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REPORT



Impact of a Wildlife Conservation Immersion Event on Youth of Color

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ABSTRACT

We implemented an experiential wildlife conservation immersion program at Colorado State University Campus with high school students identifying as girls and gender non-conforming youth of color with the goal of attracting minoritized youth to wildlife conservation studies. To evaluate the impact of the program, we collected daily written reflections, pre/post, surveys, and interviews (pre, during, and post the event). Our evaluation of the program demonstrated that our objectives (increasing a sense of belonging with others with shared minoritized identities, knowledge of social-ecological systems, understanding of diversity, equity, inclusion, and justice issues related to wildlife conservation, and skills in leadership and communication) were met. We also conclude that experiential immersion events for minoritized youth can help not only bridge the connection between K-12 educational institutions and higher institutions by creating greater awareness of wildlife conservation among the youth but also elicit the unique world views and experiences they could bring to jobs in this field.

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Introduction

Without diversifying the field of environmental science, only some perspectives of the value of nature and people's relationship with it will drive policy and practices aimed at preserving biological diversity (Pretty and Smith 2004; Green et al. 2015; Rudd et al. 2021). The early environmental movement in the U.S. privileged white men and oppressed people of color and women (Bowser et al. 2012; Stapleton 2020). As a result, many people of color feel excluded, isolated or stereotyped in the field of wildlife conservation and related academic spaces (Taylor 2015; Bailey, Morales, and Newberry 2020), and women conservation professionals report being excluded or experiencing bias in their work spaces (Jones and Solomon 2019). Despite an interest among women of color in contributing to conservation movements (Taylor 2015), social barriers exist that discourage them from doing so (Bailey, Morales, and Newberry 2020). A lack of representation of Black, Indigenous, and people of color (BIPOC) in environmental and conservation sciences

leads to a limited pool of mentors to support the next generation of potential conservationists (Stapleton 2020). Some argue that conservation should reflect the voices and perspectives of diverse community members (Bailey et al. 2020), and some BIPOC believe that outdoor recreation and conservation are only meant for white people (Warren et al. 2014).

This challenge underscores the urgency of addressing diversity gaps in conservation science and education to foster equitable representation and innovative solutions in environmental stewardship. In 2015, 38% of the population identified as an ethnic/racial minority, but only 12% of leaders in non-governmental organizations (NGOs), environmental academic institutions, and public agencies were ethnic/racial minorities (Taylor 2015). A more recent survey of Green 2.0 (2024) shows that 36.5% of environmental NGO staff are people of color, while 61.8% of Senior staff and 69% of Heads of NGOs are white. Black and Hispanic workers make up only 5% each of the natural resource science workforce and only 2% and 4%, respectively, of the conservation science workforce, despite making

up 11% and 17% of the general US workforce (Fry, Kennedy, and Funk 2021). Many identities are also underrepresented in natural resources and conservation sciences at the graduate student level, including Black (3% versus 14% of the US population), Hispanic or Latino (8% versus 19%), American Indian or Alaska Native (0.8% versus 1.3%), Asian (3% versus 6.3%), and Native Hawaiian or Pacific Islander (0.1% versus 0.3%; National Center for Science and Engineering Statistics 2021).

This diversity gap begins early evidenced by low numbers of BIPOC individuals enrolled in conservation and natural resource degree programs in higher education. In 2012, only 2% of undergraduate enrollment in natural resource programs comprised Black students, while Native American and Hispanic students represented a mere 1% and 5%, respectively (Sharik et al. 2015). In 2024, the average enrollment of ethnic/racial minorities in environmental conservation degree programs was only 17%, while the number of women has increased to 46.6% (Bullard, Walker, and Burger 2024). However, women continue to face bias and discrimination in these fields (Jones and Solomon 2019). Also often overlooked is the low representation of Asian Americans in environmental sciences (Kou-Giesbrecht 2020) despite examples of Asian Americans disproportionately being negatively impacted by pollution and being the fastest growing community of color in the U.S. (Grineski, Collins, and Morales 2017; Museus, Maramba, and Teranishi 2013). These statistics, and our shared identities as women and/or BIPOC scientists and educators, inspired our team to design a meaningful wildlife immersion program to introduce youth to diversity in conservation biology with early input from school district colleagues (Cicchino et al. 2023).

Program

Our wildlife immersion program was informed by sense of belonging theory because our focus was on students of marginalized identities. Sense of belonging in educational programs is key to student well-being and requires experiences that make them feel needed and valued, and like they fit in with others and the environment (Hagerty et al. 1992; Osterman 2000; Museus, Yi, and Saelua 2018). This is critical for youth of color who are typically stereotyped and do not feel like they fit into STEM fields (Gopalan and Brady 2019; Rainey et al. 2018). We designed the program for youth of color to explore both wildlife conservation as a field and their own intersectional

identities. The program had four objectives: (1) Foster a sense of belonging; (2) build leadership skills; (3) foster awareness of social-ecological systems; and (4) foster awareness of diversity, equity, inclusion and justice (DEIJ).

This program was implemented immediately at the end of the high school year at Colorado State University (CSU) Mountain Campus, and the main campus for 3 days/nights. We collaborated with a local school district English Language Development Advocate who helped recruit participants through a recruitment call and his academic network. Eight high school students, between the ages of 15–17, who identified as girls (7) and gender non-binary (1) youth of color (2 Asian, 5 Latina, and 1 mixed race) were selected through the application process. The students were paid a \$500 stipend for their participation in the program to reduce potential financial barriers.

Our team includes scientists and educators who are women and/or BIPOC and are experts in diversity, equity, inclusion and justice (DEIJ), social science, wildlife conservation, conservation education, and youth science. Three team members who identify as women of color were selected to lead the program because they could serve as role models, had prior experience working with youth, and could foster a sense of belonging among the students and within wildlife conservation.

Activities

High school youth (ages 14–17) are at an age when they begin to think about how to integrate their various interests into future plans (Aloisio et al. 2018). In social settings, youth often share their interests with those with similar identities. For example, girls can feel disadvantaged compared to boys in outdoor experiential education, so experiences with other girls can feel more supportive (Warren et al. 2014). Similarly, gender non-binary people have been historically excluded, so including this population was important for our team (Lundin and Bombaci 2023). In addition, programs (like Project TRUE) are successful because they were designed for racial minoritized youth to explore environmental interests with mentoring from role models with similar identities (Aloisio et al. 2018). Creating a safe space where youth feel comfortable discussing DEIJ issues with others creates a welcoming environment for them to consider pursuing conservation careers (Torres and Bingham 2008; Warren et al. 2014; Stapleton 2020).

Hence, to address objective one, foster sense of belonging, we recruited mentors with shared identities and focused on a sense of belonging. Drawing on recommendations in the research literature, we recruited three Biology PhD students who identify as women of color to lead the program and activities. The shared identities between youth and the event leaders were meant to foster strong relationships and a sense of belonging for the youth. We also leveraged our partnership with the local school district in which the youth were enrolled. The school district has led a successful outdoor program for the past several decades with members from our university. However, it is not designed around minoritized youth or high school students. Through meaningful conversations with the district's Science Curriculum Facilitator, we collaboratively identified what experiences were motivating for their younger (elementary to middle school) students and which could be modified to suit the needs of teenage participants (Cicchino et al. 2023). The district English Language Development Advocate, whose job involves ensuring that minority students feel supported, helped us foreground activities centered on increasing confidence and collaboration, further addressing objective one.

Initial bonding activities involved ropes challenge courses offered by the University's Mountain Campus, which also helped meet objective two, building leadership skills. The ropes challenge course fosters team building and personal growth through high and low elements. Focal points are risk-taking, communication, group problem-solving, and leadership skills. The lower ropes course took place on day one and included the Mars Rover Activity, Search and Rescue, and Helium Tent Pole, all of which required the students to work in teams to find solutions to the activities. These low-element challenges emphasized teamwork and effective communication. The high ropes course took place on day two and provided an opportunity for personal challenge and growth, and high-risk trust and leadership development. Students climbed 40-foot walls and poles, swung from high levels, and free-fell while others supported their harnesses and cheered them on. Building self-confidence and trust are key components of leadership skill development and the ropes challenge courses enabled the youth to bond with one another and with the event leaders as they developed these skills.

To meet objective 3, foster awareness of social-ecological systems, we designed hands-on activities for students to investigate life like scientists. Students surveyed stream macroinvertebrates, and went on bird

walks to identify birds (using Merlin Bird ID app Version 3.0, developed by the Cornell Lab of Ornithology), following PowerPoint presentations of these wildlife. They also learned about mountain plants and ecosystems during biodiversity walks. On the final day, they toured teaching and research labs of the University main campus. We designed these activities to reinforce the interconnectedness of wildlife and ecosystems. All three leaders shared examples from their graduate research as well, including climate change impacts on birds and ecosystems.

To meet objective 4, the leaders and youth discussed the importance of DEIJ issues in social-ecological systems studies. The leaders first delivered a presentation on the history of the U.S. conservation movement, uncovering racism oppression and exclusion of diverse identities. This is not typically shared in high school or college level curricula because conservation-related topics are often told from a white perspective (Stapleton 2020). After the presentation, the youth were encouraged to think beyond their racial identity as they were introduced to the concept of intersectionality and how BIPOC and women conservation scientists face hurdles in this field (Jones and Solomon 2019; James et al. 2023). The leaders asked students to reflect on their own identities as women and non-binary youth of color, and they discussed implicit biases within their own lives and in conservation biology. To enhance their understanding of socio-ecological systems, and how humans are a part of ecological systems, the students were encouraged to connect biodiversity within ecosystems with racial diversity in social environments throughout the event.

Evaluation

To evaluate the program, we primarily drew on social science qualitative methodology (Newing 2011), and sense of belonging theory described earlier. Data collection included pre and post event surveys, daily written reflections, post event interviews, and a 6-month follow-up interview (Table 1). The post-event and follow-up interviews lasted roughly 45–60 min. The graduate student leaders also documented observations and recorded field notes during the event. The surveys elicited socio-ecological systems knowledge, DEIJ and conservation knowledge, and interest in wildlife conservation before and after the event. The post survey also included questions about the most impactful and inspiring aspects of the event. The reflections and interviews helped assess the

Table 1. Survey, reflection, and interview themes and questions.

Themes	Pre-event Survey	Post-event Survey	Reflections (3)	Post-event Interview	Follow-up Interview
Perspectives on and attitudes toward wildlife conservation	X	X	X	X	X
Perspectives on DEIJ	X	X		X	X
Experiences with wildlife or outdoor recreation	X	X		X	X
Interest in pursuing wildlife conservation	X	X		X	X
Goals for event and learning, memorable, and inspirational experiences throughout	X	X	X	X	X
Feelings of pride and discomfort during event activities			X		X
How youth were inspired by the group at the event					X
Future learning interests inspired by the event			X		X
Survey questions					
1. What does wildlife conservation mean to you?					
2. What does diversity, equity, inclusion, and justice (DEIJ) mean to you?					
3. What do you think DEIJ has to do with wildlife conservation?					
4. What is your most memorable experience learning about, or engaging with wildlife? How did it make you feel?					
5. If you participate in nature outdoor recreation, what activities do you enjoy and how often do you do them?					
6. Do you feel you would be a good fit for a job in wildlife conservation? Why or why not?					
7. Do you have a desire to pursue a degree in wildlife conservation? Why or why not?					
8. What did you learn from this 3-day immersion event? (<i>post</i>)					
9. What topics or aspects inspired you the most from the 3-day event? (<i>post</i>)					
10. What is the first thing you are going to tell your friends or parents when you get back home? (<i>post</i>)					
11. How could the event be improved? (<i>post</i>)					
Reflections and post event interview questions					
1. What was your greatest learning experience today?					
2. What inspired you the most today?					
3. What did you learn about today that you never thought about before?					
4. Has your thinking or knowledge of wildlife conservation changed today compared to before the event? Or yesterday? How so?					
5. What made you feel uncomfortable today/from the event (if any) & why?					
6. What are you most proud of today?					
7. What would you like to learn more about & why?					
Follow-up interview questions					
1. What was your greatest learning experience from the event?					
2. What inspired you the most from the event?					
3. What did you learn about from the event that you never thought about before?					
4. Has your thinking or knowledge of wildlife conservation changed compared to before the event? How so?					
5. What career field are you interested in pursuing after graduation? What got you interested in that?					
6. What is a learning experience or piece of knowledge that you will remember and has stuck with you since the event?					
7. During the event, was there an experience or something you learned that you think challenged your beliefs? In what ways?					
8. How do you feel about wildlife and wildlife conservation now?					
9. How do you think learning alongside a group of BIPOC youth influenced how you felt about the event or how you felt about what you were learning at the event?					

effectiveness of the group dynamics in creating a welcoming environment, which daily activities were most meaningful and impactful, in what ways their knowledge and attitudes towards DEIJ in conservation biology changed, and if they desired to pursue education or careers in wildlife conservation. Our protocol (#4487) was approved by the CSU Institutional Review Board for research ethics and compliance for recruitment and consent of minors.

We conducted a thematic analysis using MaxQDA Analytics Pro 24 to identify salient patterns in the

youth's perceptions of the program. The data were deductively coded to identify common themes that aligned with the project's objectives, after which sub-themes were inductively drawn (Saldana 2009). Five team members engaged in peer debriefing to ensure agreement with the findings.

Findings

We found that this short, but purposefully designed program, met all four program objectives. The major

themes aligning with the program objectives include increased 1) feelings of belonging, 2) knowledge of social-ecological systems, 3) knowledge of DEIJ issues related to wildlife conservation, and 4) confidence in leadership knowledge and skills (Table 2).

Sense of belonging

Participants described a sense of belonging when surrounded by others with similar identities. This was illustrated during participant post interviews. For example, participant 7 said, “My most memorable experiences on this trip were just walking around with people that looked like me, people who could share that with me.” Participant 8 shared, “Connecting with other BIPOC was one of the most inspiring things to me. Seeing other people who are like me being interested in the same stuff really inspired me.” The youths’ sense of belonging during the event also came from their perceptions of the event leaders as inspirational mentors. Participant 4 wrote in their reflection: “[It] has been really great learning about what [the leaders] do, and they are inspirational to me, and some people to look up to because they are women of color.” Participant 5 explained in the post interview that “... I’ve never really clicked that much with people in one day.” This was a common sentiment among the participants.

Leadership

Participants shared how communication and teamwork were key in building leadership skills, which was particularly important for the ropes challenge courses. For example, Participant 6 wrote in one of the daily reflections, “Communication [was my greatest learning experience today], since we do lots of teamwork

activities and I know communication is so important when we want something to be successful.” Other students discussed that teamwork helps overcome challenges and that the diversity of communication styles among their peers was inspirational. Another student explained that while the importance of teamwork was not a novel concept, their experience developing leadership was expanded during the event.

The participants were proud of being empathic and inspired by others’ kindness and support and wrote about this in their reflections. Participant 2, for example, shared that, “when I talk to [participant 4] in Spanish, I feel like someone who is using what they have for a good rather than just speaking English to her ... It inspired me to use my good more often.” Communication and support allowed the youth to persevere. Participant 4 described that “having a supportive group does a lot like in the ropes course – it was scary, but with the help from my peers it made it a little better.” Participant 3 explained that they were able to overcome personal challenges during ropes course activities: “I learned that sometimes fear is just fear, it doesn’t hurt you. Sometimes, fear can give you good experiences that are nice and you can have fun.”

Social-ecological systems

Learning about ecological systems increased student interest in learning more. Participant 2 wrote in a reflection “I learned [that] I actually like to look at those water bugs and discuss what they are, what they look like, and what differs each.” Participant 5 discovered birding: “I always saw birds as birds. I never thought there were different types of birds like the warbler ... I like that all of them have their own effects on how they impact the environment” (post-interview). Participant 6 explained in a follow-up

Table 2. Codebook from data collected from students using a sense of belonging framework.

Themes	Subthemes	Description
Sense of belonging	Relatability Mentorship	Inspired by being able to relate to other youth Feeling of mentorship from BIPOC leaders
Realizations of social-ecological systems	Social safety	Feeling of safety within the event group
	Wildlife	Interested in facts learned about wildlife or interactions with wildlife during the event
	Interconnectedness	Realizations that ecosystems and society are multi-scalar and interconnected
	Sustainability Enjoyment of nature	Realizations that sustainable actions matter Personal positive experiences interacting with nature throughout the event
Awareness of DEIJ issues in wildlife conservation	Racist history	Newfound awareness of racist history of wildlife conservation
	Inclusion	Newfound perspective that BIPOC inclusion in conservation is important
Leadership knowledge and skills	Teamwork	Building teamwork and communication skills
	Kindness	Inspired to be kind and supportive to others
	Perseverance	Realizations on the importance of perseverance

interview that touring the university teaching collection was inspiring: “that teaching lab allowed me to know more about the animals in detail and know how they look up close. And then it just made me more interested in animals because they were lovely.”

Embedded within the wildlife activities were lessons on the interconnectedness of ecological systems and people. Students described social-ecological systems in their post-interviews. Participant 4 shared: “without the little bugs or the birds, I wouldn’t be here. They’re what keep the world going.” In turn, Participant 5 explained that she learned “if something is wrong with a certain [species], we can see how it impacts the bigger [species] ... and we can always prevent [biodiversity loss] from going any further.” The youth explained that as they discussed how people impact and are impacted by wildlife increased their curiosity about how they can act sustainably to protect wildlife. They were also inspired by the figurative symbolism that connects social systems and ecosystems. Some students noted that macroinvertebrates are often underappreciated as crucial components of ecosystems in the same way that BIPOC and others with diverse identities are often underappreciated for their roles in social systems.

Participants learned that sustainable actions matter. Participant 1 explained in the follow-up interview “before I went on the trip, I actually didn’t know too much about [wildlife conservation] and I hadn’t thought about it too much ... But after going on the trip, it made me think about how we need to take care of our environment.” This participant explained that she places visible materials on her windows to prevent birds from flying into them. Others told us that since the event, they walk instead of drive, are more conscious about recycling and composting, and talk to peers about environmental issues. Many participants felt inspired by the event to act more sustainably because they realized their actions could help protect wildlife and habitats.

All the participants described positive perceptions of spending time outdoors during their post-interviews. Participant 7, for example, shared that “just being in nature and being in this place, ... I felt like part of something bigger.” Participant 4 shared her sense of biophilia: “it really makes you appreciate things more, learning to love the world around you -not only the animals and the plants, but [also] my peers and even myself, too.”

DEIJ in wildlife conservation

All participants described an increased awareness of DEIJ and wildlife conservation to one another in

conversations and in reflections and interviews. The presentation along with discussions on DEIJ changed student perspectives from lack of knowledge of the issue toward deeper understanding and the importance of BIPOC inclusion in wildlife conservation. For example, Participant 7 described in the post interview: “I think paying attention to past events from when settlers came and took land, rights, and resources away from Indigenous people. Then how rules were emplaced to ‘protect’ nature when, in actuality, there were biased motives behind those rules.” Other students, during their respective post interviews, recalled from discussions that some environmentalists who started conservation movements in the U.S. were racist, leaving a legacy of racism in conservation fields today. Participant 8 explained: “it’s very important that we get people from all different places and perspectives to look at [wildlife conservation issues] because we will learn so much more from so many different people.” Participant 1 spoke about representation in the field: “I think we don’t have enough POC in wildlife conservation, and you don’t picture POC when you think of it, so we need to include more POC.”

Discussion and conclusions

Our program was successful in meeting our objectives as all students provided responses that substantiated the goals. Participating youth expressed a strong sense of belonging with one another and in the learning spaces; they demonstrated teamwork and leadership skills; they developed an awareness of social-ecological systems; and awareness of DEIJ issues as they relate to conservation. Our findings are consistent with other reports that immersive experiential education has a positive impact on youth’s learning and sense of self (Aloisio et al. 2018; Stern, Powell, and Frensley 2022). The participants described an immediate sense of belonging, attributing this feeling to shared identities with the event leaders and peers. This allowed them to share their thoughts and feelings in ways they would not have, had the event not been focused on their intersectional identities as girls/gender non-conforming BIPOC (Aloisio et al. 2018; Ashley Parra et al. 2024). This is consistent with Stern, Powell, and Frensley’s (2022) study that examined patterns of multiple groups of students who experienced environmental education, and non-white students experienced higher satisfaction when their program was led by non-white educators.

Our program also included several aspects that Bullard et al. (2024) indicate are important in educational programs for youth. These include hands on wildlife science activities in nature that were fun yet challenging and involved teamwork, explored real life issues of DEIJ and conservation and challenged stereotypes, involved expert leaders and relevant role models, and shared wildlife career inspiration. Productive immersive education programs involve engaging youth in hands-on learning that is socially meaningful through shared identity and purpose, which we provided and this can have a lasting impact on these youth of color (NRC 2015, 25).

Additionally, youth awareness of social-ecological systems (SES) and the development of outdoor leadership skills allowed students to learn about wildlife conservation topics and develop some of the skills necessary to engage in sustainability activities. Students experienced a sense of embodiment within SES as they expressed the importance of the diversity of organisms within ecosystems and the diversity of humans (themselves) as part of that system contributing to sustainability. Project TRUE used a similar place-based learning model to ours that fostered students' interests in ecological sciences and allowed them to develop stronger ecological literacy, making for more environmentally informed citizens (Aloisio et al. 2018). While our program inspired youth to learn more about wildlife and to act sustainably, a few of the students wished they had learned more about how exactly to do so. Although none of the participants expressed a desire to study wildlife conservation in college, most shared that they plan to incorporate something they learned from the event in their career, especially issues related to DEIJ.

Increasing awareness of DEIJ issues relating to conservation including the oppressive history of wildlife conservation and inequities that still exist today, because of this historical oppression, is important (Torres and Bingham 2008). Learning about conservation's racist history may initially be troubling to students who were unaware of the issue, but they then gain a deep interest in learning more to address social injustices and become change-makers for the future of conservation (Warren et al. 2014; Bailey, Morales, and Newberry 2020). Furthermore, it is critical that conservation educators and scientists proactively contribute to this change through education and outreach programs for pre-college-age BIPOC youth, as we have demonstrated through our program (Rudd et al. 2021).

Lastly, the youths' evaluation and responses to this program have allowed us to adapt our plans for future iterations. While we had only eight students which may be a caveat for the generalizability of our study, the success of this project in reaching its objectives indicates that the event structure should remain the same or similar in future iterations. We learned that the shared intersectional identities of the leaders with participants were important as well as the student-mentor ratio. We also learned that participants' identities were more complex than what our team focused on (gender and ethnicity). In fact, some of the participants described the complexity of identifying as mixed-race or being raised by adoptive white parents. Hence, we will ensure that future programming allows students to share what avowed identities matter to them and how these may conflict with ascribed identities. We also hope to recruit some of the alumnae participants to become near-peer leaders for subsequent programs, as this can reinforce the sense of community and belonging. Finally, the participants resoundingly asked us to continue to partner with the school district to offer future events. We are inspired by their enthusiasm.

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The authors declare no conflict of interest in this work.

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