 minutes 4-4:30 pm						
9	All Teams	4:30-5 pm		VC: WG 4,5,6: Student/Groups (Pro Dev) (1 hr) 4:30-5:30 pm						
10	12:00-2:00 pm	5-5:30 pm								
11	All Teams									
12	3:00-4:00 pm									
13	ZOOM Wednesday									
14	All Teams									
15	12:00-2:00 pm									
16	All Teams									
17	3:00-4:00 pm									
18	ZOOM Thursday									
19	11:00 AM-2:00PM by appointment with science mentor									
20	WG 7, 8 & 9									
21	3:00-5:00 pm									
22										
23										
24										
25										

We developed a 10-week program with a structure that included:

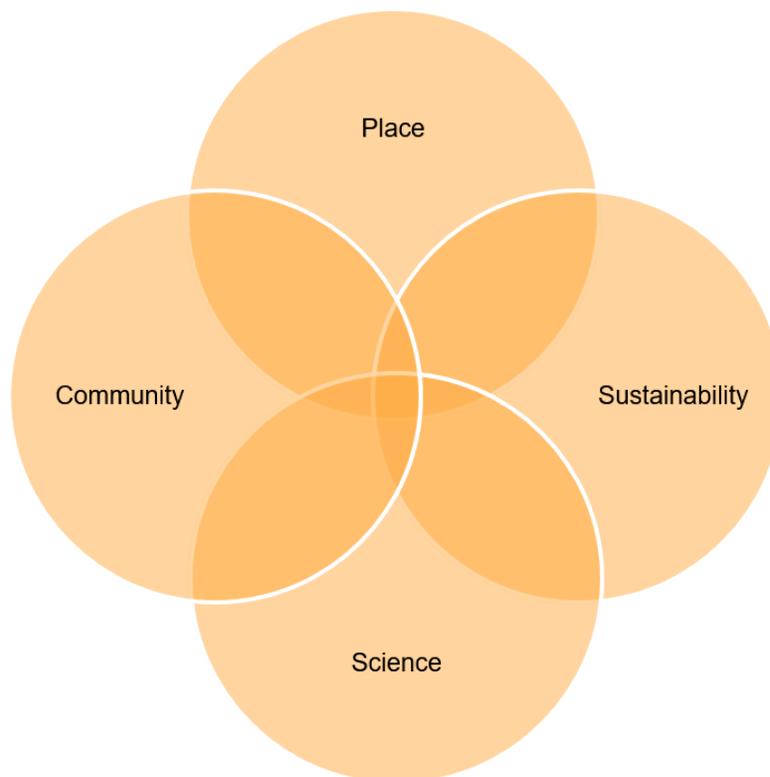
- Research Teams
- Weekly guest lectures
- Working groups
- “My Place” project using ARC GIS Story Maps
- Weekly Research Sharing Sessions
- Weekly Fun Sharing Sessions about Participants’ Home Places

ESRI Story Maps became a major feature of the REU, allowing students to learn and incorporate GIS mapping, and share information about themselves. We had training from the Univ. of MN's Uspatial

A major challenge was working across time zones, so we created a modular format, with blocked times for each type of activity (meeting with your science advisor and research teams, all-team meetings, seminar, sharing sessions).

ELEMENTS OF PLACE AND CULTURE

The REU SLAWR is centered on place and culture. The benefits of research that students can relate to their own culture or a place they love is well-documented (Semken et al., more). The community-based research projects reinforce this aspect.



A virtual REU posed real barriers to incorporating place and culture. Participants and mentors were scattered across the country. Opportunities to visit our partner reservations, camp at Glacier National Park, and to share their own cultures fell victim to travel bans.

A series of program elements were added to maintain culture and place at the center of the REU.

Our fun “My Place” project using GoPro and ESRI Story Maps

- Participants were trained in ESRI Story Mapping from Uspatial at the UMN.
- We provided all the participants with a GoPro Camera and a Garmin handheld GPS.
- Participants took videos around their home, the city, and of their family and loved ones. Some mounted the GoPro on their pets!
- We shared the videos and our developing story maps at 1-hour weekly fun sharing sessions.
- Students shared other aspects about themselves and had time to just talk.

Emphasis on Native Culture

- The REU SLAWR has always had Native American culture at the core of the program. In the virtual space, this was accomplished by:
 - Projects that were a continuation of tribal collaborations from past years.
 - Involvement of tribal partners in research projects, working groups, and weekly seminars.
 - We mailed manoomin from Fond du Lac to all participants and mentors so they could experience this important cultural food source from Minnesota.
 - We shared a virtual manoomin feast on the final day of the program.

- We encouraged all participants to talk about their backgrounds and culture and share that in their story maps.

Student feedback on these elements (from final interviews) was positive:

- *“Getting to use the GoPro and GPS really helped me discover the place I’ve been living for the duration of the REU.”*
- *“Sharing my place made me feel more connected to it.”*
- *“This REU allowed me to learn more about my state through my personal story map and to really appreciate its beauty. Although I live in the city, this state really has a lot to offer when it comes to nature and the environment.”*
- *“Receiving the GoPro and taking footage of my neighborhood and the outdoors made me appreciate it more.”*

IMPLICATIONS



The experience offered to students through an online or virtual Research Experience for Undergraduates is not an optimal research experience if the primary goal is seen as giving students hands-on experience in laboratory and field techniques. However, most REU programs have a much wider range of goals for their students which include engagement in STEM fields, an improved understanding of the research process, developing a student's identity as a science researcher, giving guidance for preparing for graduate school or careers, and developing an understanding of research ethics, then much can be accomplished by a completely virtual program.

In addition, because projects must be developed that can be completed remotely, it opens the door for greater emphasis on the kinds of computational and modeling research that is actually becoming more dominant in most areas of science. Students do not need to miss out on key elements of the program, such as team-building, incorporation of culture and place, and professional development if the program leaders build the program around their basic goals and develop alternate means of presenting these key elements.

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Thanks to all of the science mentors who supported students this year:

Team SPAW



Dr. Antony Berthelote, Head, Hydrology Dept., Salish Kootenai College

Dr. Janene Lichtenburg, Head, Wildlife and Fisheries Dept., Salish Kootenai College

Drew Grennell, Instructor, Salish Kootenai College

Dennis Lichtenberg, Adjunct Faculty, Wildlife and Fisheries Dept., Salish Kootenai College

Rebekah Brassfield, Graduate Student, University of Montana

Teams Redwood and Hydro (new to the REU in 2020)



Dr. Nievita Bueno Watts, Director INRSEP + Diversity in STEM Programs, Humboldt State University

Dr. James Graham, Professor, Environmental Science and Management, Humboldt State University

Dr. Ruth Saunders, Assist. Professor, Physics Dept., Humboldt State University

Dr. Sean Craig, Professor, Invertebrate Geology, Humboldt State University

Dr. Alexandru Tomescu, Professor, Plant Morphology, Anatomy, and Paleobotany,

Humboldt State University

Dr. Cassie Bowman, Assoc. Professor, School of Earth and Space Exploration, Arizona State University

Dr. Yadong Zheng, Postdoctoral Researcher, St. Anthony Falls Laboratory, University of Minnesota

Dr. Ardeshir Ebtejah, Assist. Professor, Dept. of Civil, Environmental, and Geo Engineering, University of Minnesota

Team Stream



Dr. Gene-Hua Crystal Ng, Assoc.

Professor, Dept. of Earth and Environmental Science, University of Minnesota

Dr. Michael Dockry, Assist. Professor, Department of Forest Resources, University of Minnesota

Dr. Mae Davenport, Professor, Dept. of Forest Resources, University of Minnesota

Madelyne Nyburg, Graduate Student, Dept. of Earth and Environmental Sciences, University of Minnesota

Hannah Jo King, Graduate Student, Dept. of Earth and Environmental Sciences, University of Minnesota

Darrin Voigt, 1854 Treaty Authority, Duluth, MN

William "Joe" Graveen and Eric Chapman, Lac du Flambeau Band of Lake Superior Chippewa

Team Zaaga'igan



Dr. Nathan Johnson, Assoc. Professor, Civil Engineering, University of Minnesota, Duluth

Nancy Scholdt, Water Projects Coordinator, Fond du Lac Environmental Division, Fond du Lac Band of Lake Superior Chippewa

Dr. Sophie La-Fond Hudson, recent graduate, Dept. of Civil Engineering, University of Minnesota, Duluth

Thanks to our Working Group Leaders (not already mentioned above)

Lowana Greensky, gidakiimanaaniwigamig Program

Dr. Jason McLachlan, Assoc. Professor, Dept. of Biological Sciences, Notre Dame University

Thanks to our program evaluator:

Emily Geraghty Ward, Assoc. Professor, Dept. of Geology, Rocky Mountain College

Thanks also to our tribal partners:



Fond du Lac Resource Management



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