Diversity Assessment

of the North American Carbon Program:

Summary + Perspective

March 2022

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On behalf of the NACP Scientific Leadership Group (SLG)

INTRODUCTION

In early 2021, the Scientific Leadership Group (SLG) of the North American Carbon Program (NACP) conducted a voluntary survey to assess the diversity, experiences, and interests of its membership with respect to equity, inclusion and accessibility. This report presents the methodology, results, and includes a discussion, acknowledgement, and proposed actions for the SLG, NACP as a community of practice, and individual NACP members as part of the larger scientific community. The survey results reflect the ways in which the NACP community is similar to and different from overall North American (specifically US, where most of the current NACP community resides) demographics across race/ethnicity and gender, LGBTQ+ and disability status. We[1] aim to identify ways to shift the NACP community towards a better reflection of the overall US demographics, to create a more just and fair organization. We believe the quality, impact and effectiveness of science will benefit from a more supportive and inclusive research environment. But beyond the "business case" for addressing racism and discrimination, there is the moral imperative to affirm human dignity and counter current and historic injustices (Haacker et al. 2022). For this report, we found the figure on the next page to be a useful visualization of the differences between equality, equity, and justice

There has been growing recognition of the historic and ongoing impacts of systemic bias, discrimination, and inequality in our society, and there is ample evidence that barriers exist for some members of our community, as well as within the STEM (Science, Technology, Engineering and Math) disciplines (Berhe et al. 2021, Woolston 2021, Barber et al. 2020)[2]. Many individuals, organizations, professional societies, and institutions have been confronting the ways in which they may have both benefited from and been harmed by these injustices, and various efforts have been made to redress these and prevent further discrimination and exclusion. The STEM fields are one arena where lack of diversity is pervasive (Pew Research Center, 2021) despite efforts to increase participation and inclusion. The North American Carbon Program (NACP) is a community drawn mainly from the earth, atmospheric, and ocean sciences, for which a recent study has found that there has been "no progress on diversity in 40 years" (Bernard and Cooperdock, 2018).

[1] Throughout this report, the authors use the term "we." The authors wrote the report in consultation with the NACP SLG. It is our hope that the conclusions and action plans presented will be adopted by the larger "we" of the NACP community.

[2] If the prior citations are not convincing enough and the reader is skeptical about the existence of racism and discrimination in STEM, the impacts of racism, discrimination, and exclusion both on individual members of the community and on the science itself, we strongly urge the reader to review Gosztyla et al. 2021. Responses to 10 common criticisms of anti-racism action in STEMM. *PLOS Computational Biology* 17, e1009141. https://doi.org/10.1371/journal.pcbi.1009141

On January 20, 2021, the US White House released an Executive Order (EO) titled Advancing Racial Equity and Support for Underserved Communities throughout the Federal Government (Exec. Order 13985, 2021). The order states, “Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies... must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity,” and calls on Federal agencies to “assess whether, and to what extent, its programs and policies perpetuate systemic barriers to opportunities and benefits for people of color and other underserved groups.” The EO further notes that many Federal datasets are not disaggregated by race, ethnicity, gender, disability, income, veteran status, or other key demographic variables. This lack of data has cascading effects and impedes efforts to measure and advance equity. A first step to promoting equity in Government action is to gather the data necessary to inform that effort.” There have been other related US federal actions and guidance, including EO 14008, Tackling the Climate Crisis at Home and Abroad, and the Office of Management and Budget (OMB) Memorandum on Interim Implementation Guidance for the Justice40 Initiative, which state that “‘40 percent of the overall benefits’ of federal investments from covered programs should flow to disadvantaged communities.” One important component of this whole-of-government approach is to define and identify “overburdened and underserved” communities, and then take steps to assess when and if at least 40 percent of benefits are accruing to these communities. Of necessity, this requires baseline data about current levels of participation or service. Many, if not most, members of the NACP community receive US federal funding for their work, and the NACP Office and Coordinator are hosted by NASA Goddard Space Flight Center, so the goals and intent of this EO are especially relevant for the NACP and the global change research enterprise which receives coordinated US federal research funding in accordance with the Global Change Research Act (1990). Thus, in early 2021, members of the NACP Science Leadership Group (SLG) and the Meeting Planning Committee of the 7th NACP Open Science Meeting (OSM) designed a survey to assess the diversity, needs, and interests of the NACP community.[3]

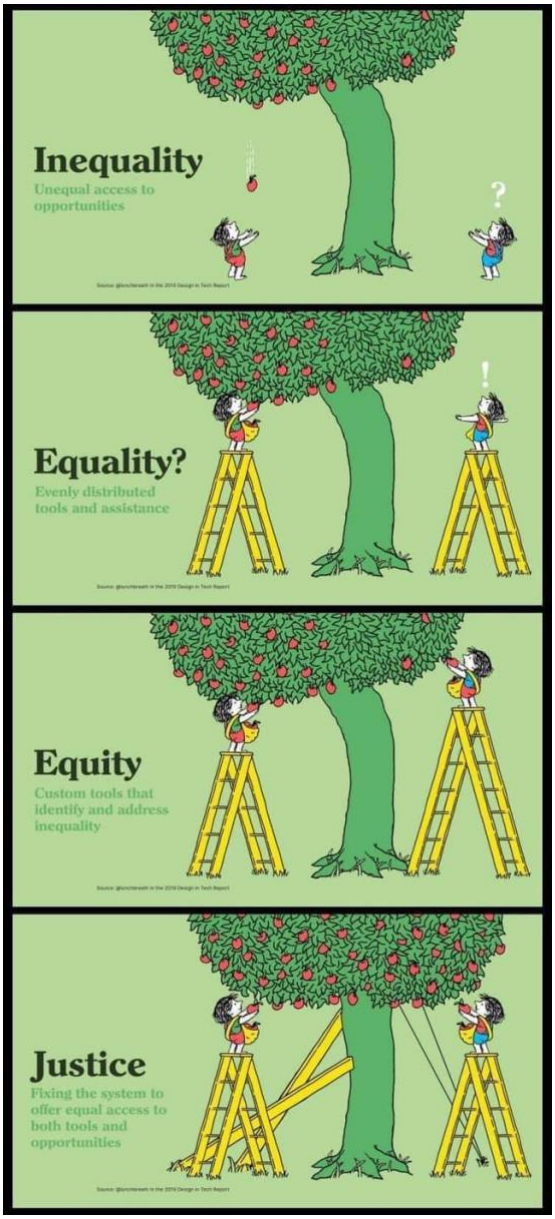

Figure 1- created by the Twitter user @lunchbreath, based on Shel Silverstein's The Giving Tree for John Maeda's 2019 Design In Tech Report.

Recent justice and equity incidents, initiatives and mandates emphasize the need for acknowledging the legacies of discrimination and developing actionable plans that are explicitly anti-racist, anti-misogynist, anti-ableist, anti-homophobic, etc. (Kendi, 2019). It is not enough to simply say that we are welcoming and inclusive. We must look to ways that we can reduce barriers and ultimately eliminate the ways in

[3] However, it should be noted that despite ties to Federal agencies, NACP as an organization is independent of any specific agency and the diversity assessment effort presented here does not represent an official Federal response to EO 13985, EO 14008, or the OMB Interim Guidance.

which various forms of discrimination have hurt both people and the scientific endeavor. The NACP is a multi-disciplinary, multigenerational and multinational science organization that is almost 20 years old, and many participants individually would like to improve diversity, equity, inclusion, and accessibility (DEIA) in STEM, and work for institutions that have committed and/or are legally mandated to address these issues. To do so, we need to ask ourselves some hard questions. As Ali et al. 2021 note 'For an organization to be anti-racist and equitable, it needs to ask and answer some difficult yet important questions: Who is in the organization? Who benefits from the status quo? Who holds power and who feels safe? Who is left out, who is powerless, who feels unsafe and why?' For our NACP, we may add: What are the effects on the types of projects that are designed, proposed, funded, conducted, and publicized? Does inequitable participation in carbon science research affect where data are collected, what types of ecosystems and landscapes become the focus of research, what carbon-related decisions are being made and by whom, and what research impacts decision support systems? What kind of NACP do we want to see in 5 years, 10 years, 20 years? It is our hope that this report is one step towards community reflection and action.

To address DEIA within the NACP community, the first step is to identify and acknowledge the existing conditions (Ali et al. 2021). What are the barriers, and what are possible actions NACP can take to address them? Acknowledgement, understanding, and planning is an iterative process to make progress in changing the culture and advancing the science. The NACP can learn from other scientific and professional organizations, implementing the same or similar steps as appropriate. While some are more immediate and tractable (e.g., early career support, mentoring, networking, listening sessions, improving leadership composition with respect to multidimensional diversity), this work happens within the context of the longer-term goal of achieving justice.

DISCUSSION OF FINDINGS

This is the first time that the NACP community has undertaken an assessment of the diversity of its membership. The survey was sent out to the NACP "general interest" listserv (2500+), which is larger than the community of people regularly engaged with NACP activities. For example, the NACP Twitter feed currently has 1100+ followers, and the 2021 NACP 7th Open Science Meeting had 528 registrants. We received 128 complete (all non-optional questions answered) surveys, which represents a <5% response rate. Given the low sample size, the responses may not reflect the demographic makeup of the NACP community (however defined), yet the open-ended and experiential responses provide valuable insight into the characteristics and experiences of the engaged community members. As scientists, we are motivated to quantify the world around us, and we do hope that the numbers reported here can be used as a baseline for comparison in future surveys. The goal of science is to increase our understanding, not simply to collect numerical data. As the anthropologist Marilyn Strathern stated, "When a measure becomes a target, it ceases to be a good measure" (Strathern 1997). Therefore, we eschew specific numerical goals per se, but rather use the numbers reported here along with the open-ended responses and opinions expressed to help paint a picture of our community and its needs.

There are some demographic characteristics that are particularly noticeable. The number of women and men responding to the survey was roughly equal (48% female, 49% male), even across career stages, non-native English speakers, and first-time higher education graduates. In contrast, the US Ocean Carbon and Biogeochemistry program (OCB) had 61% female respondents to their survey (OCB 2021 Presentation), and the American Geophysical Union (AGU) reports only 27.8% female for its membership (2020 DEI Dashboard).

For race and ethnicity, Table 1 compares the NACP results with the US Census, AGU, and OCB. The percentages for non-white race and ethnicity were generally similar or lower than the numbers reported for the overall US Census (US Census Bureau, 2021), and significantly lower for the "Black" and "Hispanic/Latinx" categories. Interestingly, when compared to the most recent statistics reported by the AGU (2020 DEI Dashboard), the percentages are generally similar or higher. Below are some

comparisons between the 2020 US Census, the AGU 2020 Dashboard, the OCB survey and the NACP respondents:

Table 1

Race and/or Ethnicity	US Census*	AGU†	OCB††	NACP†††
White	61.6%	54.0%	71.7%	58.6%
Black	12.4%	1.2%	<1%	3.1%
Hispanic/Latinx	18.7%	4.1%	7 - 11%	7.8%
Asian	6.0%	6.1%	<1%	9.4%
American Indian and Alaska Native	1.1%	0.3%*	<1%	0.8%
Multiracial	10.2%			6.3%

* Categories here are reported only for those that are similar across sources. For the US Census, these numbers are for respondents selecting one category only. Total US population for 2020: 331,449,281

† These numbers are reported for US members only. The n for the survey is not reported publicly. AGU reports that for 2020 was 58,866, and that "nearly 61%" are from the US, leaving the highest possible n = 35,899)

†† n = 205. Note that the OCB survey had several potential subcategories as options and individuals could choose more than one. The estimates then are reported as ranges depending on the minimum and maximum number of possible responses for the larger category. For example, if the minimum number of people chose both "Hispanic/Latinx" and "Hispanic/Latinx, White", then the answer is approximately 7%. The maximum is approximately 11%

††† n = 128

It's possible that the high response rate for Hispanic/Latinx participants compared to the AGU statistics is a result of increasing outreach to Mexican colleagues in advance of the 2021 NACP Open Science Meeting, resulting in greater engagement with NACP and responses to the survey. Because that meeting was virtual, it was easier for foreign participants to attend.

It is worthwhile considering if the results reflect or differ from at least one respondent's perception of the NACP community: "As I am guessing the survey will show, the overwhelming majority of the PI-level people are white and male." At least among the survey respondents, the proportion of men and women was roughly equal, and while the majority of respondents were white, 58.6% does not likely represent an "overwhelming majority." Perhaps the respondent's perceptions are influenced by attendance at NACP events and leadership in NACP activities, as their comment continues: "Many of the leadership positions are voluntary and have no support associated with them. For some leadership positions can detract from their ability to get science done. I would just urge the NACP to make sure that senior white males are doing their fair share of the service within NACP and not leaving what can sometimes be pretty thankless tasks to members of under-represented groups. We need to make sure that "leadership" is recognized as a service too."

Given the low response rate to the survey, it is unlikely that we can draw any statistical inferences with respect to the intersections across identity characteristics (e.g., race and career stage, sexuality and race, etc.). Even so, the individual descriptive responses are illustrative of issues known to exist broadly in STEM. Fewer BIPOC are enrolled, graduated, hired, and retained along STEM career paths (Asai 2020, NCSES 2021, Pew Research Center, 2021). People for whom English is not their first language, who are first in their family to attend higher education institutions, who are LGBTQ+, or who are living with disabilities can face additional cultural and practical barriers to success, both within STEM and society at large. If there were no systemic and institutional barriers, we would expect that the distribution of demographic and other identity characteristics for those in STEM would not be statistically different from the overall population. Recently, Berhe et al. (2021) described the unequal and often vicious or hostile obstacle course faced by BIPOC scholars, particularly those faced by women of color, as a 'hostile

obstacle course', emphasizing that those in power should assume the responsibility to remove and prevent barriers such as macro- and micro-aggressions, exclusionary behaviors and hidden 'landmines'.

Addressing systemic and institutional barriers requires acknowledging history and differences in identity, while not limiting our understanding, compassion, and support to issues of personal identity alone. Responding to the question about potential NACP actions, one person noted: “Not everyone wants their professional identity to be characterized by their personal or cultural identity. This is especially often true with disabilities or sexual preferences. That doesn’t mean they don’t face additional challenges navigating their careers because of these differences. It means everyone should have access to good mentorship, essential resources and acceptance while pursuing excellence.” The Diversity Assessment was an opportunity for participants to self-identify, if desired, and we wanted input from a range of people about what potential NACP activities would be useful in making the NACP community more inclusive and equitable.

The results about professional identity (institution type, primary and secondary roles) are perhaps unsurprising, given NACP’s origin as a collection of federally- funded, PI-led research projects. But the NACP community has evolved over time, becoming a community of practice, a community “formed when people consistently engage in shared communication and activities toward a common passion or learning goal” (Brown et al., 2016). From the very first “All-Investigators Meeting" there was a recognition of the need to connect science with decision making (Birdsey et al. 2007), and subsequent meetings (held every other year, except for a gap in 2019) actively sought greater participation from policy makers and science communicators. Despite the interest from the community in engaging with these groups, the low response of individuals with those job roles to this survey indicates that there is more work to be done to entrain them within the NACP community. As one respondent noted, “The diversity of carbon cycle science related careers out there is not visible to students and can take a while for early career professionals to find and move into. That is something NACP could help rectify.”

ACKNOWLEDGEMENT AND ACTION PLAN

We acknowledge that, although some issues are larger than us and outside our realm of control, our individual and collective actions may improve immediately by establishing leadership within our organization to affect change that will flow through our members outward to our constituent institutions and research communities.

As a high-level international research organization, participation and completion of pathways in higher education are effectively prerequisites for NACP membership. “Organizations shape the discipline” (Ali et al. 2021) and the NACP community has a role to play in shaping the discipline of carbon cycle science and STEM more broadly. As we stated in our June 2020 Statement Against Racism and Injustice, “one of the goals of the North American Carbon Program is to grow and promote networks of diverse scientists to help advance the agenda of carbon-cycle science. These networks aim to be inclusive, spanning career paths and stages as well as science and policy interests, and have gender-balance and racial equality.” As reflected in at least one of the survey responses, some feel that DEIA initiatives are distracting from institutions’ primary missions (Abbot and Marinovic 2021), but there is ample evidence that discriminatory and exclusionary practices hinder scientific advancement (Gosztyla 2021). While this assessment did not explicitly ask respondents about their experiences with racism or discrimination, several of the responses indicate that NACP community members either experience or are aware of racism and discrimination in their lives. It is possible that these experiences are not associated explicitly with NACP activities (e.g., meetings, working groups, leadership, communications), but as a boundary-spanning, supportive community, **NACP is interested in producing the best scientific understanding of the carbon cycle in North America and beyond, and so we must work to eliminate the barriers that prevent creative, inquiring, talented people from joining us in this work.**

Institutions bear responsibility to implement evidence-based approaches that focus on equity, inclusion, and accessibility. There are many approaches to take, but we need to be cautious about overburdening black, Indigenous, and people of color (BIPOC) and members of other minoritized identities with diversity-related activities. As a (currently) predominantly white organization, NACP may answer calls for non-BIPOC researchers to join BIPOC colleagues in their efforts to "prioritize recruiting, supporting, and championing diversity" (Barber et al. 2020). NACP as a community should strive to be accomplices in seeking diversity, equity, inclusion, accessibility, and justice, rather than simply acting as allies, which can sometimes devolve to tone policing, centering of the ally's feelings rather than the people needing support and help, and conditional support until risk is involved (Jones 2021).

This journey will take a long time, and will not always be easy, but we are committed to the "unwavering dedication and real work (Barber et al. 2020)" required of us in order to pursue excellence in carbon science through a path of equity, inclusion, accessibility and justice. Requisite actions in statements and surveys were a key first step. But to "decry structural racism, then return to the behaviors and process that led us here" is unacceptable (Barber et al 2020). There have been several recent articles outlining practical steps for working toward these goals (e.g., Ali et al. 2021, Cronin et al. 2021, Jones 2021). We propose beginning with the plan put forward by Ali et al. (2021, figure at right) to determine which steps are appropriate for the NACP Coordinator, the Science Leadership Group, the community as a whole, and individual members of the community. The scope of necessary change is beyond the capacity of one person, committee, or NACP alone. It is up to everyone to consider how their individual and collective decisions and actions perpetuate the challenges and problems of representation in STEM (Barber et al. 2020).

1	Collect & use intersectional data
2	Publicly display anti-racism statements
3	Adopt inclusive ethics & conduct codes
4	Survey & publish internally collected data
5	Be & hold people accountable for their actions
6	Support & highlight diverse science
7	Disseminate best practices
8	Invest & recruit from minority serving institutions
9	Recruit & pay experts to audit and educate
10	Evaluate re-define professionalism
11	Revise awards and promotion criteria
12	Sponsor & amplify minority networking events
13	Diversify awards & nominations committees
14	Establish accountability for income parity
15	Equally compensate people for all paid work
16	Acknowledge & address organization's failures
17	Deal with colonialism and parachute science
18	Collaborate with communities as stakeholders
19	Divest from industries that cause harm
20	Address barriers to retention of minorities

Figure 2 - Twenty action steps to build a robust anti-racist organization. (Ali et al. 2021)

Some of the actions identified by Ali et al. (2021) have already been taken or are underway for NACP. This Diversity Assessment document addresses Steps 1 and 4, and it will be important to iteratively and reflectively collect more data (quantitative and qualitative) about the experiences of NACP members. For Step 2, as mentioned earlier, in June 2020 NACP published a Statement Against Racism and Injustice, which will be periodically reviewed and updated as our understanding and circumstances change. For the March 2021 NACP Open Science Meeting, we used a Code of Conduct derived from the AGU; we should develop and implement a more general code to address Step 3. The NACP Coordinator, in developing the monthly updates, selects both "Member Spotlights" and "Science Highlights" that are ways to implement Step 6. Some of the steps are beyond the scope of direct action for NACP, although the Coordinator and SLG should consider ways that the NACP can partner with and support other

relevant organizations working on these issues, such as ADVANCEGeo Partnership (which includes Earth Science Women's Network, Association for Women Geoscientists, and the American Geophysical Union (AGU)), Unlearning Racism in Geoscience (URGE), The Ecological Society of America's Strategies for Ecology Education, Diversity and Sustainability (SEEDS) and EcologyPlus programs, AGU's Ethics & Equity Center, Out in STEM (oSTEM), and Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), to name a few. Several of these organizations have resources and training opportunities that NACP could help disseminate and implement for the NACP community (Step 7).

The NACP Diversity and Assessment survey is described below. In addition to capturing descriptive information of the respondent, the survey also included open ended questions; a major objective was to allow the carbon cycle science community to propose actions that would advance DEIA objectives. It was conducted from January to March 2021 and completed before the publication of Ali et al. 2021, however some of the proposed actions and comments in responses map onto steps in this framework. The possible proposed actions that appeared in the survey were generally favorably reviewed, and the first two contribute to addressing Step 8: Invest & recruit from minority serving institutions. The proposed actions were:

- More deliberate nominations and recruitment of scientists from underrepresented groups to speak at meetings, take leadership positions, propose activities, etc.
- Special programs and initiatives to support early career researchers from underrepresented groups (mentoring, training, etc.)
- Fostering a more welcoming and inclusive climate at its meetings and activities

While the last action contributes to Step 20, it is too vague to implement as is, specific activities need to be identified that would contribute to the idea of "fostering." Some of the additional comments provided by the respondents provide possible examples of more concrete actions that also correspond to the Steps. For example: "Having explicit anti-harassment policies" (Step 3); "Propose an award or recognition for early, mid and senior scientists/researchers from underrepresented groups" (Steps 6 and 13). Note that currently the only awards associated with NACP are the Outstanding Student Presentation Awards that are given during science meetings. Additionally, having an award specifically for underrepresented groups can be problematic, as people (both the recipients and others) may view the award as tokenism. Regardless, there is a need to implement intentional practices to diversify the pool of nominees and awardees (Holmes et al. 2020, Ali 2019, Glass and Cobb 2019, Pourret et al. 2021).

Many of the proposed activities center around meeting and networking. We acknowledge the loss of opportunities for in-person connection due to the global pandemic, but also recognize that the shift to online has often resulted in greater access to participation for many. Moving forward, it will be important to consider how to provide a mixture of virtual, in-person, and hybrid events that maintain and expand access while also providing genuine opportunities for networking and collaboration. The NACP community should take advantage of evolving technologies, etiquette, and culture to provide innovative opportunities for meeting and networking.

Increased accessibility, along with the other activities proposed to enhance representation in NACP to reflect the North American population is especially important considering the changing nature of NACP membership and the desire to include more decision-makers, practitioners, and researchers from countries other than the US. At its inception, the NACP was solely comprised of scientists funded by US federal agencies participating in the Carbon Cycle Interagency Working Group/US Carbon Cycle Science Program. Membership to NACP is no longer restricted and is now open to any researcher or practitioner working on carbon cycle science in North America. With increasing international and practitioner participation, it will be essential to take active steps to ensure that the NACP community is equitable, inclusive, and accessible. Current and future virtual technologies will serve as tools for achieving this goal, but this work also requires developing and changing online culture and approaches to networking and collaboration.

One of the most difficult steps is Step 16: Acknowledge and address the organization's failures. Although the survey response was small, the results indicate that the NACP at the very least has failed to represent the broader North American community, but it is unclear how much of that is a result from NACP (in)actions versus the fact that the NACP community draws from communities (e.g., academia, government) already narrowed in part by systemic racism and discrimination. NACP may be able to offer some activities that fill known gaps – e.g., mentoring, networking, actively adopting anti racist approaches, providing support systems absent still in academia. As a subset of the broader STEM community, we should look for ways to both address concerns within our own group, as well as bringing the energy and lessons learned here to the wider institutions of which we are members. There will be discussion and ongoing change about what are our individual and collective roles, how do we fully acknowledge the depth of the issues and move forward together to create a better environment in which we all contribute to the best science. What can the NACP community do uniquely as a collective of researchers, rather than an agency or institution? Our collective actions will carry through to our partner agencies, institutes, and universities, etc. **amplifying the positive effects through the carbon community.**

In January 2022, the White House Office of Science and Technology Policy's (OSTP) Scientific Integrity Task Force released 'Protecting the Integrity of Government Science' (White House, 2022). The Task Force emphasizes, "*Strengthening scientific integrity is not possible without elevating issues of DEIA as an integral component of the entire scientific process. Attention to DEIA can improve the representativeness and eminence of the scientific workforce, foster innovation in the conduct and use of science, and provide for more equitable participation in science by diverse communities. The responsible and ethical conduct of research requires an environment that is equitable, inclusive, safe, and free from harassment. Activities counter to these values are disruptive to the conduct of science."* Some of the proposed policies are could also be embraced by the NACP and its community, e.g. "*Embed DEIA issues in scientific integrity policies"* and "*Incorporate DEIA considerations into all aspects of science planning, execution, and communication"* to ensure that "*1) scientists are adequately trained on its importance and the potential negative impacts of exclusion on science, 2) scientific research focuses on research questions, samples, and settings that reflect the diversity of the U.S. population, and 3) data are sufficiently disaggregated, where possible, by demographic variables to facilitate identification and analysis of issues affecting people from all backgrounds."*

In conclusion, we recommend the following actions as first steps:

Actions for the NACP Coordinator and office

- In monthly updates, continue to select Member Spotlight and Science Highlights that reflect the diversity of the NACP Community.
- Highlight carbon cycle research being conducted on under-represented topics and geographic areas or that is useful to socio-economically disadvantaged populations.
- When collecting demographic information (either in another survey, or through meeting registrations, etc.) improve/evolve the questions to better reflect and capture ways that people identify themselves, and avoid ways they do not want to be identified.

Actions for the Science Leadership Group

- Develop an explicit policy on anti-harassment and discrimination for the NACP community, based on advice from ADVANCEGeo Partnership.
- When looking for new members, explicitly encourage nominees with diverse backgrounds and professional identities, and different ways of knowing, such as Indigenous Knowledge or Traditional Ecological Knowledge. Selections should focus on being as anti-racist, anti-misogynist, anti-ableist, anti-homophobic, etc., as possible and, at a minimum, avoid any negative bias based on gender, race, sexual orientation or identity.
- Work with the NACP Coordinator to develop activities to support the NACP community, enhancing networking and collaboration, especially for early career and minoritized/under-represented peoples. Examples include: mentoring, virtual social hours, topical webinar series, workshops, etc.

- Partner with other scientific and professional organizations to help with broader DEIA initiatives
- Review the 2020 Statement Against Racism and Injustice, reflect on progress to date and remaining challenges
- Consider further actions that may help evaluate and address the NACP community and its needs, such as conducting the Diversity Assessment periodically (with improvements to methodology and activities to increase response rates), holding listening sessions, convening discussions on colonialism and parachute science, etc.

Actions for NACP community members

When able, NACP members are encouraged to play active roles, such as by volunteering to assist the NACP (via the Coordinator and SLG) in the above endeavors, and generally reflect on their participation and impact in the NACP community, their home institutions, and the broader STEM community. Drawing from the Ali et al. 2021 framework, steps that are most applicable to NACP members include:

- Be and hold people accountable for their actions
- Support and highlight diverse science
- Invest and recruit from minority serving institutions
- Diversify award and committee nominations
- Equally compensate people for all paid work
- Address legacies of colonialism in our institutions and scientific practices, including helicopter research and parachute science (e.g. Minasny et al. 2020).
- Work with decision-making and end-user communities as partners and collaborators

Working together, the NACP Coordinator, the SLG, and membership can make significant progress towards a more equitable and just community for the NACP, STEM, and broader communities.

SURVEY DEVELOPMENT AND METHODOLOGY

The NACP Coordinator worked with the NACP SLG and the OSM Meeting Planning Committee to develop the survey tool, which was based in part on a similar survey conducted by the Ocean Carbon & Biogeochemistry Program (OCB). In an iterative process, the questions were refined, eliminating some OCB-specific answer options, expanding the race and ethnicity sections, and adding questions about career stage, type of work institution, and job functions.

Generally speaking, the survey had two categories of questions. The first grouping contained questions about the demographics, career stage, and roles of the respondents. Many of the questions in this category were multiple choice, although a few were open ended, and all questions had the option of "Other" with the ability for the respondent to answer with their own words. For the purposes of this report, this category of questions will be referred to as the Descriptive Questions. At the end of the survey there were several questions aimed at elucidating the experience and opinions of the respondents with respect to diversity, equity and inclusion experiences, activities, and opinions. For the purposes of this report, this category of questions will be referred to as the Experiential Questions.

The survey (Appendix A) was circulated among the 2500+ members of the NACP and the 500+ registrants of the NACP OSM (some of whom may not have been prior members of the NACP database). The Assessment was first announced in the monthly NACP newsletter in January 2021, with reminders in the February/March newsletter, announcements to OSM meeting attendees, and in general emails to the community. The survey was introduced with the following text:

> As a cross-disciplinary, cross-institutional organization, the North American Carbon Program (NACP), in consultation with the Science Leadership Group, is conducting this survey to understand the current diversity of our membership and gather feedback on how we can increase support of and engagement with scientists from marginalized and minoritized groups. Your participation is voluntary, confidential and specific responses will be anonymized. The survey responses are for our assessment and planning and we hope they will help us in better serving the needs of our community. We also plan on sharing overall statistics with the larger community at the upcoming Open Science Meeting and in other communications in order to facilitate community reflection and discussion. In addition to the multiple-choice questions, please don't hesitate to share your ideas in the open comment fields. We really appreciate your participation!

The survey closed on March 2, 2021. There were 128 complete responses, which represents < 5% of the people who received the survey. In this report, in addition to tabulating the categorical responses, we also highlight some of the individual responses to the open-ended questions. We do not have space here to include all of the responses, but all of the responses to "Other" and open-ended questions are available in Appendix B. All are anonymous, as no identifying data (e.g. name, email, IP address) were collected during the survey.

In addition to the Diversity Assessment survey, when participants registered for the OSM, data were collected about student status, career stage, and job role. Where applicable, this information will be reported here alongside the Assessment results for similar questions. There were 526 registered participants for the 7th NACP OSM.

SURVEY RESULTS[4]

Descriptive Questions

1. **Personal Identity**
   a. **Race and Gender:**
   In the survey, respondents were first given the option to ***provide their own description*** of how they identified racially, and we have then grouped those into more general categories based on our own judgment. To see the original responses, please view Appendix B. Most of the respondents (59%) wrote either "White" or "Caucasian", with some respondents offering more specificity (e.g. "Irish American", "of European descent."). Approximately nine percent of respondents listed "Asian", sometimes with more specificity, e.g. "South Asian." Around eight percent of the respondents identified as "Latin American" or "Latinx," and 6% of respondents listed a specific nationality, often "Mexican." Six percent of respondents listed multiple races or ethnicities or identified as "mixed" or "mutliracial." Some respondents objected to being asked this question, for example noting "I think doing so is wrong" or "My race is Human, my ethnicity is Scientist. I don't adopt narrow notions of identity." Below are the generalized categories based on the descriptions.

[4] To preserve anonymity and following ethical research practices, only percentages are reported rather than the number of responses. This is especially important because the number of responses to the survey was so small (Meyer 2018).

Generalized Response	% of Total
White/Caucasian	59%
Asian	9%
Latin American or Latinx	8%
Multiple, mixed, or multi-racial	6%
Specific Nationality	6%
Objection	4%
Black	3%
Mestizo/a	2%
Prefer not to say	2%
Alaska Native/Native American/Indigenous	<1%

Most of the respondents were **evenly split in identifying as either female (48%) or male (49%)**. For gender, respondents could only select one category, but could write in a response, for example the "I don't accept the premise of this question" answer.

Respondents were also offered to select categories based on US and Canadian Census groups. Respondents were allowed to select more than one category. Most respondents identified as White (61%), and two categories ("Pacific Islander" and "Prefer Not to Say") had no responses. Open-text responses for those selecting "Other" included "Mixed" (or variations), "All of the above", and "Jewish". The following table shows the percentage of respondents broken down by gender and race (note that the total responses for race > total responses to the survey (128) because individuals could choose multiple categories for race, also some total percentages differ due to rounding):

Table 2

Gender	**Race**											
	White	Latin Amer.	S. Asian	Middle Eastern/W. Asian	Race Other	Chinese	Black	Native Amer./ Alaska Native/ Indigenous	Arab	Korea	SE Asian	Japanese
Female	29%	8%	4%	2%	2%	2%	1%	1%	1%	1%		
Male	31%	6%	2%	2%		2%	2%	1%	1%	1%	1%	1%
Non-binary	1%											
I don't accept the premise of the question								1%				
Prefer Not to Say					1%							
Total	**61%**	**14%**	**5%**	**5%**	**2%**	**4%**	**3%**	**2%**	**2%**	**2%**	**1%**	**1%**

Note that for the remainder of the report, the individuals in the "I don't accept the premise of the question" and "Prefer not to say" will be grouped together as PNS ("Prefer Not to Say").

b. **Ethnicity:** The survey asked respondents to also include information on their ethnicity, categorical options were based on the US Census. Below are the responses received for ethnicity:

Answer	Percentage
Hispanic/Latinx	15%
Not Hispanic/Latinx	77%
Other	9%
Other:	French Cameroonian
	Poor Slavic farming background from immigration 110 years ago
	Mixed
	Unknown (I was adopted)
	Sami
	Indian
	Black or African American

c. **Sexual Orientation:** Which of the following best describes your sexual orientation?

Answer	Percentage
Asexual	3%
Bisexual	5%
Gay	2%
Heterosexual	83%
Lesbian	1%
Queer	0%
Prefer not to say	3%
Pansexual	1%
Other	2%
Other:	Demisexual
	All of the above

d. **Disability:** Are you a person living with a disability?

Answer	Percentage
Yes	6%
No	91%
Prefer not to say	3%
Yes -- optional disclosure:	Severe hearing loss
	Autoimmune disease, other major medical conditions, mental health.
	Mobility handicapped
	Arthritis

e. **First-Generation College:** Are/were you a first-generation college or graduate student? We use the broadest definition of first-generation to be someone whose family lacks a history of attending college/graduate school. Note that the total number of responses is greater than the number of survey responses, as some people may be both first-generation undergraduate and graduate students.

Answer	Percentage
Yes, undergraduate	22%
Yes, graduate	40%
No	56%
Prefer not to say	2%

Here are these percentages by self-reported gender:

First-Generation College/University			
Gender	**Undergraduate**	**Graduate**	**Not First-Generation**
Female	7%	17%	30%
Male	15%	23%	24%
Non-binary			1%
PNS*			1%
Total	**22%**	**40%**	**55%**

***Individuals answering "I don't accept the premise of the question" and "Prefer not to say" will be grouped together as PNS ("Prefer Not to Say").**

f. English as First Language: Is English your first language?

Answer	Percentage
Yes	66%
No	33%
Prefer not to say	1%

Here are these percentages by self-reported gender:

	Is English your first language?		
Gender	**No**	**Yes**	**Prefer Not to Say**
Female	16%	32%	
Male	16%	33%	
Non-binary		1%	
PNS*		1%	1%
Total	33%	66%	1%

***Individuals answering "I don't accept the premise of the question" and "Prefer not to say" will be grouped together as PNS ("Prefer Not to Say").**

2. Professional Identity[5]

a. Career Stage:

Here are the percentages by career stage and self-reported gender:

	Career Stage					
Gender	**Undergraduate**	**Graduate**	**Postdoc**	**Early Career**	**Middle/Late**	**Prefer Not to Say**
Female	2%	9%	5%	5%	27%	
Male		6%	5%	5%	33%	
Non-binary				1%		
PNS*					1%	1%
Total	**2%**	**15%**	**10%**	**12%**	**61%**	**1%**

***Individuals answering "I don't accept the premise of the question" and "Prefer not to say" will be grouped together as PNS ("Prefer Not to Say").**

[5] The survey asked several questions about the professional identity of respondents. Because there is evidence that peoples' personal identities can influence their professional engagement and success, we present cross-tabulated results of professional identity with gender and by the categorical race answers (i.e., not the open-text race answers).

And the percentages by career stage and categorical race:

	Career Stage					
Race	**Undergraduate**	**Graduate**	**Postdoc**	**Early Career**	**Middle/Late**	**Prefer not to say**
White		9%	4%	6%	41%	
Latin American	1%	3%	1%	3%	6%	
South Asian			2%	1%	2%	
Middle Eastern/West Asian					5%	
Chinese	1%		2%		1%	
Black		2%			2%	
Native American/Alaska Native/Indigenous				1%	2%	
Korean			1		1%	
Mixed (Indian Ocean islander)		1				
Southeast Asian					1%	
Japanese				1%		
Mixed					1%	
All of the above						1%
Total	**2%**	**15%**	**10%**	**12%**	**61%**	**1%**

Here are comparisons of career stage answers between the Assessment and registrants at the March 2021 Open Science Meeting (OSM):

- **Students:** Are you currently a student?

Assessment Answers	Percentage
Yes, undergraduate	2%
Yes, graduate	15%
No	83%
Prefer not to say	1%

OSM Answers	Percentage
Yes, undergraduate	3%
Yes, graduate	20%
No	63%

- **Postdocs:** Are you currently in a postdoctoral position?

Assessment Answers	Percentage
Yes	11%
No	88%
Prefer not to say	1%

OSM Answers	Percentage
Yes	14%
No	86%

- **Early Career:** Are you in the early stage of your career (≤ 5 years terminal degree)?

Assessment Answers	Percentage
Yes	29%
No	70%
Prefer not to say	1%

For the OSM, early career was defined as **≤ 10 years** terminal degree:

OSM Answers	Percentage
Yes	16%
No	77%
Not provided	7%

b. Institution and job role: The survey asked “What kind of institution do you work for?” and “What is your primary job function?”

	Primary Job Function					
Institution Type	**Research**	**Teaching**	**Management**	**Outreach/ Communication**	**Other**	**N/A**
University	38%	9%	2%		2%	
Federal Government	17%		4%		1%	
Research Institute	11%					1%
Company	1%		1%		2%	
NGO	1%		2%	1%		
State Government	2%	1%				
Other	1%		1%		1%	
Territorial Government			2%			
Local Government	1%					
Provincial Government	1%					
Prefer not to say						1%
Total	**72%**	**10%**	**11%**	**1%**	**5%**	**2%**

Institution Type “Other” answers	FFRDC, Interagency, Contractor
Job Function “Other” answers	PhD Student, Program Manager, Research & Teaching, Consulting, Research Support, Assessment Support

Here are the results from the attendees at the OSM:

	Primary Job Function					
Institution Type	**Research**	**Teaching**	**Management**	**Outreach/ Communication**	**Policy**	**Other**
University	46%	17%	<1%	<1%		8%
Federal Government	15%		23%	<1%	1%	1%
Research Institute	10%		<1%	<1%	<1%	1%
Company	1%	<1%	2%	<1%		1%
NGO	1%		<1%	<1%	<1%	<1%
State Government	<1%		<1%		<1%	
Other	<1%	1	<1%			1%
Provincial Government	<1%					
Indigenous Organization	<1%		<1%			
Inter-governmental Organization			<1%			
Media						<1%
Museum					<1%	
Retired					<1%	
Unemployed	<1%					<1%
Total	**75%**	**5%**	**10%**	**1%**	**2%**	**7%**

Primary and Secondary Job Function: The survey also asked “What is your secondary job function?” Below is the cross-tabulation of primary and secondary job functions.

	Secondary Job Function							
Primary Job Function	**Research**	**Teaching**	**Management**	**Outreach/ Communication**	**Policy**	**Other**	**N/A**	**Total**
Research	6%	26%	13%	9%	1%	2%	15%	72%
Teaching	9%			1%				9%
Management	7%			2%	2%	1%		11%
Outreach/Communication							1%	1%
Other		1%	1%	1%		1%	2%	5%
N/A							2%	2%
Total	**22%**	**27%**	**14%**	**13%**	**2%**	**3%**	**20%**	
Secondary Function “Other” answers			Student, Research and teaching, Development, “The work no one wants to do”					

Here are the results for the attendees of the OSM:

	Secondary Job Function							
Primary Job Function	**Research**	**Management**	**Policy**	**Outreach/ Communication**	**Teaching**	**Other**	**N/A**	**Total**
Research	16%	42%	2%	8%	24%	8%	6%	75%
Management	5%		2%	2%		1%	<1%	10%
Policy	<1%	<1%		1%		<1%		2%
Outreach/Communication	<1%	<1%	<1%	<1%	<1%	<1%		1%
Teaching	4%			<1%	<1%			5%
Other	2%	<1%		<1%	<1%	4%	<1%	7%
Total	**27%**	**12%**	**4%**	**12%**	**25%**	**14%**	**6%**	

SUMMARY OF EXPERIENTIAL QUESTIONS

1. **Other Affinity Groups**
   The survey included a couple of questions about other groups that respondents have found useful, both for general affinity and specifically in the carbon cycle science community.

   a. **Identity**
      We were interested in learning about other affinity groups members of the NACP community might be a part of where they find support specifically associated with aspects of their identity. We asked:

      > *Generally speaking, are there places where, in a professional context, you connect with people who share similar identity traits (e.g., race, sexuality, gender, disability, career interest or stage) and that others might benefit from knowing about? Please describe.*

      This question was not mandatory, and forty-eight people provided answers, although 12 of these were "No," "None," or "N/A." For the "No" and "None" answers, without further information it is not possible to interpret if the responses are indicating that the person does not have a need/desire for such groups, or if the person has not been able to find relevant groups for their interest.

      There were some groups that were mentioned more than once, including:

      - 500 Women Scientists
      - American Geophysical Union (AGU)
      - American Meteorological Society (AMS)
      - Earth Science Women's Network (ESWN)
      - Graduate Women in Science (GWIS)
      - Investigadoras y madres (A private Facebook group for mothers in academia in México)
      - Out in STEM (oSTEM)
      - Society for Women in Meteorology (SWIM) (which seems to actually be Supportive Network for Women in Meteorology)

      A few respondents also mentioned generally finding useful communities while attending special events at conferences or serving on committees of the professional societies listed above, like AGU and AMS.

      Other groups mentioned:

      - American Association for the Advancement of Science (AAAS)
      - American Mathematical Society (AMS)
      - American Scientific Affiliation
      - AmeriFlux network
      - ARROWS (assuming this is referring to Advance, Recruit, Retain, and Organize Women in STEM, a program at Boston University)
      - Association for Women in Geosciences (AWG)
      - Comunidad de Científicas Mexicanas
      - GeoLatinas
      - IEEE Geoscience and Remote Sensing Society (IGARSS)
      - Society for Women in Marine Science (SWMS)
      - Women in Nuclear
      - Women in Science
      - Women of Color in Ecology and Evolutionary Biology

Some respondents said that there weren't specific groups they had participated in, but that they had worked in groups or been able to find colleagues at conferences with whom they had identities in common.

One respondent noted "There is nothing for first-generation students from low-income families."

b. Carbon Cycle Science Community

The survey also asked explicitly about groups for the carbon cycle science community:

NACP is working to build stronger connections to and support of our members in the carbon cycle science communities, especially for marginalized or minoritized people. Please list any relevant affinity group networks in which you participate (current or previously).

This question was not mandatory and thirty-four people provided a response, although 11 of those were "None," or "N/A." As with the prior question, without further information it is not possible to interpret if the respondent does not have a need/desire for such groups, or if the person has not been able to find relevant groups for their interest.

Organizations that were mentioned more than once in the responses:

- American Geophysical Union (AGU)
- Earth Science Women's Network (ESWN)

Other groups mentioned:

- 500 Women Scientists
- American Association for the Advancement of Science (AAAS)
- AmeriFlux
- AMS (not sure if American Meteorological Society, or American Mathematical Society)
- Association for Fire Ecology Diversity and Equity Committee
- Comunidad de Científicas Mexicanas
- Ecological Society of America Strategies for Ecology Education, Diversity and Sustainability (ESA SEEDS)
- Fluxcourse
- Graduate Women in Science (GWIS)
- Homeward Bound
- International Association of Landscape Ecologists - North American Chapter
- Investigadoras y madres
- Mexican Blue Carbon Alliance
- Mexican Carbon Program
- NACP
- NSBP (we assume this is National Society of Black Physicists)
- Ocean Carbon & Biogeochemistry
- Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)

2. Actions for NACP

We were interested in getting feedback from the community about potential actions or areas of focus for NACP. For opinions on focus we asked:

NACP is considering the following key areas and actions to build a more diverse and inclusive network:

- *More deliberate nominations and recruitment of scientists from underrepresented groups to speak at meetings, take leadership positions, propose activities, etc.*

- *Special programs and initiatives to support early career researchers from underrepresented groups (mentoring, training, etc.)*
- *Fostering a more welcoming and inclusive climate at its meetings and activities*

Please share your feedback on these areas and/or suggest additional/alternative areas of Focus.

This question was not mandatory and 44 respondents made comments, although one of these was "None." Nineteen of the responses were generally "I support all of these ideas," or "These are good ideas," etc., without providing further commentary. One respondent stated "I think the first proposal is actually racist."

A few commenters mentioned that while they thought the proposed actions were good ideas, it is important to be cautious about increasing the workload/burden on underrepresented groups. Service on committees should be shared equitably, making sure that "thankless tasks" are not delegated to underrepresented groups.

Other specific ideas suggested here and in response to "Additional Comments" (next question) include:

- Having explicit anti-harassment policies
- Fostering leadership skills
- Professional development training
- Resources for faculty to recruit graduate students and postdocs from underrepresented groups
- Publishing abstracts in English, Spanish, and French
- Propose an award or recognition for early, mid and senior scientists/researchers from underrepresented groups
- Partnering with Native American organizations and include AISES to increase participation of Native students in NACP
- Any materials that the group distributes should have images that are welcoming/accepting of everyone.
- Invite early career researchers (specifically from underrepresented groups) to help with the planning and strategy of future meetings
- Facilitate that meeting attendance (via funding support for travel when in-person meetings resume)
- Programs that recruit and target established leaders in the field and use them to recruit their senior peers into these efforts. Otherwise, it starts to feel like the burden for changing institutional norms is placed on the people who are impacted-- not by the people in leadership.
- I think our community needs to focus on how to argue more constructively. I think we could have a panel on the difference between constructive criticism and aggressive questioning. Disagreement is a key part of science, traditionally this has taken an adversarial tone - this can be uncomfortable and could be seen as exclusionary or discriminatory in some cases.
- Strategies on how to secure funding from Federal Government agencies.

One respondent to the survey did not feel that DEIA activities were appropriate to the core NACP mission.

We also solicited feedback from respondents on possible topics for virtual panel discussions. We asked:

> *One tangible action NACP would like to take in the coming months is to convene an online panel discussion to focus on solutions to common issues and hurdles faced by people in the disciplines associated with carbon cycle science. Below are key issues we have considered in our discussions about inclusivity, but we would like to prioritize those that are especially big hurdles for marginalized and minoritized groups. Please select the hurdles you think are the biggest challenges and/or add your own.*
>
> a. *Applying to graduate school/finding an advisor*
> b. *Student funding/scholarships*
> c. *Preparing for your first conference*
> d. *Networking*
> e. *Mentorship and letters of recommendation*
> f. *Initiating and sustaining scientific collaborations*
> g. *Self-advocacy*
> h. *Sense of belonging in the carbon cycle community*
> i. *DEI Solutions for advancing carbon sciences equitably – bystander interventions, bias recognition, allyship and other helpful tips*
> j. *Other:*

108 people responded positively to one or more topics and/or suggested additional ones in the "Other" text. The popularity of the topic choices was:

Topic	Percentage
Applying to graduate school/finding an advisor	29.7%
Student funding/scholarships	30.5%
Preparing for conferences	10.2%
Networking	37.5%
Mentorship and letters of recommendation	25.8%
Initiating and sustaining scientific collaborations	40.6%
Self-advocacy	26.6%
Sense of belonging in the carbon cycle community	35.2%
Diversity, Equity, Inclusion, and Justice solutions for advancing carbon cycle sciences equitably - bystander interventions, bias-recognition, allyship and other helpful tips	32.0%
None/NA	2.3%
Other	7.8%

The 10 “Other” responses were:

> “Many student opportunities are unfunded and this can be an initial barrier to entry. Students who are able to take an unfunded opportunity quickly get more experience and are then more competitive for funded opportunities.”
>
> “Unconscious bias is a problem in our community. Most senior researchers may think of themselves as progressive and inclusive but an analysis of the gender and diversity of the papers authored in our group indicates that this view does not jive with who gets invited to be a co-author or collaborator”
>
> “Integrating carbon cycle science into other disciplines and management practices.”
>
> “Lack of visible role models for underrepresented groups”
>
> “Recruiting Native students into carbon research”
>
> “Time wasted belly-gazing on things like this instead of doing serious science”
>
> “imposter syndrome”
>
> “Work-Life balance”
>
> “Surviving/thriving in graduate School”
>
> “A sense of what work/ research options exist at every career stage”

3. Additional Comments

The final question of the survey allowed for additional comments:

> *Please elaborate on whether there is anything else you'd like us to know about the challenges you have faced entering or succeeding in carbon cycle science.*

Twenty-five respondents left comments, although 3 wrote “None.”

A couple of the comments related to the challenges and barriers non-US and non-English speakers face in participating in and contributing to carbon cycle science. For example, one respondent noted “Scientists need to recognize that some tools or techniques may not be available in other parts of the world (or North America) and scientists are trying their best to contribute to carbon cycle science. Unfortunately some expectations are unrealistic by some researchers within the carbon cycle community when providing feedback/criticism to scientific work performed in other places in the world.,” while another wrote that “Colleagues with more advances in carbon science minimize, ignore, the advances that are made in other countries with less advances and resources.”

There were also a couple of comments about difficulties parents face, noting that “the lack of support for early childhood education that is a big roadblock for sustaining a career in research in general.” Expanding on this, one respondent wrote: “One of my largest challenges has been managing childcare during carbon cycle-related scientific conferences. During graduate school my stipend was not high enough to cover conventional conference childcare costs, nor was it reasonable to pay for extra plane tickets for my children. Offering childcare at NACP with staggered costs, or offer scholarships/reimbursements for early career scientist and graduate students that would help cover childcare/dependent-care at home during the conference, would go a long way towards enabling other graduate student parents the opportunity to attend NACP.” Related to childcare, but not limited to those with children, on respondent noted: “It feels like there are cliques of people who all know

each other in the top levels of the field, and even if you do great work, it's hard getting recognition if you don't go out and drink beer and hobnob with people after hours at conferences."

Respondents also noted the systemic, societal, and cultural challenges that are larger than NACP. One respondent wrote: "It's just awfully frustrating and demoralizing that we have so few Black, Indigenous, and LatinX people in our field. I wish I knew how to fix the problem. I feel the roots of the problem are so deep. Education in the US is certainly part of the problem. When the type of education you get largely depends on the zip code you were born in, it's a big problem. How can NACP and other science organizations make progress on solving the problem of lack of representation in science when we live in a society with so much systemic and structural racism? I think the problem has to be tackled on multiple fronts and time scales. It's overwhelming, and maybe NACP should join with other science organizations to advocate for long-term solutions." Another respondent wrote that there are "superhuman labor expectations accompanied by simultaneous biased undervaluation or devaluation of non-white labor, intellectual input and expertise;
lack of access, inclusion, recognition, visibility, outreach, opportunities to new scientists (students, faculty, postdocs, esp. non-white) outside existing or historical science teams or informal academic networks associated with or supported by funding agencies, 'elite' universities and large institutions."

CITATIONS

Click here to download an .ris file of these citations.

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