

Addressing social field safety as a proponent of the natural sciences workplace

Murry L. Burgess^{1,*}, Lauren D. Pharr² and Kayla A. Stukes³

¹Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Starkville, MS 39762, United States

²Department of Biology, Wingate University, Wingate, NC 28174, United States

³Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27695, United States

*Corresponding author. Murry L. Burgess, E-mail: mlb1016@msstate.edu

Murry L. Burgess (mlb1016@msstate.edu) is an urban ecologist at Mississippi State University, Starkville. She studies the effects of anthropogenic stressors on birds.

Lauren D. Pharr (lpharr@wingate.edu) is an avian behavioral ecologist and Assistant Professor at Wingate University, Wingate. She examines bird behavior and conservation as well as leads community-engaged research that provides meaningful undergraduate research experiences.

Kayla A. Stukes (kastukes@ncsu.edu) is a PhD student in forestry at North Carolina State University, Raleigh. Her research focuses on land instability and intergenerational cultural transmission among Indigenous and African American communities in the southeastern United States.

Abstract

An existing gap in the natural sciences is the lack of attention to and action surrounding social and psychological safety, particularly concerning marginalized individuals and those who are at risk or have been historically excluded from fieldwork in the natural sciences. In this paper, we seek to (1) frame the field environment as a professional workplace that should be safe and regulated; (2) define social and psychological risks; (3) highlight the role of social and psychological safety in breaking down barriers to participation for at-risk individuals in the natural sciences; (4) discuss the benefits of implementing safety protocols on personal, supervisory, and institutional levels within the natural sciences; and (5) provide recommendations for professionals working in the field and those who employ and supervise fieldworkers. Addressing this gap can lead to greater recruitment, participation, and retention of all natural science students and professionals.

Keywords social field safety, natural science, fieldwork, marginalized, historically excluded

Introduction: defining social field safety and its role in fieldwork

Hands-on activities conducted in educational settings allow students to grasp fundamental concepts associated with their academic disciplines. Most educators in the natural and environmental sciences hold a firm belief that *fieldwork*—the practice of collecting data, conducting research, or making observations in natural settings as opposed to controlled environments such as laboratories or offices—is a vital component of teaching and research, as it allows for the development of critical thinking, application, and collaboration skills (Maskall and Stokes 2008, Fleischner et al. 2017). Students are often introduced to key concepts of fieldwork through courses or laboratories that include field or outdoor components (Boyle et al. 2009). In higher education, government agencies, and non-governmental organizations, advisors and supervisors are typically trained to prepare themselves, their students, and their employees for successful scientific research in the field. Specifically, resources describing modern field and labo-

ratory techniques, logistical planning, and physical safety are widely available and frequently referenced (e.g., Burgess 2003, Silvy 2020). Yet, discussions regarding the social environments in which fieldwork takes place and the personal circumstances that may influence fieldworkers' safety are often overlooked or underemphasized (Cronin et al. 2024).

The lack of discussion surrounding the social, emotional, mental, and interpersonal challenges encountered during fieldwork leaves the onus on individuals to navigate these situations without adequate preparation or institutional support. As a result, fieldwork has become a barrier to participation in natural science not only financially (Jensen et al. 2021; Lawrence and Dowe 2021; Carter et al. 2022, Carlin et al. 2024), but also socially (Lawrence and Dowe 2021; Carter et al. 2022, Carlin et al. 2024). By recognizing these challenges and implementing appropriate protocols and training at the personal, supervisory, institutional, and organizational level, advisors, supervisors, students, and staff can better prepare for fieldwork, reduce barriers

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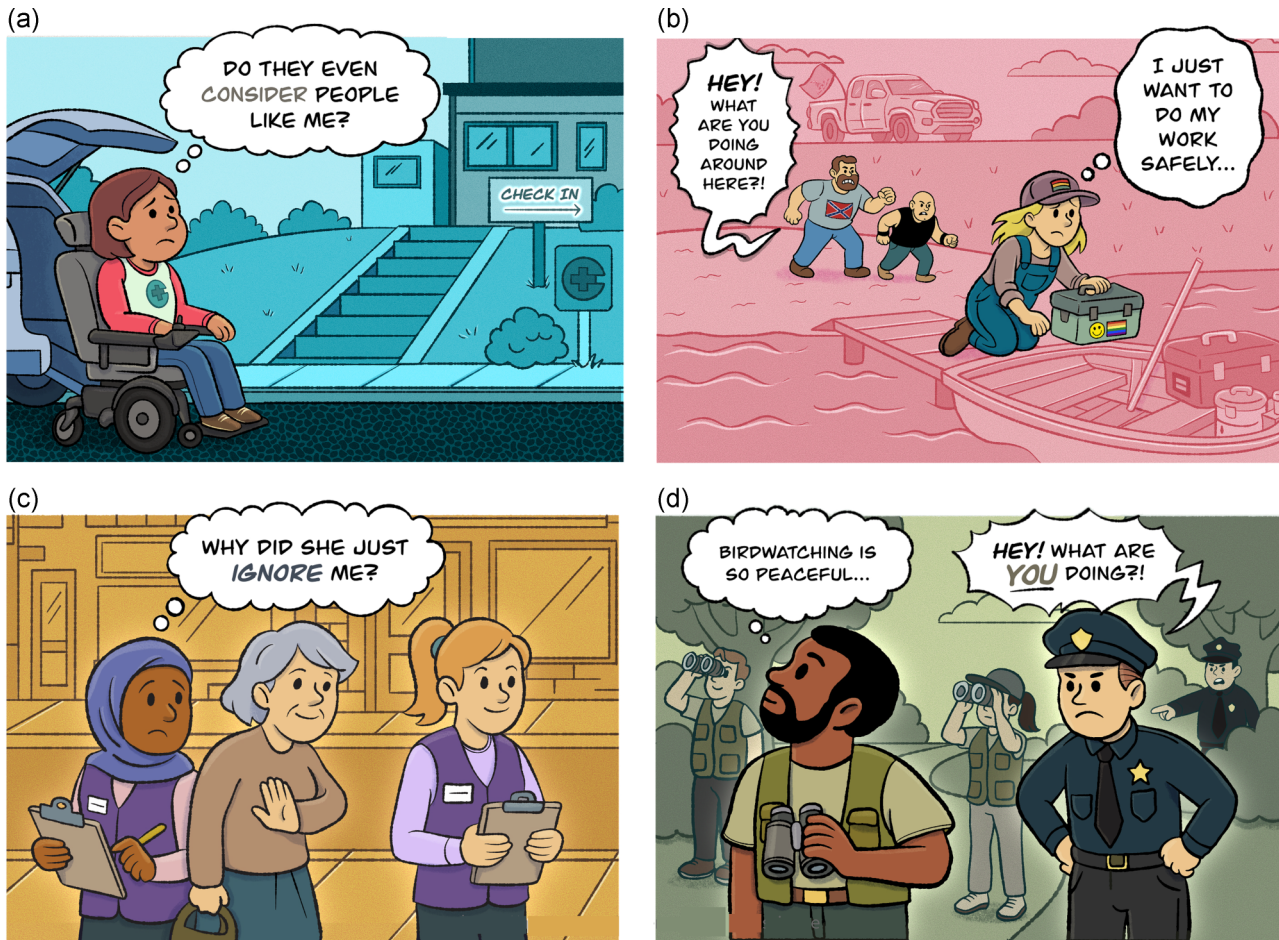


Figure 1. Examples of social field safety concerns including (a) a wheelchair user is unable to navigate a gravel parking lot and a stair entrance, (b) an LGBTQ+ fieldworker is accosted by two men, one of whom is wearing a shirt with a hateful symbol, (c) a surveyor wearing a hijab is ignored, and (d) a black birder is singled out and confronted by police. Illustrated by Dameon Williams.

to participation, and create safer and more inclusive environments (Jensen et al. 2021).

Social field safety

The authors of this paper define social field safety (SFS) as the prevention, protocols, and resources concerned with protecting fieldworkers from discrimination, prejudice, microaggressions, and mentally or physically unsafe encounters (whether intentional or unintentional) with other people while performing fieldwork. Examples of SFS concerns include encounters with law enforcement responding to or questioning fieldworkers; property owners intimidating fieldworkers with hostile language or dangerous weapons such as firearms; hate symbols or discriminatory language displayed at field sites; inaccessible field environments, housing, transportation, or facilities that limit participation; and experiences of sexual harassment, assault, discrimination, or other forms of interpersonal misconduct involving research team members, supervisors, collaborators, or members of the public encountered during fieldwork (see figure 1).

Although anyone can experience SFS issues, some fieldworkers face disproportionately greater risks. As defined by Demery and Pipkin (2021), these “at-risk” individuals include minority identities of the following: race/ethnicity, sexual orientation, disability, gender identity, and/or religion. When individuals from these backgrounds engage in

fieldwork, especially within unfamiliar or socially hostile communities, they may find themselves in an uncomfortable and potentially unsafe position of being exposed to prejudice. Although many SFS issues stem from broader societal prejudice, they have tangible consequences for fieldworkers, including adverse effects on mental health and, in some cases, physical harm.

Physical field safety

The authors of this paper define physical field safety (PFS) as the prevention, protocols, and resources designed to protect fieldworkers from bodily harm caused by environmental hazards encountered during fieldwork, including wildlife, hazardous terrain, extreme weather, disease exposure, and other natural risks. Typical PFS practices include hazard assessments, emergency response planning, personal protective equipment, communication plans, navigation training, and first aid preparedness (Howell 1990, Boston University 2017, The Yale Environmental Health and Safety (EHS) Field Safety Handbook 2020, Kuebigg et al. 2021, Michigan Technological University College of Forest Resources and Environmental Science 2023, University of California 2023). These practices are well established across many institutions and organizations and form a routine component of fieldwork preparation (Clancey et al. 2014, Davis et al. 2021, Troutman 2023).

Integrating physical and social field safety

Physical safety protocols have become an expected component of fieldwork preparation. Although resources for outdoor work vary among disciplines, most institutions emphasize hazard identification, emergency planning, communication procedures, and environmental risk mitigation through field safety plans and other established guidelines (Flotemersch et al. 2001, Houle et al. 2004, Daniels and Lavallee 2014, Demery and Pipkin 2021, Centers for Disease Control and Prevention 2024). In contrast, comparable guidance addressing social safety remains far less common. Although physical hazards are routinely incorporated into risk assessments, interpersonal hazards, including discrimination, harassment, prejudice, and other socially driven risks, are often absent from fieldwork preparation despite growing recognition of their impact on fieldworkers (Clancy et al. 2014, Demery and Pipkin 2021, Kamran and Jennings 2023). Both physical and social safety should be considered fundamental components of comprehensive fieldwork preparation. Just as researchers routinely prepare for environmental hazards regardless of where fieldwork occurs, they should also prepare for the interpersonal and social environments in which fieldwork takes place. Together, PFS and SFS provide a more complete framework for promoting safe, effective, and inclusive field experiences.

Social field safety issues as a barrier to participation in the natural sciences

In order to provide a comprehensive understanding of the impacts of SFS on at-risk individuals, we first explain why social barriers arise and how they influence participation in the natural sciences. At-risk fieldworkers frequently report unwelcoming working environments and a lack of sense of belonging among colleagues (Nelson et al. 2017, Barber et al. 2020, Bullard et al. 2024). These experiences often stem from discrimination, microaggressions, and implicit biases that continue to persist in the natural sciences (Nelson et al. 2017, Bullard et al. 2024). Limited representation in leadership positions (Bernard and Cooperdock 2018, Carter et al. 2022), and lower participation in professional societies (Bullard et al. 2024) can further reduce opportunities for mentorship and advocacy by individuals who understand the unique challenges faced by at-risk fieldworkers (Carter et al. 2022). This lack of support may contribute to diminished self-efficacy (Bullard et al. 2024), burnout, emotional distress, and lower participation in research and professional development (Clancy et al. 2014, Nelson et al. 2017, Demery and Pipkin 2021). Collectively, these barriers can discourage participation and retention in the natural sciences (Lawrence and Dowey 2021; Nocco et al. 2021, Carlin et al. 2024). The following sections describe how personal identity and workplace culture contribute to these barriers and why they should be considered when preparing researchers for fieldwork.

Social field safety issues arising from personal identity

Although this paper focuses on the barriers faced by US-based individuals and institutions, the authors acknowledge the unique set of barriers relevant to international fieldworkers, including an unpreparedness for the sociopolitical climate they encounter when working in the United States, particularly in southern, conservative regions.

The United States of America has a history of excluding at-risk groups from the outdoors. Early works from colonist leaders such as

Muir, Grant, Pinchot, and Thoreau championed the idea of a “pristine wilderness” and, in doing so, dehumanized African Americans and Native Americans (Nocco et al. 2021, Rudd et al. 2021). African Americans experienced lynching and other forms of outdoor violence, whereas Native Americans experienced monumental loss of land and culture. Contemporary reports of racially motivated violence against black Americans participating in outdoor recreation such as hunting and camping (Hill 2016, Scott 2022) underscore that these historical legacies continue to influence perceptions of safety outdoors. Likewise, field researchers of color often face racism, including hostile language and suspicion from locals. Additionally, hate symbols like swastikas and Confederate flags have a profound psychological impact on individuals. These symbols are linked to intimidation, especially when used in areas with historical or cultural significance (Wiener and Richter 2008, Viglione 2020). The fear of outdoor violence while conducting fieldwork has gone unaddressed and unchallenged by institutions, and traditional and cultural methods of stewardship have been deemed “unscientific” (Chaudhary and Berhe 2020, Sene-Harper et al. 2022). These historical and contemporary experiences contribute to the continued underrepresentation of marginalized groups within the natural sciences. People identifying as black or African American are underrepresented in the natural sciences, making up barely 3% of professionals in the United States (Troutman 2023)—a statistic that has not changed for decades (Bernard and Cooperdock 2018, Barber et al. 2020, Bullard et al. 2024). As of 2021, Hispanic workers represented 15% of the total STEM workforce, Asian workers made up 10%, and Native Americans and Alaska Natives together made up less than 1% of the US population and STEM workforce (NSF 2023). Only 3% of the STEM workforce were people with disabilities (NSF 2023). Together, these historical and contemporary experiences can increase uncertainty and perceived risk when conducting fieldwork.

Although the number of women in STEM has overall increased (Hartshorn et al. 2023, NSF 2023), women also remain underrepresented in many natural science disciplines (Nelson et al. 2017, Carter et al. 2022, Bullard et al. 2024). Women, particularly trainees and women of color, continue to experience disproportionately high rates of sexual harassment and assault during fieldwork (Fleischner et al. 2017, Nelson et al. 2017, Demery and Pipkin 2021, Carter et al. 2022, Hamylton et al. 2023), often perpetrated by senior researchers who hold decision-making authority (Clancy et al. 2014, Rudzki et al. 2022). In one survey of 666 field scientists, 64% reported experiencing sexual harassment and more than 20% reported sexual assault (Clancy et al. 2014). Additionally, there is still stigma and a lack of resources surrounding menstruation, pregnancy, and lactation in the field (Hamilton et al. 2023, Hartshorn et al. 2023). These experiences may influence not only immediate safety but also long-term career persistence.

Likewise, members of the LGBTQ+ community experience discrimination stemming from misconceptions that LGBTQ+ identities are incompatible with the natural world despite extensive scientific evidence to the contrary. This discrimination has resulted in incidents of exclusion and outdoor violence toward individuals of diverse gender identities and sexual orientations (Kamran and Jennings 2023, Cronin et al. 2024). Within field settings, discrimination may also occur through binary gendered divisions of labor, physical endurance expectations, and limited or gender-exclusive housing accommodations (Nelson et al. 2017, Lawrence and Dowey 2021, Hamylton et al. 2023, Hartshorn et al. 2023).

Workplace harassment remains an additional concern. A recent report documented a sharp rise in sexual harassment experienced by young LGBTQ individuals, often linked to power dynamics and social stigma (Sears et al. 2024). Many incidents also go unreported because individuals fear retaliation or disbelief from supervisors (Cronin et al. 2024, The Australian 2024). Although many institutions have strengthened codes of conduct, sexual harassment policies, and reporting procedures in recent years, awareness, accessibility, and implementation of these resources remain variable across organizations and field settings (Nelson et al. 2017, National Academies of Sciences, Engineering, and Medicine 2018). These barriers extend beyond interpersonal interactions and are often reinforced through institutional practices.

Researchers from diverse religious backgrounds may encounter additional barriers during fieldwork (Mukherjee 2023), such as scheduling fieldwork during important religious events (Lawrence and Dowey 2021). Over 15% identified religious discrimination as a barrier to their field activities (Demery and Pipkin 2021). Another report indicated that researchers feel unsafe due to religious or cultural factors in certain fieldwork regions (Rudzki et al. 2022). These challenges demonstrate that field safety planning should account for cultural and religious considerations.

Low accessibility and lack of accommodations are barriers for individuals with physical and mental disabilities. Surveys show that 26% of field researchers reported non-academic accessibility challenges affecting their participation (Demery and Pipkin 2021). Common accessibility challenges include duration and intensity of physical activity (Nelson et al. 2017, Hamylton et al. 2023), a lack of breaks from physical exertion (Lawrence and Downey 2021), lack of or unpredictable bathroom and hygiene privacy (Nelson et al. 2017, Hamylton et al. 2023, Kamran and Jennings 2023, Cronin et al. 2024), and overstimulation experienced by individuals on the autism spectrum (Lawrence and Downey 2021). Additionally, field sites typically lack mobility, hearing, or visual aids. Discrimination even arises from assumptions regarding factors that may not encumber a fieldworker, such as their weight (Fleischner et al. 2017). Assumptions about who is perceived as capable of conducting fieldwork can create additional barriers for individuals whose identities or physical characteristics differ from traditional expectations of a field scientist. Accessibility barriers often arise from assumptions about how fieldwork must be conducted rather than from the scientific work itself.

Social field safety issues arising from workplace attitudes and traditions

In addition to barriers associated with personal identity, workplace attitudes and longstanding field traditions can also create obstacles to participation. Hypercritical attitudes and gatekeeping—the act of controlling or limiting access to certain opportunities, resources, information, or professional communities—can discourage participation and reinforce exclusion within outdoor work environments (Hartshorn et al. 2023, Funkhouser et al. 2024). Although the natural sciences have become increasingly diverse since the first wave of environmentalism in the 1970s, leadership positions have remained disproportionately occupied by white men (Mejia and Griffis-Kyle 2020, Nocco et al. 2021). This imbalance may contribute to workplace cultures where inappropriate behavior goes unaddressed (Nelson et al. 2017) and individuals who report concerns fear retaliation (Rawski and Conroy 2020, Cronin et al. 2024). For example, there is a tradition within certain demographics that views overcoming challenges, particularly

physical labor, independently as an essential part of professional development (Carter et al. 2022, Hamylton et al. 2023). Physical struggle in particular is compounded by the prevalence of unpaid fieldwork—specifically the pressure to take potentially unsafe jobs or do unsafe actions during fieldwork for the sake of “experience” without regard to personal safety (Nelson et al. 2017). When these attitudes become embedded within field cultures, they may contribute to unsafe working conditions by discouraging reporting, minimizing safety concerns, and creating pressure to endure physical or social challenges without support.

Benefits of implementing SFS for researchers

SFS should be viewed as a fundamental component of fieldwork preparedness. Just as researchers receive training before handling wildlife or working in hazardous environments, they should also be equipped with the knowledge and tools needed to recognize, prevent, and respond to social risks encountered during fieldwork. Integrating SFS into field preparation benefits both individual researchers and the broader research enterprise. SFS enhances researchers' confidence, preparedness, and self-efficacy (Rudzki et al. 2022), equipping them to navigate the complexities of fieldwork more effectively. By reducing social barriers and improving perceptions of safety, SFS can also increase the likelihood that researchers will pursue and sustain careers in the natural sciences (Nelson et al. 2017). Ultimately, preparing researchers for both physical and social challenges supports safer field experiences, stronger professional development, and greater participation in field-based research.

Benefits of implementing SFS for supervisors and advisors

Beyond protecting individual fieldworkers, incorporating SFS into research protocols benefits supervisors, principal investigators, and other research leaders. Establishing clear expectations for professional conduct, fostering inclusive research teams, and preparing researchers for social challenges promotes safer, more effective field experiences (Demery and Pipkin 2021, McGill et al. 2021, Kamran and Jennings 2023, Troutman 2023, Cronin et al. 2024). These practices strengthen communication, increase trust between supervisors and trainees, and contribute to research environments where all team members feel supported.

Diverse and inclusive research teams have also been shown to promote innovation, improve problem solving, and strengthen conservation outcomes (Barber et al. 2020, Chaudhary and Berhe 2020, Schell et al. 2020, Demery and Pipkin 2021, McGill et al. 2021). By prioritizing SFS, supervisors demonstrate a commitment to the well-being of their teams while cultivating collaborative research environments that improve both individual experiences and scientific outcomes (Nelson et al. 2017).

Benefits of implementing SFS for institutions

Institutional adoption of SFS policies supports researcher well-being while strengthening organizational effectiveness. Clear policies reduce stress, improve trust, and foster a stronger sense of belonging, particularly among marginalized researchers (Schell et al. 2020, Creary et al. 2021). These improvements contribute to greater reten-

tion, stronger research teams, and more equitable participation in field-based science (Schell et al. 2020, Creary et al. 2021, Bullard et al. 2024). Institutions also benefit through improved risk management, clearer expectations, and greater accountability. Integrating SFS into existing field safety frameworks aligns institutional practices with evolving standards of professional conduct while demonstrating a commitment to creating safe and supportive learning and research environments.

Recommendations for implementing SFS for supervisors and advisors

Supervisors, principal investigators, and advisors play a central role in shaping the culture and safety of field experiences. As such, SFS should be incorporated into field preparation in the same manner as traditional physical safety planning. Prior to conducting fieldwork, supervisors should establish clear expectations for professional conduct, discuss potential social and environmental risks specific to field locations, and ensure that all team members are familiar with available reporting procedures and institutional resources (Clancy et al. 2014, Demery and Pipkin 2021, Kamran and Jennings 2023, Cronin et al. 2024). Open communication before, during, and after fieldwork can help create an environment in which concerns are addressed proactively rather than reactively.

Field planning should also account for the diverse identities, experiences, and accessibility needs of research team members. This includes considering local sociopolitical contexts, respecting cultural and religious practices, incorporating accessibility and universal design principles when feasible, and developing inclusive safety plans with input from all participants (Demery and Pipkin 2021, Dolph 2021, Troutman 2023, Cronin et al. 2024). Supervisors should regularly review field safety protocols, assess potential social risks alongside physical hazards, and model the professional behaviors expected of all members of the research team. By integrating these practices into routine field preparation, supervisors foster research environments that prioritize professionalism, accountability, and the well-being of everyone involved.

Recommendations for implementing SFS for institutions

Institutions should recognize SFS as an essential component of comprehensive field safety rather than treating it as a separate diversity or compliance initiative. Written field safety policies should explicitly address social risks, including discrimination, harassment, retaliation, and reporting procedures, and should be integrated into existing risk assessment and field safety frameworks (Clancy et al. 2014, Demery and Pipkin 2021, Kamran and Jennings 2023, Cronin et al. 2024). Regular training for students, staff, faculty, and field supervisors should accompany these policies to ensure consistent implementation across departments and field programs.

Institutions should also establish accessible reporting mechanisms, regularly evaluate the effectiveness of field safety policies, and update protocols as new research and best practices emerge. Supporting inclusive field station design, encouraging accessibility accommodations, and providing resources that account for diverse cultural, religious, and personal identities further strengthen field safety for all participants (Dolph 2021, Demery and Pipkin 2021, Cronin et al. 2024).

Embedding SFS within institutional policy, training, and accountability structures reinforces a culture of prevention rather than reaction and demonstrates a sustained commitment to safe, equitable, and inclusive field research.

In conclusion

Fieldwork remains a cornerstone of education, research, and conservation in the natural sciences, yet preparing researchers for the social realities they may encounter has not kept pace with traditional approaches to physical safety. As this review demonstrates, SFS is not separate from field safety but rather an essential component of comprehensive field preparedness. Just as researchers routinely prepare for environmental hazards, they should also prepare for the interpersonal, cultural, and societal factors that can influence safety, well-being, and success in the field.

Integrating SFS alongside established PFS protocols has the potential to reduce barriers to participation, improve research well-being and retention, strengthen field teams, and foster more inclusive scientific communities. By adopting SFS as a standard component of fieldwork preparation, supervisors, institutions, and research organizations can move beyond reactive responses toward a culture of prevention, professionalism, and shared responsibility. Ultimately, ensuring that fieldworkers are prepared for both physical and social hazards will strengthen not only individual experiences but also the future of field-based science itself.

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