

THESIS

HARNESSING ROCK CLIMBERS FOR BAT CONSERVATION: UNDERSTANDING THE BARRIERS AND BENEFITS
FOR ROCK CLIMBERS TO ENGAGE IN CITIZEN SCIENCE

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ABSTRACT

HARNESSING ROCK CLIMBERS FOR BAT CONSERVATION: UNDERSTANDING THE BARRIERS AND BENEFITS FOR ROCK CLIMBERS TO ENGAGE IN CITIZEN SCIENCE

Citizen science is a valuable tool for crowdsourcing data, yet it remains underutilized at the nexus of conservation and recreation. The value of citizen science lies in its ability to expand the scope of research by reducing financial burden, increasing data collection over time, and tapping into a diverse pool of skillsets from individuals. Recreators, in particular, can broaden the extent of the project in new ways. Extreme sports participants emerge as a key subgroup of recreators due to their additional specialized skills, knowledge, and daring prowess. This research focuses on one such community of extreme sport participants— rock climbers. Rock climbers are distinguished by their ability to navigate and collect data from vertical environments that remain inaccessible to many biologists. The potential of collaboration is timely, as bats are facing unprecedented threats from white-nose syndrome, wind energy, habitat loss, and climate change. Thus, this research aims to (1) uncover the barriers and motivations for rock climbers to participate in a citizen science initiative called Climbers for Bat Conservation (CBC), (2) explore the relevance of environmental attitudes and knowledge of the organization on climber engagement, and (3) suggest strategies to increase the likelihood of reporting a bat to CBC, utilizing the Community-Based Social Marketing framework.

Data for this project was collected using mixed methods, including two sets of semi-structured interviews and a structured survey. Semi-structured interviews were conducted at a rock climbing festival, Rocktoberfest, in Red River Gorge, Kentucky and through the video chat platform, Teams. Results from the semi-structured interviews were used to inform the structured survey. The survey was

administered to climbers at Rocktoberfest and to an online database of climbers who reported seeing a bat to CBC. In Chapter 1. I present and discuss the semi-structured interviews, which revealed diverse motivations for participation, including knowledge and experiences with bats, the role of the climbing community, and the complexities of navigating climbing access and conservation. Results of the survey are discussed in Chapter 2., revealing the importance of situational barriers (time, forgetting, and fear of losing access), as well as highlighting the key role that the climbing community plays in influencing behavior. Results also revealed that accurate knowledge of CBC did not have a significant impact on the reporting behavior. It could be that the larger influence on the reporting behavior comes from environmental attitudes, as the results showed that climbers who reported to CBC had a significantly higher proportion of individuals who held pro-environmental attitudes as compared to climbers who had not reported. Both reporting and non-reporting climbers valued the ecological benefits of reporting a bat, highlighting a key topic that can be utilized in future message framing.

These findings build upon the growing body of research that demonstrates knowledge alone does not change behavior. This is important for citizen science organizations seeking to utilize rock climbers because many climbers are guided by ecological motivations in tandem with the fear of losing access. My research suggests that acknowledging tradeoffs regarding management of climbing routes and bat conservation while maintaining transparency about how the data will be used will likely aid in recruitment and retention of climber volunteers. Results of this research may aid future citizen science projects in beginning a social marketing campaign for organizations with limited time, budget, and/ or staff availability, while shedding light on the motivations of rock climbers to participate in pro-environmental behaviors.

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CHAPTER 1 – ACCESSING THE INACCESSIBLE: ROCK CLIMBER MOTIVATIONS FOR PARTICIPATING IN CITIZEN SCIENCE

1.1 INTRODUCTION

Collaborations between scientists and non-scientists for conservation and environmental issues take many forms. One such collaboration is “community science”, which is defined as scientific research driven and controlled by local community participants (Charles et al., 2020). This approach emphasizes local knowledge, collective action, and empowerment (Charles et al., 2020). In contrast, “citizen science”, also known as participatory science, involves engaging the public in conservation science research, crowd-sourcing data, and possibly influencing environmental policy (Burgess et al., 2017; Dickinson et al., 2012; Fontaine et al., 2022). Citizen science broadens the potential scope of studies through the use of its participants, often while overcoming limitations related to time, specialized skills, and financial resources (Bonney, Cooper, et al., 2009; R.J.P. Blaney & A.C.V. Philippe, 2016). This is in contrast to community science, where participants usually have a centralized goal to empower their own community.

The Center for Advancement in Information Science Education (CASE) describes three types of citizen science including : (1) Contributory- in which the project is designed by a scientist and members of the public are asked to collect data, (2) Collaborative- in which members of the public engage in multiple aspects of the scientific process including data collection, analysis of data, and disseminating results, and (3) Co-created projects- in which projects originate and grow, from start to finish, as partnerships between members of the public and scientists (Bonney, Ballard, et al., 2009). Contributory citizen science is the most prevalent of the three types (Shirk et al., 2012; West et al., 2016), and it is the type of project that this research focuses on.

Citizen science is being underutilized in conservation because practitioners have a preference bias for certain data sources including institution, age, and education level (Burgess et al., 2017). Despite speculation of data accuracy, there are many examples of projects where crowdsourced data produced data of similar quality to that collected by highly trained scientists (Kosmala et al., 2016; Lewandowski & Specht, 2015; Lin et al., 2015). There has been a steady increase in research on the methodology and quality of data output by citizen science over the past decade, but motivations for volunteer participation remain largely unexplored (Follett & Strezov, 2015). Understanding and delivering motivations ensures long term engagement and increased impact of citizen science projects, and should therefore be included in the recruitment and retention of volunteers (August et al., 2019; Domroese & Johnson, 2017; Rotman et al., 2012).

Motivations of participants in conservation citizen science projects vary. Larson et al.'s (2020) work highlights the value of wanting to participate in scientific discovery and intrinsic environmental values, while Domroese and Johnson (2017) found that citizen science volunteers in the Great Pollinator Project participated because they wanted to learn more about the species of interest, bees. These varying motivations likely are due to variable demographics and experiences of participants, highlighting the need for segmenting audiences based on the project and its goals (Larson et al., 2020). This is especially pertinent for conservation citizen science and environmental volunteering projects that do not target the typical participant, that is, highly educated white females, over the age of 50, in higher income brackets (Crall et al., 2012; Domroese & Johnson, 2017; Guiney & Oberhauser, 2009; Waugh et al., 2023).

One participant group whose motivations in citizen science have not been clearly studied are extreme sport participants. While the definition of extreme sports can be hard to define, I recognize Brymer's (2005) definition of extreme sports as an "activity where a mismanaged mistake or accident would most likely result in death (pg. 71)." Historically, the literature reduces extreme sport participants to simple adrenaline seekers, with little connection to nature (Zuckerman & Neeb, 1979). However,

research suggests that participants can develop closer relationships with nature through extreme sports (E. Brymer & Gray, 2009, 2010), which may, in turn, increase pro-environmental behavior such as participating in conservation citizen science (MacIntyre et al., 2019; Rosenblatt et al., 2022). The proclivity of extreme sports participants towards pro-environmental behavior is of interest to citizen science, as these participants often have the skills, resources, and time to access remote areas where most scientists are unable to go (Carey et al., 2016; Davis et al., 2017; Lucrezi, 2021). This study focuses on citizen science engagement from a particular subset of extreme sport participants, rock climbers.

1.1.2 A review of climbing and climber citizen science

Understanding the term, “climbing”, and the different disciplines the term embodies, is essential before delving into the intersection of climbing and citizen science. “Sport climbing” involves the use of fixed gear like bolts and anchors to climb a route while protecting by rope, harness, and belay device (Lockwood & Sparks, 2013). Routes can be single pitch (climbed safely with approximately one ropes length), or multi-pitch which involves multiple rope lengths. Alternatively, in “traditional climbing” the climber must place pieces of protection as they ascend the route (in the form of camalots, chocks, nuts, etc.), and also utilizes a rope, harness, and belay device (Kiewa, 2002). “Bouldering” refers to climbing that involves no on-the-rock protection, but rather a thick pad onto which the climber (hopefully) falls from a relatively short height (typically <4.5 m) (Wheaton, 2004). “Mountaineering”, a highly risky form of climbing, combines the skills of both traditional and sport climbing and involves orienteering and a variety of other mountain climbing skillsets needed to navigate long treks on mountain peaks (Wheaton, 2004). Bouldering tends to be more accessible due to lower technical requirements and equipment costs, while traditional climbing and mountaineering demand expensive gear and extensive knowledge. For many, sport climbing lands somewhere in the middle in terms of cost and expertise. Other less

common forms of climbing include aid climbing, ice climbing, free soloing, and deep water soloing which will not be covered in this study (Lockwood & Sparks, 2013).

Citizen science programs have engaged climbers in data collection in a variety of efforts, but especially in the disciplines of mountaineering and snow science. Adventure Scientists, a non-profit that utilizes adventure sports to collect scientific data, trains mountaineers to collect vertical columns of snow above 15,000 feet to understand how glaciers are thinning (*Snow and Ice Collection*, n.d.). Carey et al. (2016) calls for collaboration between glaciologists and mountaineers in the Cordillera Blanca region of Peru to collect on-the-ground glaciological data, prevent glacial lake outburst floods and understand climate change impacts on the region. Inspiring Girls Expeditions takes high school-aged girls on expeditions on Alaskan glaciers to learn how to develop scientific projects and collect glacial data (*Girls on Ice Alaska*, n.d.). However, climber expertise isn't only being recognized in the snow sciences. The American Climber Science Program teams up scientists and mountaineers to understand remote mountain environments. The program has collected information on impacts of cattle grazing and changes in fire regimes in high elevation environments (All et al., 2017; Thapa et al., 2016).

Currently, most climber citizen science programs focus on landscape-level science, but some organizations are beginning to utilize climbers for imperiled species conservation. Big Wall Bats is a program based in Yosemite National Park and Zion National Park that encourages traditional and sport climbers to report bats on the parks' acclaimed multi-thousand foot, multi-pitch climbing routes (Miller, 2022). These towering cliffs are then surveyed by climber scientists to understand more about the spread of White-Nose Syndrome, a fatal disease devastating certain species of North American Bats (Hoyt et al., 2021). This novel partnership is of importance to scientists due to the general inaccessibility of cracks, crevices, and pockets on cliff faces for detailed study (Loeb & Jodice, 2018; R. A. Schorr et al., 2022a) and the swift decline of bat species due to disease, wind energy development, climate change, and habitat loss (E. Arnett et al., 2015; E. B. Arnett et al., 2013; Cheng et al., 2021; Hoyt et al., 2021;

North American Bat Conservation Alliance, 2023). While Yosemite National Park boasts a variety of climbing, the reports and monitoring primarily take place on “big walls”, which refers to multiple pitches of difficult climbing requiring highly specialized skills and gear.

Similarly, Climbers for Bat Conservation (CBC) is a citizen science effort focused on bringing together rock climbers, land managers, and biologists to learn more about bats in cliff environments (Davis et al., 2017; Gross et al., 2023). CBC is unique because it emphasizes bat reporting in any cliff environment, accommodating various climbing disciplines such as bouldering, traditional, and sport climbing across the United States. This broadens the scope of participants substantially as it allows different socio-economic groups and varying levels of expertise to engage with CBC. By engaging a diverse population of outdoor climbers, CBC is able to provide valuable information on the roosts and roosting habits of cliff-roosting bats (R. A. Schorr et al., 2022b).

Climbers have proven to be effective volunteers who bring specialized outdoor skills to access environments where most scientists don't have the time, funding, or skillsets to study (All et al., 2017; Carey et al., 2016; Miller, 2022; R. A. Schorr et al., 2022b). Despite climbers’ efficacy in collecting data, I found no studies on how best to recruit climber volunteers for citizen science programs, nor climbers’ motivations for doing so. This study focuses on the motivations of rock climbers engaging with CBC with the aim to increase our current understanding of how best to engage extreme sports participants in conservation efforts. This case is particularly interesting because CBC is presented with two unique challenges. Namely, the focus of the organization is on conservation efforts of an unpopular and elusive species, and the encouraged collaboration of climbers engaging the project carries the possibility of climbing closures, potentially damaging the relationship with the very participants who contribute the data.

1.1.3 Attitudes, feelings, and experiences around bats

Understanding what impacts individual's attitudes towards specific species is complex, the results of which are highly varied in the literature (Batt, 2009; Serpell, 2004). For the purpose of this research, we draw upon Kellert's (1980) influential framework, which is recognized as the most widely employed method for evaluating public attitudes towards wildlife while leveraging extensive empirical research on the topic (George et al., 2016; Kingston, 2016; Waldhorn, 2019). Kellert's framework suggest that there are four major factors influencing people's attitudes towards wildlife, including (1) prior attitudes towards species, (2) previous experience and knowledge of species, (3) cultural significance, and (4) perceptions of individual species (S. Kellert & Felthous, 1985; S. R. Kellert & Berry, 1980). This framework can easily be applied towards bats, as there are ample studies on human perceptions and attitudes towards bats.

Bats are generally susceptible to negativistic attitudes as compared to charismatic species, such as elephants, polar bears, and butterflies (Davey et al., 1998; Knight, 2008). Negative attitudes about bats can be traced back to perceptions of bats transmitting infectious diseases, such as rabies, Ebola, and, most recently, Coronaviruses (Lu et al., 2021; Schneeberger & Voigt, 2015; Siemer et al., 2021). What more, experiences between humans and bats are often limited because of bats' nocturnal nature. When people do have experience with bats, it tends to be in a conflict setting of bats roosting in a home and being considered a nuisance (Voigt et al., 2016).

Cultural beliefs further contribute to the challenges faced by bat conservation efforts, particularly in North America where bats are often associated with vampires, evil, and death (Sieradzki & Mikkola, 2022). Such associations trigger fear responses, leading to an increased heartbeat, release of adrenaline, and fight-or-flight reactions (Castillo-Huitrón et al., 2020). Fear and disgust play a key role in influencing negative attitudes towards wildlife, and therefore affects people's engagement with a bat conservation organization (Jacobs, 2012; Kaltenborn et al., 2006; LeDoux, 1998). Thus, these widespread

cultural perceptions of bats as unattractive, frightening, and vectors of deadly disease pose a significant hurdle, making it challenging to recruit participants for bat citizen science efforts (Castillo-Huitrón et al., 2020).

1.1.4 The controversy of access in the United States

Access to rock climbing in the United States has a tumultuous history, and continues to be an area of conflict in the climbing community today (Bogardus, 2012). Access to climbing areas refers to landscape scale, corridor, and individual route access (Access Fund, 2008). Threats to access may include prohibitions on use from private land owners, industry and mining, land development, archaeological and cultural sites of significance, and biological priorities (Smith, 2017). Additionally, conflict between climbers themselves can limit access (Smith, 2017). Historically, climbing access was established and maintained through multiple levels of governance including peer consensus, input from Local Climbing Organizations (LCOs), policy driven by the national non-profit The Access Fund, and individually within specific federal and state parks (Bogardus, 2012; D. P. Carter et al., 2020; Smith, 2017). However, as recently as 2023, the United States Forest Service and the National Park Service introduced a proposed rule change prohibiting the use of fixed climbing protection in all wilderness areas, a blanket ban effectively eliminating safe access in many popular climbing areas (Grijalva et al., 2002). Access was, and currently is, a significant area of conflict between the climbing community and land managers (Bogardus, 2012).

Conflict between climbers and land managers is often related to conservation concerns, some warranted and others not (Smith, 2017). While there are many studies on the impact of rock climbers on cliff face vegetation (Bogges et al., 2021; Kuntz & Larson, 2006; Tessler & Clark, 2016), most existing literature finds the impact of rock climbing on cliff biodiversity inconclusive (Holzschuh, 2016). In some instances, rock climbing has been shown to negatively impact nesting raptors and corvids resulting in

route closures (Brambilla et al., 2004; Dwyer et al., 2020; Hendrick et al., 2023; Melanson, 2015), but climbers have taken a pro-active role in encouraging adaptive management strategies. Temporary and geographically limited closures for raptor nesting typically receive support from the climbing community (Hendrick et al., 2023). However, in some cases land managers apply blanket closure (closures ranging in a half-mile radius from the suspected cliff faces) with little evidence of actual raptor nesting (Maness, 2020). Climbers often perceive blanket closures as unwarranted, which has resulted in literature reviews on raptor ecology, an experiment on raptor viewsheds, and route monitoring by climber volunteers to establish best practices for raptor nesting success while also maintaining access (Greg Orton, 2021; Hendrick et al., 2023; Maness, 2020). Similar conflict may come to a head between climbers and bat scientists.

CBC seeks to improve relationships between bat biologists and climbers while encouraging collaboration between the two stakeholders (Davis et al., 2017). CBC asserts that there is little evidence that climbing routes need to be closed due to bat presence, although they acknowledge that in some cases, such as colonies of endangered species, closures may be advised (R. Schorr et al., 2021). Despite there being little data supporting closures of climbing routes, some biologists are still suspicious of climber impact (Wilson, 2019). Unwarranted closures pose a risk of discouraging climber engagement with CBC. However, based on previous examples with raptors, using adaptive management and collaborative conservation methods that involve climber input may mediate the issue.

1.2 METHODS

1.2.1 Study site

Located in Kentucky, the Red River Gorge (also known as “the Red”) is a world renowned climbing area due to its high density of steep, sandstone climbing routes and tight-knit climbing community (J. Rickly, 2012; J. M. Rickly, 2017a). The Red consists of six main climbing areas spread out over two counties, spanning private, state, and federal ownership (Figure 1). CBC has had a presence in the Red since 2019, when the co-founders hosted a World Café to engage with climbers and develop a community science effort that would take advantage of the high concentration of both bats and rock climbers (Davis et al., 2017). Since then, CBC has hosted a booth at the annual climbing festival, called Rocktoberfest, and organized one bat outing, which is an evening of catching bats and talking about bat conservation. This may explain why, at the time the research began, the Red River Gorge had the most bat reports of anywhere in the world (n = 32).

Climbers had previously been able to report a bat by emailing CBC or reporting in person at the festival. In April, 2022, CBC released a web-based platform to share bat reports through an online survey tool called ArcGIS Online Survey 123 (ESRI, Redlands, California) to better streamline the reporting process while collecting consistent data. Because of CBC’s established presence and abundance of reports, working with the climbing community in the Red offers a unique opportunity to explore what motivates rock climbers to report a bat sighting to CBC.

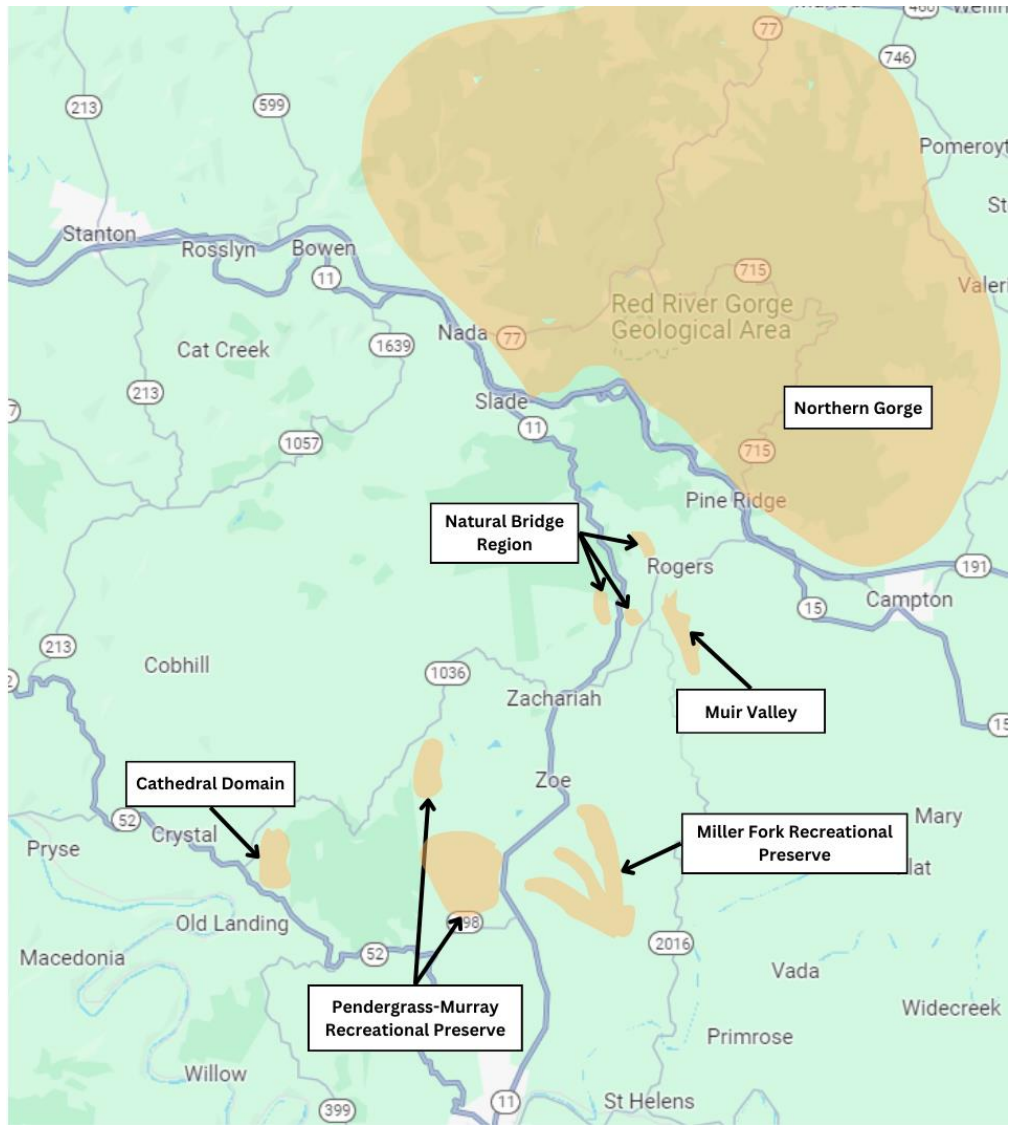


Figure 1. Map of the six main climbing areas in Kentucky's Red River Gorge, also known as "the Red" to many climbers.

1.2.2 Data collection and analysis

This study focuses on rock climbers who previously reported a bat to CBC in the Red, hereby referred to as "Reporters". A semi-structured interview guide (Newing, 2010) was created based on rock climber cultural literature, social marketing literature, and my experience participating in the climbing community (6 years of climbing). Semi-structured interview questions focus on what motivated individuals to report to CBC, climber identity, and engagement with the climbing community. Reporters

were able to skip any question. All reporters were offered the opportunity to participate in a raffle for climbing gear as incentive for their participation. The project is approved by Colorado State University's Research Integrity & Compliance Review Office Internal Institutional Review Board (IRB Protocol no. 3864).

I used a list of climbers who reported seeing bats or guano in the Red, which was acquired from CBC, to identify climbers to participate in surveys. At the time of research, 32 climbers had reported a bat, or guano, in the Red River Gorge (N = 32), and all reporters were contacted at least twice. All reporters were asked to participate in a 30-minute semi-structured interview, which I conducted on Microsoft Teams (Microsoft, Redmonds, Washington), an online video platform, and saturation was reached with 16 interviews (n = 16) (Newing, 2010). Some reporters never responded (n = 12), email addresses were incorrect (n = 1), reporters had scheduling conflicts (n = 2), or individuals were no longer associated with the organizational email address from which they reported (n = 1).

From June - July, 2023, I conducted semi-structured interviews with 16 reporters. Interviews were transcribed using the automatic online transcription tool Otter.ai (Otter.ai.Inc, Mountain View, California). An inductive grounded theory approach was used, in which patterns and themes emerged from the data rather than being imposed prior to data collection (Strauss & Corbin, 1994). I must acknowledge that I identify as a rock climber (of 6 years). I am a part of the new age of rock climbers, meaning I have not climbed my entire life and cannot claim to know everything about climbing culture. However, I have spent time climbing in the Red River Gorge and have an attachment to the area and people there. Thus, the patterns and themes that emerged from the data were informed by my innate knowledge of climbing, and the climbing community in the Red. However, I sought to avoid biases as much as possible and it is likely that my positionality encouraged an honest exchange of information between community members, rather than an extractive experience for participants.

Six parent themes, and 21 child codes resulted from the semi-structured interviews. Of the six parent themes, three parent themes and ten child codes were deemed applicable to answer the question of what motivates rock climbers to report a bat to CBC. The full table of themes, and data-rich excerpts may be seen in Appendix 3.

1.3 RESULTS AND DISCUSSION

Semi-structured interviews averaged 28 minutes in length, the shortest being 16 minutes and the longest 34 minutes. Three major themes pertinent to our research objective emerged from the interviews: (1) Bats and Climbers (2) The Community of Climbing and (3) Access and Climbing. The following results are categorized by major theme with expanded subthemes below.

1.3.1 Bats and climbers: Exploring knowledge, care, and formative experiences

Knowledge of, care for, and experiences with bats emerged as sub-themes under the overall theme of “bats”. “Knowledge of bats”, for the purpose of this study, is described as the demonstration of an understanding of the ecology, habitats, role of, and/or threats facing bats. “Care for bats” is defined as concern for the well-being of bats. Finally, “formative experiences with bats” are defined as an experience with bats that likely influenced an individual’s feelings about bats.

1.3.1.a Knowledge of bats and implications for conservation

The majority of reporters demonstrated some level of understanding of bats. Many reporters recognized the extrinsic value of bats, emphasizing their role in providing ecosystem services. For example, P9 stated:

“I know that they’re in trouble right now, to put it mildly, especially with things like white-nose syndrome. I know that, that we rely on them for everything from eating mosquitos to pollinating flowers.”

Many publications have explored ecosystem services that bats provide (Ramírez-Fráncel et al., 2022). Although there remains critique for using ecosystem services as a means for driving conservation action (Kronenberg, 2014), research suggests that in some instances highlighting ecosystem services can drive conservation behavior (Hayes et al., 2017; Lamarque et al., 2014). Reporters also recognized White-Nose Syndrome as a threat to bats, demonstrating a level of advanced knowledge about the threats facing North America's bat populations. Limiting the spread of White Nose Syndrome is a priority in *The Best Practices for Developing Climbing Worldwide* and knowledge of this disease remains relevant in the interaction between climbers and bats (R. Schorr et al., 2021).

1.3.1.b Nurturing care for bats in climbers

Care for bats, defined as expressing concern for the well-being of bats, was expressed by a few reporters. This positive affiliation with bats contrasted with the negative feelings and attitudes documented in the literature. Reporters were concerned about the impact of their climbing on bats, and a few tried to help bats they came across. Most of these reporters expressed their general positive feeling about bats. P16 expressed care for bats when describing their climbing partner's experience finding a bat on a route:

"So he had quite... he was surprised, but we kind of felt bad though, too, because we felt like the bat was probably gonna die, like, if it flew out of a crack, like in the middle of winter on a, you know, 10 degree day or five degree day or whatever."

Interestingly, some climbers held contrasting attitudes towards bats. Some reporters cared about bat conservation while still finding bats scary in some situations, as demonstrated by P6:

"I've heard some scary stories...just like if you got bit or something. Like some, you have to go do, my friend recently had to go do rabies shots."

These mixed feelings echo Kahn et al.'s findings, which observed both moral and fearful sentiments coexisting in children after experiencing bats in person (Kahn Jr. et al., 2008).

1.3.1.c Formative experiences shape climber perspectives

Formative experiences in our study are defined as an experience, be it direct, indirect or vicarious, with a bat that strongly influences one's feeling about bats (Corbett, 2006). Some participants expressed positive experiences with bats as children as demonstrated by P15:

"I just read a lot of that science written for kids' books that just like portrayed them [bats] as really friendly and cool. And kind of quirky and outcasts, but like important parts of the ecosystem."

A few participants shared positive experiences with bats as adults, both seeing them while rock climbing and near their home. One reporter had an objectively negative experience of being bitten by a bat, but still left the experience with positive attitudes about protecting bats, stating,

"you sort of tread on their turf on they bite you, that's all a part of the game (P4)."

While there are many factors that impact behavior, it is worth noting that these individuals' prior experiences with bats likely influenced their attitudes about bats, amplifying pro-environmental behavior, such as engaging with CBC (Shapiro et al., 2022). There is a dearth of research on this subject, but these results build upon the work of Greving et al. (2022) who found that a citizen science effort that collected bat echolocation data increased both knowledge and positive attitudes from participants. Besides engaging with CBC, climbers might gain indirect experience with bats by working with local biologists on roost counts, observing bat netting projects, and participating in bat talks and walks. Of note, it is recommended that few people, including researchers, should have direct experiences with bats due to the risk of transmitting Covid-19 to the bat (Cook et al., 2021). However, indirect experiences have still proven effective in increasing knowledge, empathy, and concern for the environment (Myers Jr

et al., 2009; Yue et al., 2021). Regardless, further research is needed to understand how much of an impact formative experiences with bats influence engagement with CBC.

1.3.2 Climbing Community: Friendship, community, and organizational involvement to uphold social norms

Climbing culture has been investigated on a many levels (D. Carter, 2019; Rossiter, 2007), but fully describing it is beyond the scope of this paper. For this research, the parent theme Climbing Community will focus on the subthemes of friendship, community, organizational involvement, and social norms as described below.

1.3.2.a Friendships as pillars of the climbing experience

For most of the reporters, establishing friendships and taking part in community were a key part of the climbing experience. Friendships, defined as the social life and interactions that are facilitated by climbing, show that, for reporters, there is more to climbing than the physical sport. This is demonstrated by P1, who stated:

“...it’s [climbing] really just to be spending time with friends and being outside going to new places.”

Rickly’s work in the Red River Gorge indicates that climbing identity and locality play a key role in friendships, and therefore where interpersonal communication takes place (2017b) . These friendship behaviors have implications on how information regarding CBC may be spread, particularly through the utilization of diffusion behavior (Jones & Niemiec, 2020).

1.3.2.b Community displayed through mutual support

Integral to the climbing experience is a sense of community, which was expressed through fellowship and shared actions for the collective benefit as expressed by P5:

“In the climbing community, we all kind of help each other out.”

A few reporters mentioned helping new climbers, or climbers unfamiliar with the area demonstrating a collective ethos that extends beyond individual achievement. Mutual support displayed through mentorship and collective action has a long history in climbing, impacting the norms and actions of the group as a whole (Naylor, 2023).

1.3.2.c Organizational commitment to uphold environmental values

A majority of reporters demonstrated a commitment to the climbing community through organizational involvement. Organizational involvement is defined as giving time or money to a local climbing organization (LCO) (D. Carter, 2021). Local climbing organizations' structures vary, but they share a collective mission around climbing stewardship and advocacy in their area (Schild, 2019). Most reporters made monetary donations to LCOs, and some of the reporters in the study donated their time through trail-maintenance days coordinated by their LCO.

1.3.2.d Social influence to uphold conservation norms

Friendships and community are a form of social influence, which can be motivating factors for conservation behavior (Abrahamse & Steg, 2013). One way this is expressed is through peer-monitoring and social sanctioning, in which the powers of social norms, or perceived appropriate behavior, and influence are utilized to encourage certain behaviors between peers (Guckian et al., 2018). Some participants recognized the role of norms on conservation values in the climbing community, although their perceptions of what those norms were varied. A few reporters were under the impression that reporting a bat was the norm, while other reporters expressed that closures for wildlife are the new norm for outdoor climbers. For example, P11 stated:

“People understand that this is just something that happens every year, and you kind of have to deal with it. And it’s something that now, it’s kind of part of that conversation mixture of how outdoor rock climbing is [referring to closures for wildlife]”

Past literature supports the idea that peer monitoring and social sanctioning to uphold conservation norms take place in the climbing community. Carter (2019) provides an example of social sanctioning where a rock climber observer noticed two individuals climbing on a route that had been closed by the Forest Service due to raptor nesting. In this situation, social sanctions included direct threats of a \$10,000 penalty and jail time, followed by public shaming on the climbing website, Mountain Project (D. Carter, 2019). A similar scenario of peer monitoring was shared by P16 when observing climbers on closed routes:

“Like I’ve seen people going into closed areas and hollered at them and then just used it as an opportunity to educate them like, hey, you know why this is closed XYZ. You know, please don’t climb here. Please get a permit to climb here or whatever.”

These examples illustrate the importance of social influence in enforcing pro-environmental behaviors, and further illustrate the importance of establishing and maintaining conservation norms in the climbing community. While some of the reporters already believed that reporting a bat was the norm, others saw it as an opportunity to instill conservation norms in the climbing community. Maintaining support of CBC in the climbing community is especially important because conservation beliefs may conflict with beliefs around access. The delicate equilibrium between the two beliefs systems demonstrates the complex dynamics inherent in climbing culture.

1.3.3 Access: Navigating climbing closures and acknowledging tradeoffs

Access refers to more than being able to climb a route. In this context it is a climber’s legal ability to go to a climbing area, including permission to traverse roadways and trails, and climb a specific rock feature (Access Fund, 2008). Climbers acknowledge that sometimes climbing closures are valid, while in other cases they are unwarranted. In many cases this returns to tradeoffs, or conditions in which certain management practices were acceptable.

1.3.3.a Varied perspectives on closures

The intersection of climbing, conservation, and access were a focal point for almost all reporters. The term “access” holds significant weight in the climbing community, often triggering strong reactions from climbers. Opinions regarding closures were diverse, highlighting the complex landscape of climbers’ attitudes regarding access and conservation. Many reporters acknowledged feeling apprehension themselves, or in the climbing community, about closures. As shared by P5:

“People don’t want climbs to be closed. As somebody who works with the climbing community, and has to navigate access, and access is a trigger word for a lot of people.”

Additionally, a few participants associated closures with raptor conservation, revealing potential expectations for bat conservation which may have implications on reporting behavior.

Notably, most reporters voiced support for closures, emphasizing the importance of awareness and prioritizing conservation efforts over climbing activities. The nature of the closure, such as length of time and number of routes, and the transparency of information regarding the closure were typically included in statements supporting closures for wildlife conservation.

P11: “I am very conservation minded. So, you know, a closure for part of the year is not going to affect the way I feel about a certain thing. I think that’s how it should be.”

1.3.3.b Navigating distrust and acknowledging tradeoffs

Conservation actions among climbers are not solely driven by intrinsic values but also by a desire to maintain positive relationships with land management agencies to safeguard access to climbing areas (D. Carter, 2019). This additional motivation for conservation is demonstrated by P8:

“so not just conservation for its own sake... but making sure that there is public access for recreational use in particular.”

Distrust towards local land managers, stemming from the ambiguity of previous route closures, adds a layer of complexity to the conservation relationship (Maples, 2021). Within the Red River Gorge, temporary closures have turned permanent. Some climbing areas were initially closed for archaeological site protection, but have left a lasting sense of skepticism and distrust in the climbing community (Maples, 2021). This distrust extends into current conservation work that is collaborative with land managers, as shown by P16:

“Well, I guess just a question like, I mean, I'm assuming like all the reports on bats and things are, you know stay confidential... and I mean do you do you (meaning CBC?) share the reports of bat sightings and things with the [land management agency]?”

Conflicting feelings about working with local land management agencies, based on previous experiences, will likely impact climber reporting behavior.

To address feelings of distrust, acknowledging tradeoffs from the outset becomes essential (Mcshane et al., 2011). Tradeoffs, in the context of this research, involve conditional statements related to management decisions, bat conservation, and climbing access. CBC explicitly states that their goal is to “increase knowledge of cliff roosting bats through collaboration with land managers,” but it is largely believed that this means there have not been, nor will there be closures for bat conservation. Route closures may occur, which could result in a degradation of the trust CBC has worked to establish in the community. The prevalent belief of working with CBC not resulting in closures is recognized by P11:

“those people [people “in the know in the Red”] would also be more likely to report it [the bat], because they know that’s not really going to, you guys aren’t out to close things down. You’re just trying to gather information.”

While that statement is technically true, the context missing here is that CBC ultimately lacks control over land managers' responses, introducing an element of uncertainty. The potential discovery of

an endangered species or maternity colony may lead to temporary closures. Closures may result in lost of trust, due to the precedent that appear to have been set by CBC- the precedent that routes will not be closed (R. Schorr et al., 2021). It is inherent in the nature of the relationship with climbers, that by haphazardly closing routes, land managers are likely to lose the support of climbers for Climber for Bat Conservation. However, the implications of that assumption have not yet been realized.

While closures may occur due to local land managers, they may be temporary and isolated, a tradeoff encouraged by CBC and respected by some participants like P6:

"I think it's probably okay [closures] if there were not permanent closures"

And P2:

"there's enough climbing out there that if, it's not like they're going to, like if they close all of Pendergrass-Murray Recreational Preserve (PMRP), that would be a problem. But if you close three climbs in one area, that's fine."

Many participants expressed environmental beliefs along with feelings about wanting to maintain access. Addressing potential tradeoffs transparently from the beginning positions CBC and land management agencies for a more successful collaboration with the climbing community (Mcshane et al., 2011). P5 expressed many climber's feelings about conservation and access well:

"And I think that climbers want to see crags open, but they also want to see crags being taken care of."

Honesty and transparency can lead to better outcomes in conservation programming (Graham et al., 2021; Smallhorn-West & Pressey, 2022). The responsibility of honesty and transparency does not solely rest on CBC. It is equally incumbent upon the land management agencies and biologists to uphold these principles, otherwise the collaboration will be undermined.

1.4 FINAL CONCLUSIONS

Understanding climber engagement with CBC involves recognizing a multitude of factors at play. My conclusions and recommendations, derived from semi-structured interview results, illuminate the significant role that past experiences with bats, the climbing community, and the role of access play in shaping climbers' current sentiments about reporting a bat to CBC.

Formative experiences with bats and in-depth knowledge of their threats and ecology suggest that integrating climbers into ongoing scientific research on bats within the Red may increase engagement with CBC. Community science initiatives like roost counts, observing bat netting projects, and participating in bat talks are promising avenues for fostering positive collaboration in future conservation efforts.

In tandem with individual attitudes towards bats, the influence of the climbing community remains an important factor driving reporter behavior. Friendship and community norms drive some behaviors and are enforced through peer monitoring and social sanctioning within the climbing community. Adding a layer of complexity to climbers' attitudes are occasionally conflicting views on access. Acknowledging tradeoffs to potential reporters and fostering trust with local land managers remains crucial in cultivating a positive relationship between these stakeholders.

1.4.1. Study Limitations and Future Considerations

Semi-structured interviews were conducted utilizing the grounded inductive theory approach. This approach has been critiqued, as it is arguably not possible to enter the interview process without introducing your own biases from both literature review and life experience (Giles et al., 2013). I conducted my literature review before the semi-structured interviews, and I have a background as a rock climber, as mentioned above, so bias was undoubtedly introduced in the deductive process. However, I attempted to reduce bias where possible by working with non-rock climbers to develop the semi-

structured interview guide and survey questionnaire. It may also be that my identity as a climber allowed me to deduce themes that may not have been obvious to a non-rock climber.

Looking forward, there is a need for research on message framing that taps into both environmental and use-oriented attitudes that continue to recognize climber concerns about access. Future work might also incorporate the role of community by exploring social diffusion, or behaviors that spread information and apply social pressure, as a tool for increasing bat reports (Jones & Niemiec, 2020). Understanding how to effectively communicate with climbers is key to driving reports. This research on climber motivations can provide valuable insights into tailoring communication strategies that resonate with climbers, ultimately advancing the goals of conservation initiatives. However, keep in mind that results from this work are specific to the Red, an area noted for having a particularly tight knit climbing community (J. Rickly, 2012; J. M. Rickly, 2017b), which may have an impact on the results. More research is needed to understand if climber motivations to contribute to CBC vary across climbing locations, or rather, if the climbing community as a whole shares similar beliefs.

CHAPTER 2- BARRIERS AND BENEFITS OF ROCK CLIMBER PARTICIPATION IN CITIZEN SCIENCE FOR BAT
CONSERVATION: BEGINNING STAGES OF A COMMUNITY BASED SOCIAL MARKETING CAMPAIGN

2.1 INTRODUCTION

Participation in outdoor recreation is increasing at an unprecedented rate, meaning more people interacting with the natural world (Beery et al., 2021). There are many studies looking at the negative impacts of recreators on the environment (Forster et al., 2023; Kuwaczka et al., 2023; Leveau & Kopp, 2024). However, the benefits, rather than impact, of recreation-based stewardship through citizen science remain largely unexplored (Schild, 2019). Citizen science, an effective tool for crowd-sourcing data, provides reliable scientific data while also empowering non-scientists to contribute to collaborative management of resources (Ostermann-Miyashita et al., 2021). In the realm of recreational stewardship, non-scientist recreators have the potential to offer their time, resources, and unique skills to aid in data collection in remote or challenging environments. Therefore, recognizing these recreational enthusiasts as citizen scientists becomes crucial for organizations operating on limited budgets and manpower. Climbers for Bat Conservation (CBC) is one such organization seeking to collect data and empower rock climbers in bat conservation and cliff management.

Established in 2014, CBC is an organization that brings together rock climbers, biologists, and landowners to learn more about cliff-roosting bats (Davis et al., 2017). CBC was initiated using a World Café-style meeting involving rock climbers, land managers, and scientists. Key takeaways from that initial meeting included the identification of challenges, such as establishing shared goals between stakeholders, recreation-related concerns, and language barriers between these groups. The participants collaboratively developed strategies to address these challenges by emphasizing the importance of gaining trust within the climbing community and refining project goals. This stakeholder consultation

was instrumental in shaping the mission and direction of the CBC organization in its early stages (Davis et al., 2017).

In 2019, a second World Café meeting was held in Red River Gorge, Kentucky that included bat biologists, rock climbers, and land managers. The main takeaways from the discussions included a broad range of importance assigned to bats, climbing, and conservation, with emerging themes of connection, coexistence, education, and resource conservation (Gross et al., 2023). Participants emphasized the significance of obtaining data on the presence, location, and date of bat observations, suggesting the use of a phone application with location and time tags for reporting (Gross et al., 2023). These suggestions ultimately resulted in the creation of the online reporting form and mapping tool released in April of 2022.

The online reporting form, powered by Survey 123, is accessible via a QR code posted on stickers and posters, or via CBC url (<https://survey123.arcgis.com/share/f925892f9a934fe482be26a126e1b418>).

The report populates an interactive map

(<https://www.arcgis.com/apps/dashboards/e5d3d1aae8ba46cfa64d7f2d96c7c1cb>) that is open access, allowing for transparency between stakeholders (climbers, landowners, and biologists). Historically, these reports have been solicited by a variety of methods including word of mouth, magazine articles, solicitations on Mountain Project (<https://www.mountainproject.com/>; a crowd-sourced guide to rock climbing), stickers, signs, and tabling at climbing festivals. However, there has yet to be a targeted approach to increase reports of bats on climbing routes to CBC. This study applies the Community-Based Social Marketing framework to increase the focal behavior of reporting a bat to CBC using the online survey platform.

2.1.1 A review of Community-Based Social Marketing in recreation

Community-Based Social Marketing(CBSM) is a framework that applies principles of psychology and traditional marketing to encourage behavior change by working closely within a specific community to establish behavior change (McKenzie-Mohr, 2000). While the exact prescription of CBSM varies within the literature, most initiatives contain five steps: (1) selecting the behavior, (2) identifying barriers and benefits, (3) developing strategies, (4) piloting test strategies, and (5) broad implementation and evaluation (Doug McKenzie-Mohr, 2011). Within CBSM, barriers are defined as factors that inhibit the desired behavior, whereas benefits are motivating factors. Identifying barriers and benefits of the focal behavior is a crucial first step in informing strategies to maximize the chance of the behavior change (Doug McKenzie-Mohr, 2011). This study focuses primarily on barrier and benefit identification and strategy development, the process of which is explained in more depth in the Methodological Concept section below.

Social marketing campaigns have been used widely in the field of public health and injury prevention, sustainable tourism, and city-wide sustainability initiatives (Abrams et al., 2020; Haldeman & Turner, 2009; Levy et al., 2007; Martin et al., 2015). Examples of CBSM within the recreation sector show similar success when applying the framework. For example, Barry et al.'s (2020) CBSM campaign encouraged the target behavior of responsible boating to protect seagrass beds. The authors identified lack of adequate resources about seagrass locations and knowledge of impact of irresponsible boating behavior as the top barriers inhibiting the behavior (Barry et al., 2020). They then deployed their strategies: a knowledge campaign and behavioral cues (navigational aids such as buoys). Results showed that the navigational aids led to an increase in responsible boating, while the knowledge campaign had minimal impact (Barry et al., 2020).

Bowerman & DeLorme (2014) had a similar goal of increasing responsible boating behavior to protect seagrass beds, by deploying the strategy of an area specific app that identified seagrass

locations. Interestingly, Bowerman & DeLorme (2014) discovered unexpected barriers that were unique to the marine environment, mainly that boaters did not want to have their phones out while on the water and therefore were not likely to use the phone app. This highlighted the importance of fully understanding barriers by revealing the variety of conditions in which recreational activities may take place and how that may impact the target behavior (Bowerman & DeLorme, 2014). These considerations are especially important when working with rock climbers, as their environment also has a large influence on their behaviors (Borden & Mahamane, 2020).

CBSM campaigns have not been widely applied to rock climbers. Carter et al. (2021) focused on the behavior of joining a Utah based local climbing organization (LCO). Results showed that climbers identified mostly situational barriers (such as time and scheduling constraints) keeping them from engaging in the behavior, but also identified knowledge points that may help amplify the behavior such as increased information about the LCO to increase transparency and trust in the community (D. Carter, 2021). My research further explores the implications of knowledge about the organization proposing the target behavior (CBC), and how that impacts climber behavior.

Borden and Mahamane (2020) carried out a CBSM campaign with the identified behavior of increasing climbers signing Access Fund's Climber's Pact, which is a commitment to environmentally responsible behavior while climbing. These researchers applied a mixed methods approach to uncover barriers including "awareness of Access Fund" from newer climbers and difficulty of some of the behaviors outlined in the Climber's Pact. The strategies selected (increasing brand recognition, mentorship, social pressure, and public commitments) lead to a 90% increase in signing the Climber's Pact and a 72% increase in overall awareness of the Access Fund in their target group (Borden & Mahamane, 2020).

Despite the demonstrated success of the applications of CBSM in both recreation as a whole and with rock climbers, there are no documented campaigns which seek to target pro-environmental behavior from rock climbers for the benefit of rare and threatened species based on my literature review of CBSM. These examples illustrate the versatility of CBSM, while providing valuable insights into effective strategies and considerations when working in extreme and variable outdoor environments, as outdoor rock climbers often do. Building upon these insights, this study applies the CBSM framework to increase rock climber reports of bats on climbing routes to CBC.

2.1.2 Methodological Concept

Research was conducted in four stages and through mixed methods (Figure 2). In Stage 1, I identified the focal behavior: reporting a bat to Climber's for Bat Conservation using the online platform. In Stage 2, I conducted semi-structured interviews with rock climbers at a rock climbing festival (Red River Gorge Climbers' Coalition's Rocktoberfest; Appendix A.) and Microsoft Teams, a video chat platform (Microsoft Corporation, Redmonds, Washington; Appendix B.) to identify barriers and benefits to reporting. The semi-structured interviews also allowed me to uncover themes that proved important to strategy development. In Stage 3, I conducted a survey focusing on barriers, benefits, knowledge, and environmental attitudes to gain a deeper understanding of the audience. Results of the survey allowed me to make suggestions for future strategies and applications in Stage 4. This four-step mixed method approach, inspired by the works of Borden and Mahamane (2020) and Carins, Rundle, and Fidock and Kaiser (2016) supports the idea that the use of mixed methods in CBSM may reduce the attitude-behavior gap and social desirability bias. Research Stages 2-4 are explored in depth below.

It is my hope that these steps may aid future research on how to begin a CBSM campaign for citizen science efforts seeking to have a large impact with limited time, budget, and staff availability. The

Institutional Review Board at Colorado State University approves the methods conducted in this research (IRB Protocol no. 3864).

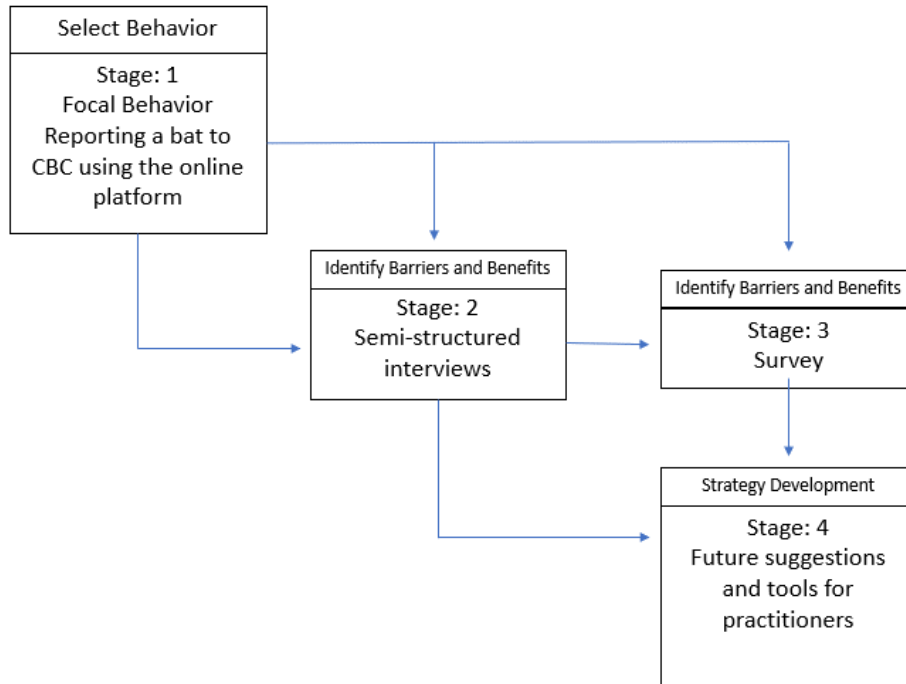


Figure 2. Flow of information in the establishment of a CBSM campaign to increase bat reports to Climbers for Bat Conservation from rock climbers.

2.2 METHODS

2.2.1 Semi-structured interview methods

Semi-structured interviews (n = 12) were conducted in October 2022 with climbers at Kentucky’s Red River Gorge Rocktoberfest (Newing, 2010). Every third individual who walked by me at Rocktoberfest was approached and asked if they were a rock climber and were 18 years of age or older. If they answered in the affirmative, I asked them to take part in an unrecorded interview that ranged from 15 minutes to one hour in length. Detailed notes were taken directly after each interview to best capture the details of the conversation and saturation was reached after 12 interviews (Newing, 2010).

In July of 2023 I conducted semi-structured interviews (n = 16) with climbers who had already reported a bat to CBC. These climbers were asked to participate to better understand the motivations behind the reporting behavior. Interviews were conducted on the video platform Teams and recorded for later transcription using Otter.ai (Otter.ai.Inc, Mountain View, California). Saturation was reached at the 16th interview (Newing, 2010). Details of the semi-structured interviews with reporters are provided in Chapter 1.

2.2.2 Survey development

The semi-structured interviews informed the creation of the survey. Because the interviews were conducted with a sub-sample of the entire reporting community (n = 132), every benefit, or opportunity to encourage the reporting behavior, was noted and included in the survey regardless of frequency of suggestion by interviewees. Once a benefit was identified, it was added as a survey item. Similarly, every barrier mentioned in the semi-structured interviews was included in the survey.

Knowledge of CBC was reflected by six true or false survey items about the mission of the organization. The objective of this was to understand the level of knowledge that climbers have about CBC, if there is a difference in knowledge between reporters and non-reporters, and how this may be impacting the reporting behavior.

During the semi-structured interview with reporters, almost all participants mentioned pro-environmental attitudes. Building upon the listed ecological benefits, I decided to include a separate section utilizing the New Ecological Paradigm (NEP) scale to measure environmental attitudes. The NEP is a commonly used tool for measuring environmental attitudes (Dunlap et al., 2000). Individuals with high NEP scores tend to express pro-environmental attitudes, acknowledge the importance of conservation, sustainability, and recognize the intrinsic value of nature (Dunlap & Van Liere, 1978). Alternatively, individuals may express Dominant Social Paradigm (DSP) attitudes. Those who express DSP attitudes

tend to prioritize economic growth, technological progress, and benefits of nature that prioritize humans (Dunlap et al., 2000). The inclusion of this scale was to understand if pre-existing environmental attitudes play a role in reporting behavior. I compared NEP and DSP categorizations between reporters and non-reporters to identify significant differences in attitudes.

2.2.3 Survey methods

A structured survey (Appendix D) was created using literature and information gained from the semi-structured interviews. The survey targeted two groups of rock climbers: rock climbers attending a popular climbing festival and those rock climbers who reported a bat to CBC in the past nine years.

The survey was first distributed at Rocktoberfest in October of 2023. Rocktoberfest attracts approximately 1,500 climbers per year for community, climbing, and competitions (Gross et al., 2023). At the time of the research, the Red River Gorge had the most CBC bat reports of anywhere in the world. Additionally, local land managers expressed interest in collaborating with CBC. All attendees who entered the festival through the main gate were approached, and every individual was asked if they were a rock climber and 18 years old or older. If they answered in the affirmative, they were asked to take part in the survey estimated to take approximately 15 minutes. Participants were given no prior information about CBC before the start of the survey so as not to sway their answers. Survey times varied, most taking participants 15-20 minutes to complete. All respondents were offered an incentive to enter a raffle for climbing gear.

This survey event was designed to target non-reporters, as reporters would be emailed a survey through the CBC database. Thus, reporters who attempted to take the survey at Rocktoberfest were redirected to the end of the survey and asked to commit to taking the survey at a later date to ensure that non-reporters and reporters would not take the survey twice. In total, 203 surveys were completed at the festival of an estimated 1,524 attendees (reported from Red River Gorge Climbers Coalition) resulting in

a 13% response rate. To target rock climbers who had reported a bat to CBC, I contacted reporters identified in the CBC database. I sent emails to 196 individuals, asking them to participate in the survey and 100 individuals completed the survey, resulting in a response rate of 51% for reporting climbers.

In total, 303 usable surveys were completed after eliminating respondents who did not provide complete surveys, resulting in a breakdown of 100 Reporters and 203 Non-Reporters. R studio (version 4.1.2. "Bird Hippie") was used for analysis.

For analysis purposes, I segmented the respondents into three different groups: Reporters, Non-reporters, and Potential Reporters (Figure 3). This segmentation of the audience was chosen for several reasons. For one, Reporters had already taken part in the reporting behavior, therefore providing a unique perspective. Classifying Reporters also gave me the opportunity to understand the attitudes and belief systems of this group of climbers. Secondly, those who had not reported were considered in two ways. Non-reporters are rock climbers who never reported a bat to CBC. However, being a Non-reporter could be circumstantial as you must have heard of CBC and must have seen a bat to have the opportunity to report. Thus, the smaller subgroup of Potential Reporters was created to represent climbers who had seen a bat, heard of CBC, but had not reported.

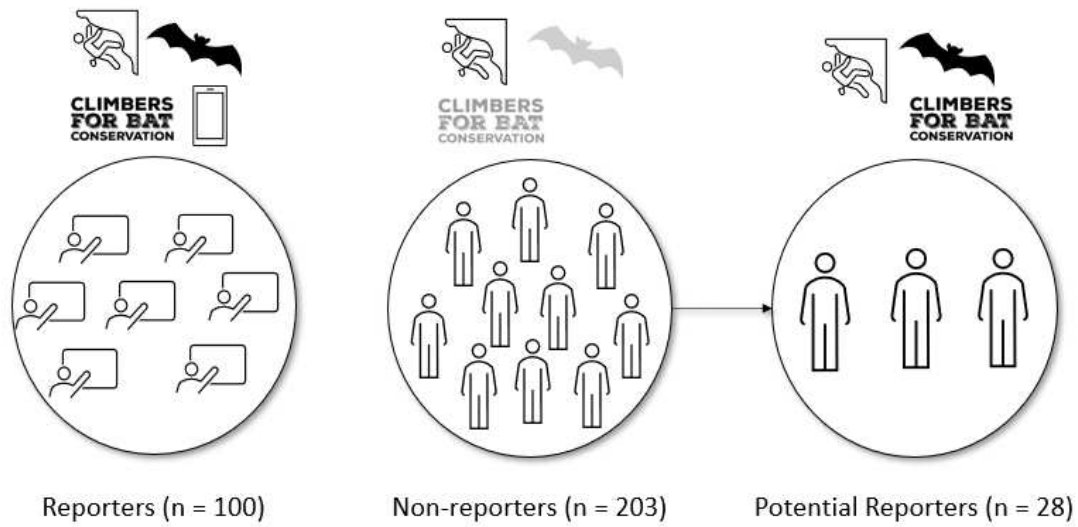


Figure 3. Explaining the segmented respondents in analyses: Reporters are climbers that have seen a bat, have heard of CBC, and reported the bat. Non-reporters are climbers who may or may not have seen a bat or heard of CBC. Potential reporters are a subset of Non-reporters who confirmed they had seen a bat and heard of CBC, but had not reported.

2.3 RESULTS

2.3.1 Semi-structured Interview results

Fifteen benefits to reporting a bat were revealed in the semi-structured interviews with reporters. These benefits were either perceived by the reporters themselves, or they were imagined to have impacted other climbers (Table 1).

Table 1. Benefit category, benefit identified, and resulting full survey items from the semi-structured interviews with conducted with reporters, 2023 (n=16).

Benefit Categories	Benefit	Survey Item
Ecological	Reduce mosquitos	I am motivated by the desire to reduce mosquito populations
	Well-being of bats	I care about the well-being of bats
	Contribute to science	I want to contribute to scientific research
	Important to the ecosystem	I feel that bats are an essential part of the ecosystem, regardless of human benefits
	Help the environment	I am motivated by my desire to help the environment
Situational	Sticker	Receiving a free sticker is an incentive that encourages me
	T-shirt	The incentive of getting a free t-shirt motivates me
	Maintain access	I am motivated by the desire to maintain access to my climbing area
Interpersonal	Friends' encouragement	My friends' encouragement would motivate me to report a bat
	Improve climbing community	I am motivated by the desire to improve the climbing community
	Other climbers know there is a bat	I want other climbers to know there is a bat on the climbing route
	Others reported	Knowing that other climbers report to CBC encourages me
	Relationships between climbers and scientists	I am interested in fostering good relationships between climbers and scientists

	Share my story	I am motivated to share the story of my experience with others in the climbing community
Intrapersonal	My climbing is important	I feel that by reporting, my climbing is contributing something important to the climbing community

Reporters revealed new barriers that had not been mentioned in previous semi-structured interviews with Non-reporters (Gross et al., 2023). The semi-structured interviews with Reporters allowed some barriers to be expanded upon from previous results. For example, “inconvenience” was expanded to better capture the design of CBC’s online survey and was listed as “survey is too complicated” and “I do not understand how to report using the online survey”. Alternatively, “Apathy” was expanded to capture “The information is not important” and “Indifference to bats.” Overall, interviews with reporters resulted in five new barriers, bolded in Table 2, and the resulting survey items.

Table 2. Barrier category, barrier identified, and resulting full survey items from the semi-structured interviews with climbers at Rocktoberfest (n = 12) and reporters to CBC (n = 16). Newly identified barriers appear with an asterisk beside them.

Barrier Categories	Barrier	Full survey item
Ecological	Concern over bats being bothered	I am concerned the information provided might result in the bats being bothered by other people
Situational	Losing access	I am concerned about losing access to the climbing route I saw a bat on
	No cell service	I do not have cell phone service at the climbing area
	Survey is too complicated*	I believe the survey to report a bat is too complicated.
	No time	I do not have time to report a bat
Interpersonal	I don’t want people to know where I am climbing*	I do not want people to know where I am climbing
Intrapersonal	Bystander effect*	I assume somebody else has already reported the bat
	Forget	I might forget to report
	Indifference to bats	My decision to report is influenced by my indifference towards bats

Negative feelings to bats*	My decision to report is influenced by my negative feelings towards bats
The information is not important	I believe the information is not important
Unsure how the information will be used	I am uncertain about how the information from the report will be used
I do not understand how to report using the online form*	I do not understand how to report using the online survey form

2.3.2 Survey Results

2.3.2.a Demographics

Results of a Kruskal-Wallis test revealed that Reporters (n = 76) had a significantly different ($W = 4990.5$, p -value < 0.0001) number of years (mean = 10.57 years, $SD = 7.37$) spent climbing compared to Non-reporters (n = 91, mean = 6.25 years, $SD = 6.66$). A Fisher's Exact test revealed there was not a significant difference in climbers' gender (Man vs. Woman) (p -value = 0.60) between Reporters (n = 91) and Non-reporters (n = 201). Results of race skewed heavily White identifying. The sample size of climbers who answered these questions was variable. Not all climbers answered every demographic question (Table 3).

Table 3. Demographics of Non-Reporters and Reporters. Note that the n is not the same between subsections of experience level, gender, and race as less participants answered the demographic questions.

	Non-Reporters	Reporters
Experience Level (years climbing)		
mean (\pm SD)	6.25 (6.66)	10.57 (7.37)
Gender		
Man	112	54
Woman	83	33

Write-in option	6	4
Race		
American Indian of Alaska Native	2	1
Asian or Asian American	24	4
Black or African American	2	0
Hispanic, Latino, Latina, or Latinx	8	4
Middle Eastern or Northern African	2	3
Pacific Islander	2	0
White	167	84
Another option not listed or prefer to self-describe	1	1

2.3.2.b Barriers

The data were not normally distributed, nor did they have homogeneity of variances. As such, I used non-parametric tests for the analyses.

The highest ranked perceived barriers identified by Reporters were “Forget to report” ($\bar{x} = 3.20$, $SD = 1.29$), “No cell service at crag” ($\bar{x} = 2.74$, $SD = 1.41$), and “Unsure how the information will be used” ($\bar{x} = 2.19$, $SD = 1.24$) (Figure 4). The highest ranked perceived barriers for Non-reporters were “Forget to report” ($\bar{x} = 3.69$, $SD = 1.17$), “No cell service at crag ($\bar{x} = 3.63$, $SD = 1.16$)”, and “Unsure how the information will be used ($\bar{x} = 2.66$, $SD = 1.32$).” Similar to Non-reporters, Potential Reporters’ first and second ranked items for Potential Reporters were “No cell service” ($\bar{x} = 3.68$, $SD = 1.06$) and “Forget to report” ($\bar{x} = 3.36$, $SD = 1.10$). However, the third highest barrier for Potential Reporters differed, “I do not understand how to report using the online form” ($\bar{x} = 2.5$, $SD = 1.26$).

We compared the mean agreement score of perceived barriers between Reporters and Non-Reporters using the Mann Whitney U test (Table 4). All perceived barriers except “Concern over bats being bothered”, “Negative feelings towards bats”, and “I don’t want people to know where I am climbing” showed a significant difference between Reporters and Non-reporters ($p < 0.05$). To understand the extent of the effect size of each barrier that revealed significance, I calculated the Cliff’s Delta statistic which revealed that “No cell service” and “I do not understand how to report using the online survey form” had medium effect sizes, while the remainder of the barriers showed small effect sizes.

I compared the mean agreement score of perceived barriers between Reporters and Potential Reporters using the Mann Whitney U test (Table 5). About one-half of the barriers were significantly different ($p < 0.05$). The Cliff’s Delta revealed that “No cell service at the crag” (medium), “Belief that someone else reported the bat” (medium), and “I do not understand how to report using the online survey form” (large) had the largest effect sizes.

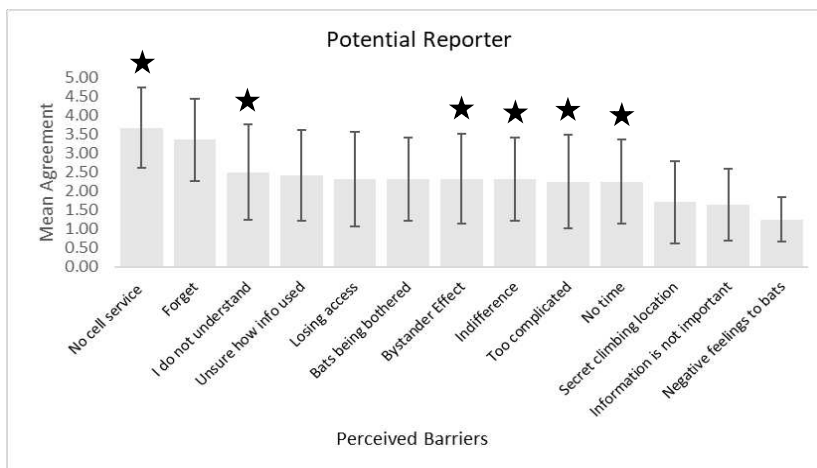
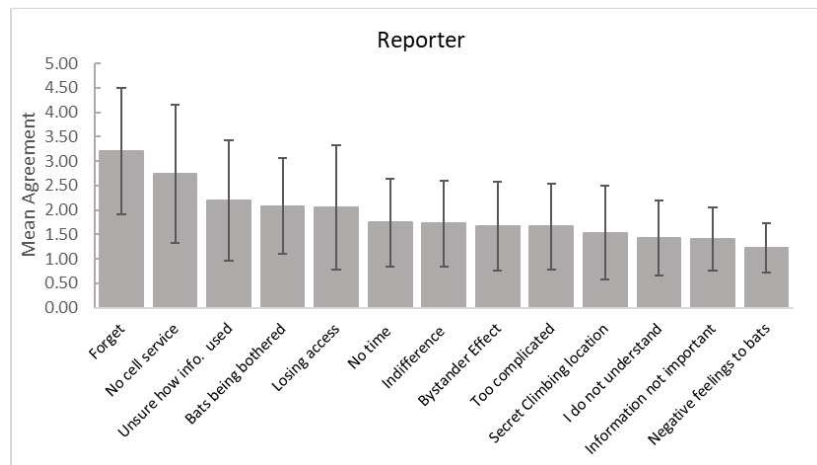
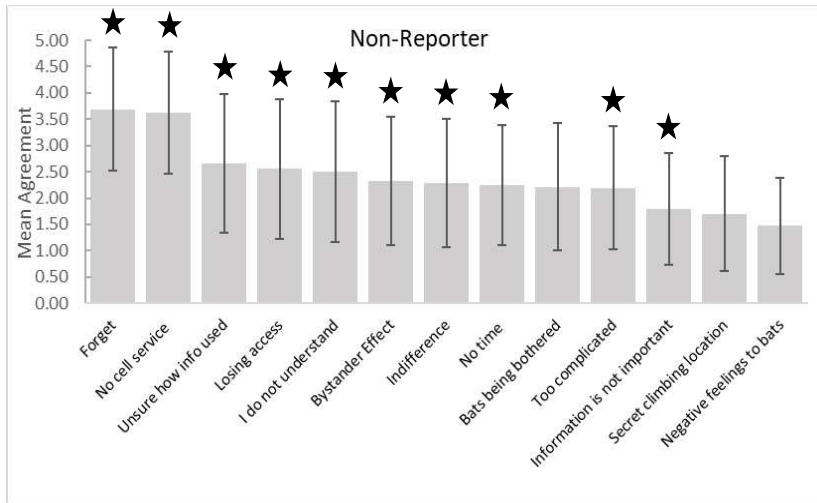


Figure 4. Ranked perceived barriers (mean) for Non-reporters, Reporters, and Potential Reporters' responses from a structured survey of climbers at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023. Stars indicate statistically significant differences among the groups ($p < 0.05$).

Table 4. Barrier, mean agreement score, p-value, Cliff's Delta, Confidence Intervals, and Cliff's Delta Size for Reporter and Non-Reporter responses from a structured survey of climbers at Red River Gorge Rocktoberfest, Kentucky, 2023 and through the CBC online database.

Barrier	Reporter (n=100)		Non-Reporter (n=203)		p	δ	Lower CI	Upper CI	δ Size
	\bar{x}	SD	\bar{x}	SD					
Concerned about losing access	2.05	1.28	2.55	1.33	0.00186	-0.2179	-0.347	-0.0807	small
Concern over bats being bothered	2.08	0.98	2.22	1.20	0.6252	-	-	-	-
No cell service at crag	2.74	1.41	3.63	1.16	4.92E-07	-0.3508	-0.4776	-0.2098	medium
Belief that someone else already reported the bat	1.67	0.90	2.33	1.23	7.20E-06	-0.3101	-0.4245	-0.1859	small
Forget to report	3.20	1.29	3.69	1.17	0.00264	-0.2075	-0.3346	-0.073	small
Survey is too complicated	1.67	0.88	2.19	1.17	0.00031	-0.2474	-0.3648	-0.1222	small
Indifference towards bats	1.72	0.88	2.28	1.22	0.00028	-0.2503	-0.3665	-0.1263	small
Negative feelings towards bats	1.23	0.51	1.47	0.92	0.06183	-	-	-	-
The information is not important	1.41	0.65	1.80	1.06	0.00432	-0.1848	-0.2966	-0.068	small

I do not understand how to report using the online form	1.43	0.77	2.50	1.33	1.37E-11	-0.4645	-0.5626	-0.3536	medium
I don't want people to know where I am climbing	1.54	0.95	1.70	1.09	0.2352	-	-	-	-
No time to report a bat	1.74	0.90	2.24	1.14	0.00037	-0.2465	-0.3657	-0.1194	small
Unsure how the information will be used	2.19	1.24	2.66	1.32	0.00474	-0.1992	-0.3289	-0.0621	small

Table 5. Barrier, mean agreement score, p-value, Cliff's Delta, Confidence Intervals, and Cliff's Delta Size for Reporters and Potential Reporters' responses from a structured survey of climbers at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023.

Barrier	Reporter (n=100)		Potential Reporter (n=28)		p	δ	Lower CI	Upper CI	δ Size
	\bar{x}	SD	\bar{x}	SD					
Concerned about losing access	2.05	1.28	2.32	1.25	0.22	-	-	-	-
Concern over bats being bothered	2.08	0.98	2.32	1.09	0.30	-	-	-	-
No cell service at crag	2.74	1.41	3.68	1.06	0.00	0.3740399	-0.5507064	-0.1652987	medium
Belief that someone else already reported the bat	1.67	0.90	2.32	1.19	0.00	0.3448541	-0.5341047	-0.1226909	medium
Forget to report	3.20	1.29	3.36	1.10	0.73	-	-	-	-
Survey is too complicated	1.67	0.88	2.25	1.24	0.02	0.2715054	0.48853522	0.02283804	small
Indifference towards bats	1.72	0.88	2.32	1.09	0.01	0.3206605	0.51767194	0.09135673	small
Negative feelings towards bats	1.23	0.51	1.25	0.59	0.99	-	-	-	-
The information is not important	1.41	0.65	1.64	0.95	0.22	-	-	-	-
I do not understand how to report using the online form	1.43	0.77	2.50	1.26	0.00	0.5192012	-0.6922933	-0.2896139	large

I don't want people to know where I am climbing	1.54	0.95	1.71	1.08	0.40	-	-	-	-
No time to report a bat	1.74	0.90	2.25	1.11	0.02	0.2680492	0.48161294	0.02443446	small
Unsure how the information will be used	2.19	1.24	2.43	1.20	0.31	-	-	-	-

2.3.2.c Benefits

The highest-ranked perceived benefits of Reporters were “Bats are an important part of the ecosystem” ($\bar{x} = 4.72$, $SD = 0.74$), “Help the environment” ($\bar{x} = 4.67$, $SD = 0.79$), and “Good relationship between climbers and scientists” ($\bar{x} = 4.67$, $SD = 0.80$) (Figure 5). The highest ranked perceived benefits of Non-reporters were “Good relationship between climbers and scientists” ($\bar{x} = 4.62$, $SD = 0.72$), “Bats are an important part of the ecosystem” ($\bar{x} = 4.58$, $SD = 0.81$), and “Reduce mosquito populations” ($\bar{x} = 4.56$, $SD = 0.83$). Potential Reporters’ highest-ranked perceived benefits were “Bats are an important part of the ecosystem” ($\bar{x} = 4.61$, $SD = 0.83$), “Good relationships between climbers and scientists” ($\bar{x} = 4.54$, $SD = 0.84$), and “Reduce mosquito populations” ($\bar{x} = 4.50$, $SD = 0.92$).

I compared the mean agreement score of perceived benefits between Reporters and Non-reporters using the Mann Whitney U test (Table 6). Less than half of the benefits showed a significant difference between Reporters and Non-Reporters ($p < 0.05$). To understand the extent of the effect size of each statistically significant barrier, I calculated the Cliff’s Delta statistic. The Cliff’s Delta statistic revealed that “Reduce mosquito populations” had a medium effect size, while “well-being of bats”, “my friends’ encouragement”, “help the environment”, “improve the climbing community”, and “share my story with others” had small or negligible effect sizes.

I compared the mean agreement score of perceived benefits between Reporters and Potential Reporters using the Mann Whitney U test (Table 7). Only the benefits “Reduce mosquito populations”, “My friends’ encouragement”, and “Share my story with others” were significantly different between Reporters and Potential Reporters ($p < 0.05$). The Cliff’s Delta statistic revealed that “Reduce mosquito populations” had a medium effect size, while “my friends’ encouragement” and “Share my story with others” had small effect sizes.

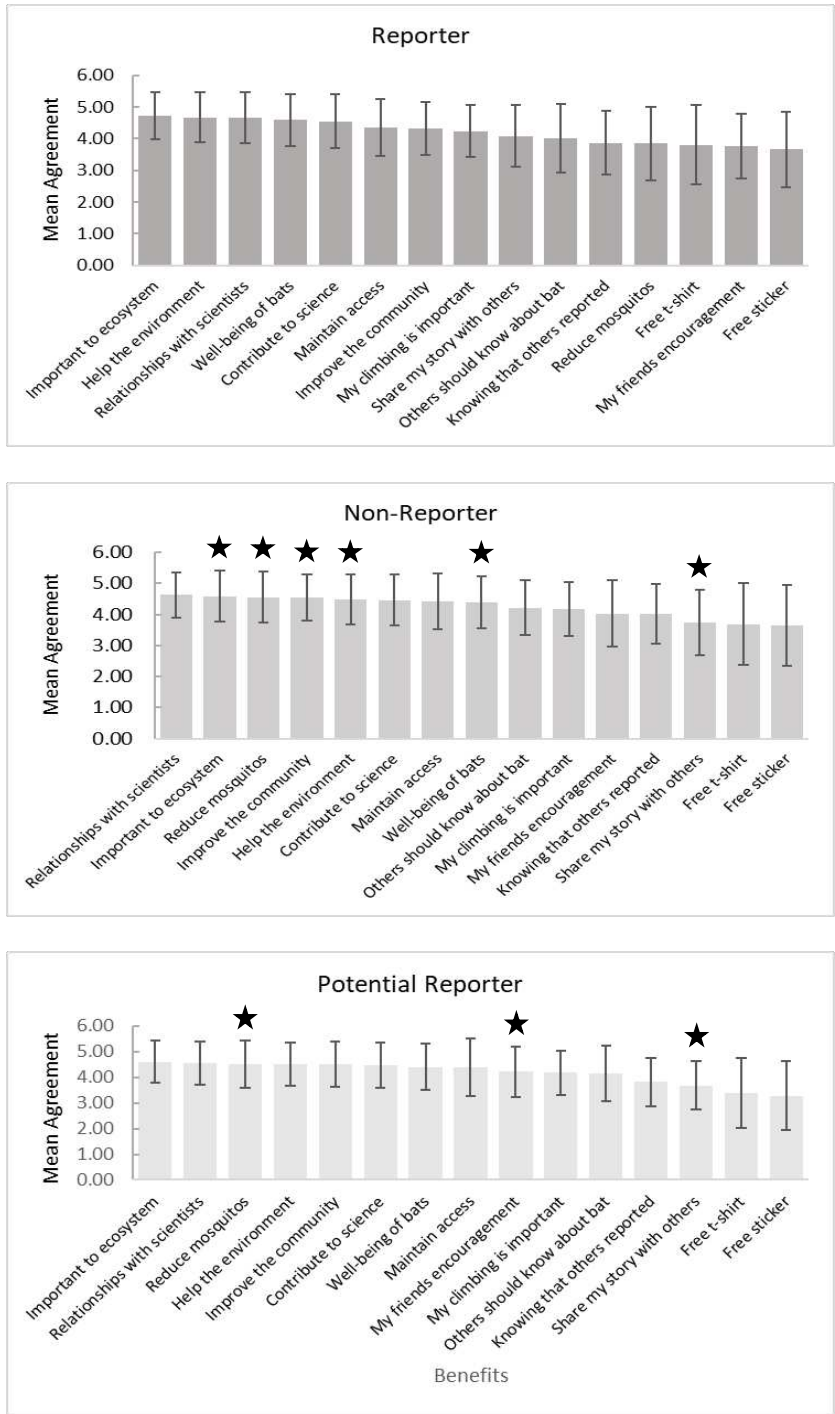


Figure 5. Ranked perceived benefits (mean) for Non-reporters, Reporters, and Potential Reporters' responses from a structured survey of climbers at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023. Stars indicate statistically significant differences among the groups ($p < 0.05$).

Table 6. Benefits, mean agreement score, p-value, Cliff's Delta, Confidence Intervals, and Cliff's Delta Size for Reporters and Non-reporters' responses from a structured survey of climbers at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023.

Benefit	Reporter (n=100)		Non-reporter (n=203)		p	δ	Lower CI	Upper CI	δ Size
	\bar{x}	SD	\bar{x}	SD					
Maintain access to my climbing area	4.35	0.89	4.41	0.90	0.4328	-	-	-	-
Well-being of bats	4.59	0.81	4.38	0.85	0.00756	0.16922	0.04909	0.28452	small
Reduce mosquito populations	3.85	1.16	4.56	0.83	5.22E-09	-0.3705	-0.4869	-0.2412	medium
Bats are an important part of the ecosystem	4.72	0.74	4.58	0.81	0.0658	-	-	-	-
My friends encouragement	3.78	1.02	4.03	1.08	0.01916	-0.161	-0.2877	-0.0286	small
Help the environment	4.67	0.79	4.48	0.81	0.00522	0.16658	0.05586	0.27325	small
My climbing is an important contribution	4.24	0.81	4.17	0.88	0.5605	-	-	-	-
Improve the climbing community	4.32	0.85	4.54	0.74	0.02556	-0.1407	-0.2657	-0.0112	negligible

I want other climbers to know there is a bat on the route	4.02	1.09	4.21	0.88	0.3394	-	-	-	-
Knowing that others reported	3.87	1.02	4.02	0.96	0.2071	-	-	-	-
Good relationships between climbers and scientists	4.67	0.80	4.62	0.72	0.2324	-	-	-	-
Contribute to scientific research	4.55	0.84	4.46	0.83	0.1784	-	-	-	-
Free t-shirt	3.81	1.25	3.69	1.31	0.5068	-	-	-	-
Free sticker	3.66	1.19	3.64	1.29	0.9251	-	-	-	-
Share my story with others	4.09	0.97	3.74	1.05	0.00577	0.19085	0.05618	0.31871	small

Table 7. Benefits, mean agreement score, p-value, Cliff's Delta, Confidence Intervals, and Cliff's Delta Size for Reporters and Potential Reporters' responses from a structured survey of climbers at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023.

Benefit	Reporter (n=100)		Potential Reporters (n=28)		p	δ	Lower CI	Upper CI	δ Size
	\bar{x}	SD	\bar{x}	SD					
Maintain access to my climbing area	4.35	0.89	4.39	1.13	0.3841	-	-	-	-
Well-being of bats	4.59	0.81	4.41	0.89	0.1646	-	-	-	-
Reduce mosquito populations	3.85	1.16	4.50	0.92	0.003295	-0.34498	-0.5258944	-0.13421	medium
Bats are an important part of the ecosystem	4.72	0.74	4.61	0.83	0.256	-	-	-	-
My friends encouragement	3.78	1.02	4.21	0.99	0.02733	-0.26292	0.47287679	-0.02471	small
Help the environment	4.67	0.79	4.50	0.84	0.07702	-	-	-	-
My climbing is an important contribution	4.24	0.81	4.18	0.86	0.7063	-	-	-	-
Improve the climbing community	4.32	0.85	4.50	0.88	0.202	-	-	-	-
I want other climbers to know there is a bat on the route	4.02	1.09	4.14	1.08	0.6337	-	-	-	-

Knowing that others reported	3.87	1.02	3.82	0.94	0.7811	-	-	-	-
Good relationships between climbers and scientists	4.67	0.80	4.54	0.84	0.1627	-	-	-	-
Contribute to scientific research	4.55	0.84	4.46	0.88	0.4536	-	-	-	-
Free t-shirt	3.81	1.25	3.39	1.37	0.1237	-	-	-	-
Free sticker	3.66	1.19	3.29	1.36	0.1566	-	-	-	-
Share my story with others	4.09	0.97	3.68	0.94	0.03107	0.255319	0.032533	0.453934	small

2.3.2.d Knowledge

Table 8 shows the correct and incorrect count for six statements about CBC. The results of a Fisher's Exact test revealed significantly different responses ($p < 0.05$) between reporters and potential reporters for two of six statements: "Removing bats from climbing routes is one of the goals of CBC" and "CBC aims to protect bats on climbing routes from rock climbers". To test an individual's understanding of CBC, I decided that answering four or more of the six questions correctly was the threshold for a majority of understanding (>50%). 31 reporters answered four or more questions correctly, while 62 reporters answered three or less questions correctly. A chi2 test revealed a significant difference ($\chi^2 = 10.333$, $df = 1$, $p\text{-value} = 0.001306$) in the number of reporters who answered less than 3 questions correctly (62) and more than 3 questions correctly (31).

Table 8. Distribution of questions and answers about CBC testing accurate knowledge of the organization from Reporters and Potential Reporters from a structured survey of climbers at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023.

Question	Reporter (n = 100)		Potential Reporter (n = 28)	
	Correct	Incorrect	Correct	Incorrect
CBC works to protect rock climbers from bats on climbing routes	62	38	13	15
One of CBC's goals is to improve knowledge of bat roosting locations	94	6	25	3
Removing bats from climbing routes is one of the goals of CBC	86	14	16	12
CBC seeks to develop relationships among climbers, biologists, and land managers	92	8	27	1
CBC aims to protect bats on climbing routes from rock climbers	10	90	0	28
CBC seeks to empower climbers as ambassadors for bat conservation	90	10	27	1

2.3.2.e Environmental attitudes

I conducted Pearson's Chi-squared test with Yates' continuity correction and found that there is a significant difference between the proportion of NEP vs. DSP between reporters and non-reporters ($\chi^2 = 16.276, df = 1, p = 5.476e-05$), with a higher proportion of reporters holding pro-environmental attitudes (NEP) as compared to the dominant social paradigm (Table 4.). If the survey participant answered less than half of the NEP questions, they were excluded from the NEP analysis.

The proportion of NEP vs. DSP between reporters and potential reporters was also statistically significant ($\chi^2 = 11.613, df = 1, p = 0.000655$). Notably, the number of potential reporters leaning DSP was not significantly different than the number of potential reporters leaning NEP ($\chi^2 = 0.037037, df = 1, p\text{-value} = 0.8474$). Proportions are described in Table 9.

Table 9. Distribution of NEP and DSP leaning climbers based on reporting status from a structured survey at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023.

	Reporter (n = 93)	Non-reporter (n = 200)	Potential Reporter (n = 27)
DSP	16	84	14
NEP	77	116	13

2.4 DISCUSSION

2.4.1 Demographics' role in reporting a bat

I found a relatively even distribution of climbers identifying as Women and Men in the survey population, which aligns with recent data on distribution of gender in climbing (2021). This was true of the Reporters group, which was unexpected because citizen science participants tend to have more participants who identify as women (Crall et al., 2012; Domroese & Johnson, 2017; Guiney & Oberhauser, 2009; Waugh et al., 2023). Race leaned heavily White which tracks with current statistics on climbing demographics, highlighting the need for more inclusion efforts in the sport of climbing ((Chisholm, 2008; Gagnon et al., 2016). The sample sizes for statistical tests of gender and race varied, likely because the questions of participant demographics were at the end of the survey. Participants may have been feeling survey fatigue at that point, or it may be that the demographics questions were considered intrusive and unnecessary for the survey (Dillman et al., 2014).

2.4.2 Removing barriers to reporting

Reporters and Non-reporters shared the same top three barriers: "Forgot", "No cell service", and "Unsure how information will be used." Forgetting to take the survey and lack of cell service as top barriers are consistent with social marketing literature which often cites situational, or practical, barriers such as these as the top factors stopping a behavior (D. Carter, 2021; Choi & DiNitto, 2012). However, the similarities between Reporters and Non-reporters should be considered from different contexts, based on information from the semi-structured interviews and World Café Focus groups (Davis et al., 2017; Gross et al., 2023). "Unsure how the information will be used" could be a top barrier for climbers for two reasons. For Non-reporters, concern over how the information will be used may include implications of worry over maintaining access to the route, as indicated by concern over losing access as the closely fourth ranked factor. Fear of losing access was cited as a top barrier to CBC in early work by Davis et. al.

as well (2017). Fear of losing access may also justify Reporter's barrier of being unsure how the information will be used, but it could be that Reporters were hoping for more feedback about how their information was used after they reported. In semi-structured interviews with Reporters, six individuals mentioned wanting to know how their data was being used, as demonstrated by P10 who stated: "Just sharing how your reporting makes an impact, I think that is, would be even more meaningful, because otherwise you're just arbitrarily contributing to something that you hope makes a difference." Feedback and open communication between leaders and citizen scientists are critical in fulfilling motivations based in knowledge, such as wanting to participate in research or science (Maund et al., 2020).

Potential Reporters ranked perceived barriers listed "I do not understand how to report using the online form" as a strong barrier to participation. This is of interest, because 11 individuals mentioned that reporting was a simple process, although not all of these individuals may have utilized the online survey form (n = 16). While the form itself is perceived as not difficult, it may be that the abundance of data being asked for is overwhelming. While the online survey form only requires your name and the route name, signified by a *, the form in its entirety asks for much more data. While quality of data is important (Kosmala et al., 2016), timely reporting of the bat on route, and cliff survey of the route by climber biologists will still yield the needed information needed to learn about cliff-roosting bats.

When analyzing differences between the groups, it may help to visualize all the barriers as part of one of four categories: (1) Intrapersonal, (2) Interpersonal, (3) Situational, and (4) Ecological. I removed the similarities between the categories, and only left items that were found to be significant between Reporters and Non-reporters, and found to be significant between Reporters and Potential Reporters ($p < 0.05$) (Figure 6). This is not to say that the other barriers are not important, but this approach helps in identifying where the largest effect sizes and barriers lie. There are no significant differences between Ecological and Interpersonal barriers among the groups, but the Intrapersonal and Situational categories are important. Bolded items highlight medium-to-large effect sizes, meaning these

items may be of particular importance in future marketing campaigns. Non-reporters and Potential Reporters agreed that they may not report because they believe that someone else had already reported a bat on a climbing route, or that the bat being present on the route is common knowledge. This phenomena is likely the result of the non-emergency bystander effect, meaning the cost of the intervention is perceived to be “low” and likely fulfilled by others (Fischer et al., 2011).

“I do not understand how to report” using the online form and “No cell service” are both strong barriers for Reporters and Non-Reporters when ranked, but also appear as significantly different ($p < 0.05$). This could mean that these are key points that need to be addressed. Practical applications of this are discussed further in the Future Applications section.

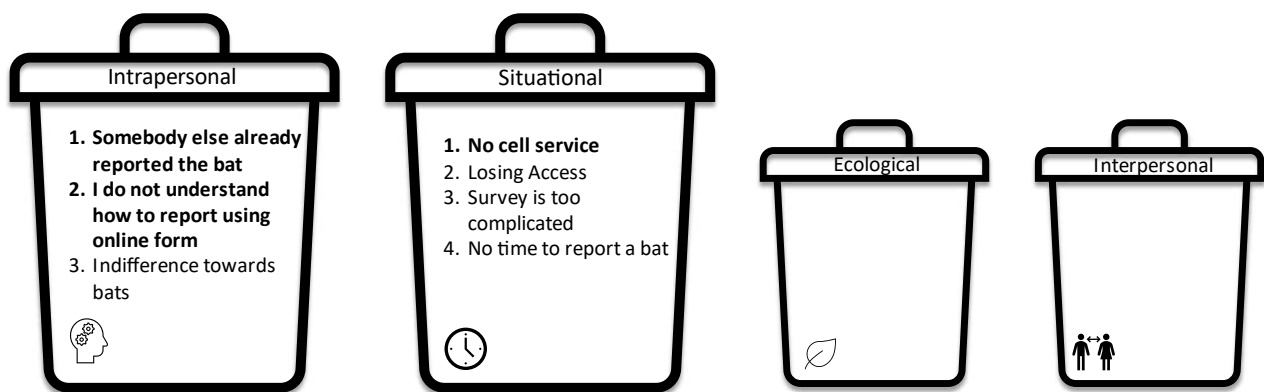


Figure 6. Categories (Intrapersonal, Situational, Ecological, and Interpersonal) containing barriers that were significantly different ($p < 0.05$) between groups of climbers (Reporters vs. Non-reporters and Reporters vs. Potential reporters) from a structured survey at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023.

2.4.3 Amplifying benefits to reporting by acknowledging environmental attitudes

The ranked mean scores of benefits between Non-reporters and Potential Reporters were similar. This may indicate that the Non-reporters group could be representative of Potential Reporters when it comes to what motivates the reporting behavior. Wanting a good relationship between climbers and scientists

could be linked to pro-environmental attitudes, but context suggests that this could also be linked to the goal of protecting access. The semi-structured interviews revealed that climbers often demonstrate pro-environmental behaviors for more than its intrinsic value, usually with the goal of maintaining access in mind. This was demonstrated by P7 who stated, “Because if we are not taking care of it, we could, I guess, in theory, lose our cliffs, or you know, just have closures for other reasons too.” Some research has found that, when climbers and scientists have good relationships, adaptive management is practiced, and more routes stay open (Greg Orton, 2021). Alternatively, the ecological benefits Reporters identified aligned with the NEP scores which showed that Reporters had a significantly higher proportion of pro-environmental attitudes, while Non-Reporters and Potential Reporters had a higher proportion of climbers aligned with the dominant social paradigm (DSP).

The theory of recreational specialization could provide insight into why Reporters are displaying higher NEP scores, meaning that they expressed pro-environmental attitudes, acknowledged the importance of conservation, sustainability, and may recognize the intrinsic value of nature (Dunlap & Van Liere, 1978). The theory of recreational specialization states that the higher the specialization in a sport, the more likely you are to have pro-environmental values. Reporters shared a higher number of years climbing than Non-reporters, and this could indicate that higher levels of experience in climbing lends itself towards a higher likelihood of engaging in the reporting behavior. However, it could be that more years climbing meant more opportunity to see a bat, resulting in an increased opportunity to report. Regardless, the high distribution of DSP leaning potential reporters indicate that environmental attitudes likely play a role in the decision-making process and supports the idea that the theory of recreational specialization may be impacting the reporting behavior. More research into the specialization of climbers and how that aligns with the reporting could lend insights into how to best segment climbers and message framing in future marketing campaigns.

Again, I broke the benefits into the categories “Interpersonal”, “Intrapersonal”, “Situational”, and “Ecological” after comparing Reporters and Non-reporters, and Reporters and Potential reporters separately. Interpersonal and Ecological emerge as important categories (Figure 7). Because “Reducing mosquito populations” showed a relatively high importance for Non-reporters, highlighting the importance of ecosystem services as an overall benefit in future message framing may increase reporting behavior for this group. Its ecological status indicates that this may be a message that performs well with both Reporters and Non-reporters alike, capturing the attention of a large proportion of the climbing community.

Non-reporters and Potential Reporters listed “Friends’ encouragement” as a benefit, indicating the influence of the climbing community on decision making. Notably, more Reporters valued sharing their story, which could be considered contributing to the climbing community. This may indicate that while both groups value the climbing community, Reporters may be more involved in the climbing community through engagement with local climbing organizations, friendship, and volunteering. In the semi-structured interviews with Reporters, many climbers displayed organizational involvement, demonstrating an increased commitment to the community. What more, Reporters acknowledged that “In the climbing community, we all kind of help each other out (Interviewee P5)”. Community engagement and LCO involvement is a factor that should be considered alongside commitment to climbing when segmenting climbers in future work.

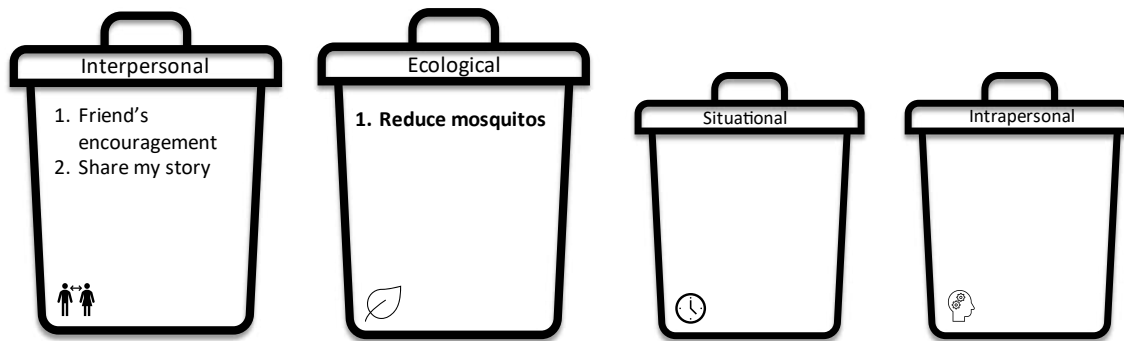


Figure 7. Categories (Intrapersonal, Situational, Ecological, and Interpersonal) containing benefits that were significantly different ($p < 0.05$) between groups of climbers (Reporters vs. Non-reporters and Reporters vs. Potential reporters) from a structured survey at Red River Gorge Rocktoberfest, Kentucky, and through the CBC online database, 2023.

2.4.4 The role of knowledge of CBC

Within social marketing, knowledge of the initiative is recognized as a prerequisite for a behavior but is often not enough to encourage behavior change alone (McKenzie-Mohr et al., 1995). Results of the semi-structured interviews with non-reporters revealed that inaccurate knowledge about the purpose of CBC may be a barrier to the reporting behavior (Gross et al., 2023).

However, when analyzed in the survey the overall lack of difference in knowledge responses between Reporters and Potential Reporters provides evidence that accurate knowledge of CBC may not be what is driving the reporting behavior. This claim can be further explored when looking at results testing a good understanding of CBC. For example, Reporters answered three or fewer questions correctly, which was less than a majority of knowledge. While these results indicate that accurate knowledge of CBC may not be driving the behavior, what knowledge of CBC is important to the reporting behavior remains unclear. For the most part, participants correctly answered questions about the mission of CBC, including the goal to increase knowledge about cliff roosting bats, empower climbers, and develop relationships between climbers and scientists. However, a study focused on the impact of knowledge of CBC on the reporting behavior would be needed to draw any conclusions. It is also

noteworthy that very few Reporters or Potential Reporters answered correctly for the statement “CBC aims to protect bats on climbing routes from rock climbers.” It could be that this is what climbers truly believe, or they could have skimmed over the statement and missed the key term, “from rock climbers,” which makes this statement false. To address this in future studies, future researchers should consider adding more questions asking the same thing in different ways to maintain best practice of survey design. However, this does add more burden for survey takers, which I was hoping to reduce.

2.4.5 Application of findings

Strategic measures can be implemented to address the structural barriers identified: forgetting and time, the complexity of the survey, fear of losing access, and the impact of the bystander effect. A simple way to reduce the barrier of the complexity of the online form would be to make it clear how to access the reporting survey and highlight how easy it is in the marketing information. The online form could be less overwhelming by making only the required information visible when reporters first open the survey form, then giving reporters the option to expand each additional section for more information, depending on time and interest. This suggestion aligns with the results of Davis’s World Café in Red River Gorge that suggested only requiring the top three essential pieces of information (Gross et al., 2023). In doing so, the burden of the data collection is lightened for the individual and moved to the biologist, which may increase engagement.

Respondents noted forgetting to report and the lack of cell service. Both barriers indicate that the action of reporting is not being completed during the time and at the place of sighting a bat. These barriers highlight the need for a common CBSM tool, a prompt, to remind reporters to submit their bat sighting to CBC using the online form (Doug McKenzie-Mohr, 2011). This prompt should utilize messaging that highlights benefits, utilizes pro-environmental message framing, and emphasizes the community aspects of climbing while also being easy to remember and engaging (“catchy”). Results also revealed

how important it is to focus on reducing the bystander effect, which may mean messaging emphasizing the importance of every report from each individual.

Top benefits perceived by climbers included relationships with scientists (which also implies maintaining access), ecological benefits, and the importance of connection to the climbing community. It may be that Non-reporters will not respond well to ecological arguments highlighting the intrinsic value of nature, as supported by the NEP results. An alternative way to highlight ecological benefits may be to focus messaging on ecosystem services such as reducing mosquito populations or bats' roles in pollination of popular products like chocolate and agave (Ramírez-Fráncel et al., 2022). The exchange of this information may be utilized through the tool of social diffusion, allowing trusted members to spread the word about CBC through conservation storytelling. Social diffusion would both highlight benefits while addressing the barrier and benefit of access, ideally by emphasizing how collaborative conservation leads to adaptive management strategies resulting in more routes staying open and successful bat conservation.

For increasing and continued engagement, CBC should work to maintain transparency in how the data is being used. Results showed that Reporters want to know how their data was used, possibly for intrinsic reasons, while Non-reporters may be more interested in why the data is being collected and how this may impact climbing access. Whether the responsibility of acknowledging how the data is being used should fall on local biologists utilizing the data or CBC themselves remains to be seen.

Building on the insights gained from Chapters 1 and 2, conducting experiments to explore the impact of different message framings on reporting rates emerges as a logical next step for piloting potential strategies. This iterative process allows for refining and tailoring communication strategies for optimal efficacy (Doug McKenzie-Mohr, 2011).

2.4.6 Study Limitations and Future Considerations

A significant portion of surveys were disseminated during a rock climbing festival, potentially introducing a sampling bias that may not reflect broader sentiments within the climbing community. Existing research underscores that festival attendees often exhibit heightened interest in the subject matter, introducing a potential bias in the collected data (Audiences London, 2011). Additionally, it is notable that not all climbers will encounter bats throughout their climbing experience. However, their buy-in remains a crucial factor in the success of CBC. These nuances should be carefully weighed in future research endeavors and Community-Based Social Marketing (CBSM) campaigns aiming to enhance collaboration with citizen science organizations working to conserve a specific species.

Results also revealed that some survey items may carry different meanings for different climbers. For example, “Unsure how the data will be used” could imply that the individual is worried about access or, the individual genuinely is interested in science and wants to know how their contribution was used. “Improving relationships between climbers and scientists” could follow similar themes relating to access or science. The different meaning for these survey items could be teased out using the NEP scores, but in the future researchers should work to distinguish the differing motivations behind these items.

Finally, I decided to categorize “Access” as situational. I chose the category “situational” because maintaining and losing access to a specific route is extremely site specific and dependent upon many factors including land managers, biologists, the local climbing organizations, other climbers, ecological conditions, positive and negative relationships in the climbing community, and more. However, from a differing perspective it could be argued that “access” is better suited for the category “intrapersonal” because the actions that a climber takes may be based on their internal dialogue of whether or not their action will impact access. In the future, the complexity of access might be teased out to acknowledge these carrying factors that come into play.

2.5 CONCLUSIONS:

In conclusion, the suggestion to highlight certain ecological benefits in future messaging, such as bats reducing mosquitoes, will likely appeal to a variety of rock climbers, even if those individuals hold differing environmental attitudes. It is important to address the situational barriers of “not having time” and “forgetting to report” by utilizing a prompt to serve as a reminder once individuals are away from the crag and have the time to report. For places like the Red, utilizing communal gathering spaces like Miguel’s Pizza (gear shop and campground) for prompt placement may prove crucial in ensuring continued buy-in from the community— another key influence on the reporting behavior. My research suggests that buy-in can be attained by acknowledging tradeoffs regarding the management of climbing routes and bat conservation. However, it is incumbent upon CBC to encourage land managers and local biologists to maintain transparency about how the data will be utilized in their area, especially acknowledging the potential impact on access. There is a rare possibility that a report of a bat may result in a route closure, especially if it leads to the discovery of a maternity colony of rare bats, or the existence of a hibernacula of endangered species. Thus, the results of this research may aid future citizen science projects looking to collaborate with rock climbers, by highlighting the importance of transparency regarding the use of the data and acknowledging the ecological benefits of the project to the individual. Additionally, the methods and resulting suggestions of this research may aid similar organizations in starting a CBSM campaign to maximize engagement with limited time, budget, and staff availability.

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APPENDICES:

Appendix A:

Semi-structured Interview Guide for Climbers at Rocktoberfest:

1.) Have you ever seen a bat on a climbing route? If yes, where? Did you tell anybody about it? If so, who? If you have seen one, what has been your reaction when you saw it? How did you feel?

2.) Have you heard of CBC before? If so, where/how?

3.) Climbers can currently access an online survey form to report bat sightings to CBC. This form is accessible through a website or via a QR code on a sticker. Which of these two methods would you prefer to use? Why?

4.) Other than knowing that CBC exists, what factors do you think may affect whether a climber reports a bat sighting to CBC? (Encourage the participant to think of more than just one factor)

5.) How would you rank the factors, from being the most significant barrier as to whether someone reports a bat to being the least important?

6.) What factors affect whether you personally will report a bat sighting to CBC?

7.) What would be the most important factor for you personally and why?

8.) Do you take your cellphone while climbing? What do you use it for? Do you typically have service at the climbing location?

9.) Finally, how often do you climb here? Do you use an app to log your climbs? If so, which one? Do you log your climbs while out climbing, on the same day, or later?

Thank you so much for your time and responses. Do you have any questions for me?

Appendix B:

Semi- structured interview guide for climbers who have reported to CBC:

Can you tell me about your experience seeing a bat on a climbing route? How did the experience make you feel?

How did you report your bat sighting to CBC (CBC)? How long after your sighting did you make the report?

Where had you heard of CBC before reporting your sighting?

What did you know about CBC before you reported? What do you know about the organization now?

Would you report a bat to CBC again? Why or why not?

Other than knowing that CBC exists, what factors do you think may affect whether a climber reports a bat sighting to CBC? (Encourage the participant to think of more than just one factor)

How would you rank the factors, from being the most significant barrier as to whether someone reports a bat to being the least important?

What kind of climbing do you do most often? Do you identify as a “type” of climber?

How often have you climbed outside in the past month? How often have you climbed in the gym in the past month?

How often do you climb in the Red?

What does it mean to you to be a local in a climbing area?

Are you a member of any local climbing organizations? (Access Fund? Friends of Muir Valley? Red River Gorge Climbers Coalition?) How do you engage with the organization?

Do you take your cellphone while climbing? What do you use it for? Do you typically have service at the climbing location?

Do you use an app to log your climbs? If so, which one? Do you log your climbs while out climbing, on the same day, or later?

Is there any additional information you would like to share with me?

Appendix C:

Themes table from semi-structured interviews with reporters:

Theme	Subtheme	Definition	Example
Bats and Climbers	Formative experience with bats	An experience with bats that likely influence their feelings about bats	P1: "I grew up going to Maine for summers, and it's an old log cabin and we would have bats flying in our cabin, because they'd get in and just can't get out. And it was the walls wouldn't go up to the ceiling so they would fly back and forth between the lofts until they eventually go to sleep. And then we removed them with a fishing net and set them outside."
	Care for bats	Concern for the wellbeing of bats	P16: "So he had quite... he was surprised, but we kind of felt bad though, too, because we felt like the bat was probably gonna die, like, if it flew out of a crack, like in the middle of winter on a, you know, 10 degree day or five degree day or whatever."
	Knowledge of bats	Demonstration of an understanding of the ecology, habitats, role of, and/or threats facing bats	P9: "I know that they'r ein trouble right now, to put It mildly, especially with things like white nose syndrome. I know that, that we rely on them for everything from eating mosquitos to pollinating flowers."

The Community of Climbing	Friendship	Climbing impacts social life and friendships	P9: "Most of my social life revolves around climbing, so usually there's nothing keeping me except the weather."
	Community	Fellowship and shared actions for the collective benefit	P3: "feeling like you're not just out there recreating purely for yourselves... but you can contribute to the bigger community is, in a very easy way, a big thing."
	Organizational Involvement	Giving time or money to a local climbing organization	P10: "I make an annual donation to access fund and get the membership t-shirt...I've also contributed to the American Alpine Club and become a member with them. Because I really like what they have set up in the New River Gorge... they have that campground there."
	Social Norms	Perceived appropriate behavior within the climbing community	P11: "People understand that this is just something that happens every year, and you kind of have to deal with it. And it's something that now it's kind of part of that conversation mixture of how outdoor rock climbing is [referring to closures for wildlife]"
Access and Climbing	Fear of closures	Worry that identifying bats will result in closures like raptor closures	P14: "I mean, I'm sure there's some stigma thinking that like, it's gonna get routes closed down like when there's a Peregrine roosting, so I'm sure some people are freaked out by that."

	Respecting closures	Demonstrated commitment to following cliff closure rules	P11: "I am very conservation minded. So, you know, a closure for part of the year is not going to affect the way I feel about a certain thing. I think that's how it should be."
	Tradeoffs	Conditional statements involving management, bats, and climbing access	P2: "there's enough climbing out there that if, it's not like they're going to, like if they close all of PMRP, that would be a problem. But if you close three climbs in one area, that's fine."

Appendix D:

Structured survey instrument:

Rocktoberfest 2023 Climber Survey

Start of Block: Introduction

This study is being conducted by researchers from Colorado State University. We would like to invite you to participate in a research study. The purpose of this study is to learn more about climbers and their behaviors. This survey will take approximately 15 minutes to complete and will ask you a variety of questions pertaining to rock climbing.

Your part in this study is confidential. That means that your answers to all questions are private. No identifiable information will be collected from you as part of this survey. Scientific reports resulting from this survey will be based on group data and will not identify you or any individual as being in this study. There are no known risks from being in this study. Taking part in this research is completely voluntary. You may skip any of the questions on the survey you do not wish to answer. If you decide not to be in this study, or you stop participating at any time, you will not be penalized nor lose any benefit to which you are otherwise entitled.

Participants who complete this survey will have the opportunity to be entered into a raffle for a voucher for La Sportiva climbing shoes, a Trango harness voucher, an REI flash 22 backpack, or an REI camp chair each worth \$150, \$95, \$39.95, and \$70 respectively. Your chance of winning the raffle is estimated at approximately 1 in 340 for each item.

You must be at least 18 years old and have participated in rock climbing to participate in this study. If you are at least 18 years old, have rock climbed before, and agree to participate, please select yes and answer the following questions. If you do not meet the requirements of this survey, please select no below. Thank you.

Yes

No

Skip To: End of Survey If This study is being conducted by researchers from Colorado State University. We would like to inv... = No

End of Block: Introduction

Start of Block: Awareness

To select an answer, tap your chosen response on the screen. When you are ready to go to the next set of questions, please tap the arrow. As a reminder, **you will not be able to go back and change your answer once you go to the next page.**

Have you ever seen a bat on a climbing route? This includes all forms of outdoor climbing including bouldering, mountaineering, traditional, and sport climbing.

- Yes
 - No
 - I am unsure
-

Have you heard of CBC before today?

- Yes
- No
- I am unsure

Skip To: Q40 If Have you heard of CBC before today? = No

Display This Question:

If Have you heard of CBC before today? = Yes

Have you ever reported a bat to CBC?

- Yes
- No
- I am unsure

Skip To: End of Survey If Have you ever reported a bat to CBC? = Yes

Display This Question:

If Have you heard of CBC before today? = Yes

Where have you heard of CBC before today? Please select all that apply.

- Climbing gym
- Climbing festival
- Rock and Ice or Vertical Times magazine
- Mountain Project
- News Site
- Other Rock Climbers
- Instagram
- Facebook
- Other: _____
- I don't know

Page Break

Display This Question:

If Have you heard of CBC before today? = Yes

Please indicate whether you believe each statement to be true or false about CBC.

	True	False	I do not know
CBC works to protect rock climbers from bats on climbing routes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
One of CBC's goals is to improve knowledge of bat roosting locations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Removing bats from climbing routes is one of the goals of CBC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CBC seeks to develop relationships among climbers, biologists, and land managers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CBC aims to protect bats on climbing routes from rock climbers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CBC seeks to empower climbers as ambassadors for bat conservation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I've heard of CBC, but I don't know what they do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Display This Question:

If Have you heard of CBC before today? = No

Or Have you heard of CBC before today? = I am unsure

Rock climbers can report bats on climbing routes to an organization called CBC through an online survey platform. A small portion of this online survey is shown below as an example of what it will look like when reporting a bat to CBC. Please quickly review this form, as the next question will refer back to it.

End of Block: Awareness

Start of Block: Explanation of CBC "Yes"

Display This Question:

If Have you heard of CBC before today? = Yes

There are multiple ways in which climbers have reported to CBC in the past. Recently, CBC started utilizing an online survey form for climbers to report. A portion of this online survey is shown below as an example of what it will look like when reporting a bat to CBC. **Please quickly review this form, as the next question will refer back to it.**

End of Block: Explanation of CBC "Yes"

Start of Block: Would you report?

Would you report a bat to CBC using the online survey in the future? As a reminder, there are no right or wrong answers to this question. I am simply interested in learning about climber behavior.

- Yes
- No
- I am unsure

End of Block: Would you report?

Start of Block: Barrier/ Benefit

Please indicate the extent to which each of the following reasons might **prevent you from reporting** a bat to CBC. Please answer using a scale ranging from "Strongly Disagree" to "Strongly Agree".

Please rate each statement based on your personal feelings and circumstances.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I do not have cell phone service at the climbing area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My decision to report is influenced by my indifference towards bats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I might forget to report	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am concerned the information provided might result in the bats being bothered by other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My decision to report is influenced by my negative feelings towards bats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the survey to report a bat is too complicated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not have time to report a bat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I assume somebody else has already reported the bat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not want people to know where I am climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe the information is not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I am uncertain about how the information from the report will be used

I am concerned about losing access to the climbing route I saw a bat on

I do not understand how to report using the online survey form

Page Break

Please indicate the extent to which each of the following reasons might **encourage you to report** a bat to CBC. Please answer using a scale ranging from “Strongly Disagree” to “Strongly Agree”.

Please rate each statement based on your personal feelings and circumstances.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I am motivated by my desire to help the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I care about the well-being of bats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing that other climbers report to CBC encourages me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The incentive of getting a free t-shirt motivates me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am interested in fostering good relationships between climbers and scientists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Receiving a free sticker is an incentive that encourages me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am motivated to share the story of my experience with others in the climbing community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am motivated by the desire to reduce mosquito populations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I feel that by reporting, my climbing is contributing something important to the climbing community

I feel that bats are an essential part of the ecosystem, regardless of human benefits

I am motivated by the desire to improve the climbing community

I want other climbers to know there is a bat on the climbing route

I want to contribute to scientific research

I am motivated by the desire to maintain access to my climbing area

My friends' encouragement would motivate me to report a bat

End of Block: Barrier/ Benefit

Start of Block: NEP scale

Listed below are statements about the relationship between humans and the environment.

Please select how much you agree with the following statements on a scale ranging from “Strongly disagree” to “Strongly agree”

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
We are approaching the limit of the number of people the Earth can support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The balance of nature is strong enough to cope with the impacts of modern industrial nations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plants and animals have as much right as humans to exist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The so-called “ecological crisis” facing humankind has been greatly exaggerated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Despite our special abilities, humans are still subject to the laws of nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: NEP scale

Start of Block: SLIM

The following question is about your relationship to climbing. Please select how much you agree with the following statements on a scale ranging from “Completely disagree” to “Completely agree”

	Completely disagree	Mostly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Mostly agree	Completely agree
Climbing has added richness to my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy interacting with other climbing enthusiasts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I overcome difficulties in climbing by being persistent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climbing has improved how I think about myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel important when I am a part of my climbing group’s accomplishments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are defining moments within climbing that have significantly shaped my involvement in it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others that know me understand that climbing is a part of who I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is important that I perform duties which unify my climbing group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that I have made progress in climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Climbing for me is an expression of myself

I share many of my climbing group's ideals

I try hard to become more competent in climbing

End of Block: SLIM

Start of Block: Goals

The goals of CBC are simply to:

1. Improve knowledge of bat roost locations
2. Develop relationships among climbers, biologists, and land managers
3. Empower climbers as ambassadors for bat conservation
4. Develop a model collaboration that can be used for gaining data on bat crevice use

Please select how much you agree with the following statement on a scale ranging from “Strongly disagree” to “Strongly agree”.

As a reminder, there are no right or wrong answers to this question.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I support CBC's goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Does support from **Access Fund** for CBC's goals **positively** influence your decision to report a bat?

- This has no influence on my decision to report
 - This has a little influence on my decision to report
 - This has a moderate amount of influence on my decision to report
 - This highly influences my decision to report
 - This negatively influences my decision to report
 - I am unsure
 - I do not know what the Access Fund is
-

Does support from **Red River Gorge Climbers Coalition** for CBC's goals **positively** influence your decision to report a bat?

- This has no influence on my decision to report
- This has a little influence on my decision to report
- This has a moderate amount of influence on my decision to report
- This highly influences my decision to report
- This negatively influences my decision to report
- I am unsure
- I do not know what the Red River Gorge Climbers Coalition is

End of Block: Goals

Start of Block: Demographics precursor

The next set of questions are to learn more about you as a climber. Please remember that none of these answers can be traced back to you and remain anonymous.

End of Block: Demographics precursor

Start of Block: Demographics

How long have you been climbing regularly? For example, if you learned to climb when you were 5, but didn't start climbing regularly until you were 30, choose the amount of time from age 30. **Please enter the number of years. If you have been climbing for less than 1 year, state "less than 1 year".**

How often do you participate in the following types of climbing? Respond with the frequency during your preferred climbing season(s).

	More than once a week	Roughly once a week	2-3 times per month	Once a month or less	Never
Gym (speed, boulder, top rope, or lead climbing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bouldering (outside)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Top-rope climbing (outside)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sport climbing (outside)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Traditional (aka trad) climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Free soloing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alpinism or mountaineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aid climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What is your home zip code?

Do you describe yourself as a man, woman, or in some other way?

- Man
 - Woman
 - Click to write in option: _____
 - Prefer not to say
-

Please indicate your race/ethnicity(ies). Please select all that apply.

- American Indian or Alaska Native
- Asian or Asian American
- Black or African American
- Hispanic, Latino, Latina, or Latinx
- Middle Eastern or Northern African
- Pacific Islander
- White
- Another option not listed or prefer to self-describe:

End of Block: Demographics
