Ash Everywhere: Place Attachment and Meanings in the Aftermath of wildfires

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Wildfires can lead to drastic environmental changes that pose a threat to communities' understandings of place. While previous research has explored the connections between environmental change and place attachment, less is known about the relationship between place meanings and environmental disasters in combination with other drivers of change such as population growth and climate change. The main goal of this article is to enhance understanding of how wildfire-related experiences impact place meanings. Through semi-structured interviews with communities who were affected by wildfires in rural Colorado, we clarify the neglected relationship between environmental disasters and place attachment and place meanings. Specifically, we identify how place meanings are channeled through different dimensions of place attachment, namely place affection and place awareness. By differentiating these two dimensions, we indicate practical possibilities for addressing climatic and environmental change, such as through community building, education on resource conservation, and wildfire–risk management.

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1. Introduction

Climate change constitutes perhaps the most significant form of environmental change underway globally, for it involves a wide range of local and regional environmental shifts, notably marked by increased extreme weather events, including more intense and frequent wildfires (IPCC 2022). Because of the high costs associated with damaged or lost buildings and other assets, wildfires threaten the economic viability of human settlements and population centers. But they also have powerful non-economic impacts. The lived experiences of wildfire-related disruptions can modify communities' connections to and understandings of their homes and environments, thus altering the meanings assigned to places once considered familiar and safe. As wildfires become more frequent and severe, then, they reshape not only landscapes and economies, but also the meanings and attachments people sustain in relation to their lived-in environments.

When addressing people-place relationships in the context of environmental attitudes and environmental change, past research often focuses on measuring the intensity of place attachment through a broad and unidimensional concept of place (Anton & Lawrance, 2016; Dandy et al., 2019; Mook et al., 2022; Morales-Giner & Gedik, 2023). However, this approach often overlooks the nuanced meanings of places as well as the diverse ways people relate to these meanings. Several studies have therefore identified place meanings as a key focus for understanding how populations experience landscape change and ecological degradation (Brehm et al., 2013; Marshall et al., 2019; Stedman, 2003). But this literature on understandings of place meanings has its own limitations. On one level, the role of place meanings in the context of wildfires has received relatively little attention in the disaster and place attachment literatures; notable exceptions include Cox and Perry (2011) and Brown (2022, 2024). More broadly, to our

knowledge no existing studies have analyzed the impacts of wildfires on place meanings in combination with other major place disruptions, such as climate change and demographic shifts.

We consequently argue for a more expansive approach that considers the multi-dimensional nature of place attachment in relation to place meanings, as this would enable deeper understanding of how disruptive environmental change impacts communities. Our main goal is to explore the nuanced dynamics between place attachment and place meanings in areas facing increasing wildfire risks. We focus on how wildfires, understood as a major form of disruptive environmental change, can alter existing meanings of place. Through analysis of these wildfire-induced alterations in place meanings, we detect and delineate previously unnoticed dimensions of place attachment – specifically, place affection and place awareness. In addition, we examine how wildfire impacts are experienced in tandem with climate change and population change to offer further insights into the way cumulative disruptions influence people-place relationships.

We take up the case of the Cameron Peak Fire in Larimer County, Colorado in 2020. Alongside this destructive fire, residents in these areas have been exposed to several other wildfires as well as notable population changes. We conducted semi-structured interviews with a diverse selection of local residents, including different age groups and residence statuses, in different kinds of communities. Our analysis of the interviews reveals that place affection and place awareness are key to examining how communities exposed to wildfires interpret and respond to environmental and demographic changes. The findings aim to advance knowledge of how climate change-induced environmental disasters can shape place meanings.

2. Place Attachment and place meanings

The academic literature has established that place-based relationships impact how people respond to environmental change (Masterson et al., 2017; Marshall et al., 2019; Nicolosi & Corbett, 2018). People affected by environmental impacts may change place relationships via shifts in place meanings, bonds, and identities (Devine-Wright, 2013). Thus, scholars argue that it is essential to study how communities are affected by environmental changes and how they interpret and navigate these shifts (Masterson et al., 2017; Raymond et al., 2021). This study focuses on the relationship between place attachment and place meanings. Indeed, place meanings linked to attachment "need to be understood to assess how changes will threaten or enhance it" (Murphy, et al., 2021, p. 59).

Place attachment involves the "bonding of people to places" (Low & Altman, 1992). Place meanings are critical foundations of this attachment (Smaldone et al., 2008; Brehm et al., 2013; Stedman, 2008) that represent people's "perceived interconnection between themselves and nature" (Brehm et al., 2013, p. 533), as well as other contextual elements. This bonding can form affective links to a place and the community that lives in it, as the place provides a sense of serenity, privacy, and security (Low & Altman, 1992; Rollero & De Piccoli, 2010). At the same time, people can establish bonds with places through awareness, knowledge, and experiences. Place attachment researchers have considered how people establish a relationship with spaces through experiences such as work, family legacy, reading, community building and involvement, engagement in recreational activities, awareness of disruptions, life-place trajectories, or acquiring environmental competence and control (Bailey, et al., 2021; Devine-Wright, 2009; Fresque-Baxter & Armitage, 2012; Mook, et al., 2022; Raymond, et al, 2010; Vorkinn & Riese, 2001).

A common way to approach place attachment in research is through Likert scales or statements that measure whether or how much individuals feel attached or identified with place and its different components, including community and nature (Raymond, et al., 2010). This approach helps capture how different levels of attachment lead to a variety of environmental behaviors and attitudes, such as decisions to move (Dandy et al., 2019), climate change concern (Morales-Giner & Gedik, 2023), wildfire preparedness (Anton & Lawrence, 2016; Wallis et al., 2022), bequest intentions (Mook et al. 2024), or pro-environmental behaviors (Mook, et al., 2022). However, here we argue that to fully grasp how place meanings are affected by disruption, we need an approach to place attachment that goes beyond unidimensional measurement of intensity and allows us to capture the different dimensions of place meanings.

2.1 Place meanings in a context of disruptive change

Place change can stimulate both positive and negative responses, depending on how people interpret change in terms of place meanings. Disruptive place changes can greatly alter place meanings in ways that involve emotional distress (Albrecht et al., 2007; Jacquet & Stedman, 2013; Masterson et al., 2017). The distress resulting from environmental change has been documented through the concept of solastalgia, which describes the emotional pain resulting from lived experiences associated with environmental change (Albrecht 2007). Importantly, solastalgia is often not produced by a single environmental event, as several factors can interact "across both time and space, resulting in cumulative impacts on emotional, mental, and spiritual health" (Galway et al. 2020; p. 13).

In the context of disasters, including fires, hurricanes, and acts of violence, previous studies have demonstrated how short-term and long-term disruptions impact place meanings in ways that involve disorientation, dislocation, and trauma (Brown, 2022; Brown, 2024; Cox & Perry, 2011).

Regarding the experience of large-scale fires in the US, Brown (2023) and Eisenman et al. (2015) document that affected communities experienced solastalgia linked to emotional distress. In Sweden, Butler et al. (2018) shows how communities affected by fires suffered a "loss of landscape identity" which involves the loss of familiar physical space. Further, in California, Brown (2024) argues that survivors of wildfires exhibit environmental anomie, that is, disruption from the place, including disturbance of local knowledge systems that residents developed over time.

At the same time, disruptions to place meanings can inspire constructive engagement with environmental change in ways that support place attachment (Kyle et al., 2004; Smith et al., 2012). For example, residents affected by fires may exhibit optimism regarding recovery and natural regeneration (Brown, 2022) or create new identities around fire management (Butler et al., 2018). Burley et al. (2007) show how residents who witness land loss and degradation in Coastal Louisiana (USA) exhibited a heightened awareness of place attachment. Similarly, in Oklahoma, residents affected by tornadoes reinforced their attachment to place (Greer et al., 2020). In this way, place change can directly challenge place meanings and prompt engagement and transformative action to reshape and reassert place attachment (Folke et al., 2005; Masterson et al., 2017; Tidball, 2012; Stedman & Ingalls, 2014).

That said, it is essential to recognize that place meanings can change slower than economic or environmental shifts. Masterson et al. (2017) note that chronic or more gradual changes can lead to the maintenance of place meanings, preventing communities from acknowledging the need for radical action. When communities resist changing place meanings, that can delay timely adaptive action. In contrast, disasters may disrupt place meanings provoking distress by undermining place attachment, but they can also catalyze new place identities and foster

constructive engagement over time (Brown, 2022; Butler et al., 2018; Kyle et al., 2004; Smith et al., 2012).

2.2 Place affection and place awareness

In the context of post-wildfire communities, previous work highlights the importance of place attachment, place meanings and resilience in communities affected by wildfire (Cox and Perry 2011; Brown 2022). Building on this effort, we examine how place attachment relates to place meanings through two key dimensions: place affection and place awareness. These two dimensions provide a foundation for understanding how individuals and communities connect to place meanings and how they respond to environmental disturbances such as wildfires.

Place affection reflects people's positive sentiments toward a place, usually driven by intangible or idyllic meanings of place that generate pride or a sense of belonging. Place affection thus highlights the personal significance of the meanings that places evoke. It also reflects a person's positive sentiments toward a place. Place affection may manifest as a deep emotional connection to the natural environment. In areas affected by wildfires, the experience of loss may lead to different responses in terms of place affection. On the one hand, loss can involve a solastalgic response in terms of emotional distress for what the place once was before being altered by fires. On the other hand, the experience of loss may instead lead to manifestations of place affection in terms of a strong desire to restore or preserve it after damage.

In contrast, place awareness involves a cognitive and informed understanding of a place's functional meanings, including its cultural, historical, social, and environmental significance, as well as awareness of specific environmental risks and material aspects. In communities influenced by wildfires, place awareness means practical knowledge regarding wildfires – for example, knowledge about the historical patterns of fire in the area, fire management, and thus

wildfire risks. In addition, place awareness involves knowledge about relevant physical landmarks in the area (e.g. specific rivers, lakes, mountains, or emblematic structures) that serve as references to understanding environmental risks and degradation.

This study investigates how these two dimensions of place attachment (i.e. place affection and place awareness) interact with the impacts of wildfires to shape individual and community place meanings. While place affection drives emotional and value-driven engagement with a place, place awareness highlights practical and informed knowledge to protect and manage a place effectively, as shown in Figure1.

Given the current and projected magnitude of wildfires, resilience goes beyond the ability to "bounce back" from disruption. As McWethy et al. (2019) note, in wildfire-prone areas resilience involves an extensive modification to social and ecological systems. In this way, resilience integrates the two dimensions of place by emphasizing that when confronted with disasters and changing dynamics, local place meanings –i.e. personal significance and practical knowledge– are key for building a community's capacity to adapt, recover, and transform in response to disturbances like wildfires. These interconnected elements ensure that communities are physically safe, emotionally secure, and capable of adapting to future challenges.

Figure 1 here

3. Methods

3.1 Study case: Rural communities in Larimer County, Colorado

Eight of Colorado's ten most significant fires have occurred in the last fifteen years (State of Colorado, n.d.), suggesting a strong link between climate change and wildfire intensity due to reduced precipitation (Abatzoglou et al., 2018). Liu et al. (2015) show that climate change significantly contributes to wildfire risk in rural areas of Colorado.

Larimer County (CO) has been significantly affected by wildfires. In May 2012, the Hewlett Gulch Fire burned 7,685 acres. A month later, the High Park Fire was caused by lightening (Robichaud et al., 2017). As a result of the fire, there was one fatality, 259 burned homes, more than 85,000 burned acres, $113 million in uninsured losses, and the intensification of post-fire floods a year later (Robichaud et al., 2017). In October 2019, a prescribed fire (the Elk Fire) escaped control, destroying one building and burning 118 acres outside planned project boundaries. There were mandatory evacuation orders for one hundred residents (Colorado Department of Public Safety, 2020). In August 2024, the Alexander Mountain Fire raged near the Loveland and Fort Collins area, burned over 10,000 acres, and destroyed twenty-six homes (Moret, 2024).

This study focuses on several communities in Larimer County affected by the Cameron Peak Fire. These communities include Red Feather Lakes, Rustic, Poudre Canyon Park, Glacier View Meadows, Livermore, Pingree Park, and Crystal Lakes, see figure 2[1]. All of these are unincorporated communities within three different zip codes and containing roughly 1,000 to 2,500 residents (USA Census 2020). The locations are situated in or near Wildland Urban Interface/Intermix areas within the Arapaho and Roosevelt National Forests, and are a 40- to 90-minute drive from Fort Collins, the largest urban center in Larimer County. The Cameron Peak Fire became the largest wildfire in Colorado's history, burned 208,913 acres, and triggered extensive mandatory evacuations, displacing residents from their homes over several months. By the time the fire was contained on December 2, 2020, it had damaged or destroyed 469 structures, including 192 residences and mobile homes (Overbeck, 2020), leaving many evacuees mostly in

[1] This map was created with ArcGIS, version Pro 3.1, using a layer that delineates the Cameron Peak Fire Perimeter (ESRI 2022)

wildland-urban interface areas with no homes to return to. In addition, the fire damaged forests in three watersheds: Poudre, Big Thompson, and Laramie. The destruction of vegetation in the aftermath of the fire increased the risk of other hazards. In July 2021, a post-fire flood in Poudre Canyon caused by heavy rains claimed the lives of four people and destroyed seven structures (Larimer County, 2021). This event demonstrates the risks faced by residents even after fires are controlled.

Figure 2 here

At the same time, Larimer County, like much of Colorado, has been impacted by population growth, despite the area's high percentage of public land. In 1990, its population 200,000 was four times greater than in 1960 (Wright, 1993). Han et al. (2022) note that in 2016, Larimer County experienced a population rise of 20% since 2006. Further, as in many other rural areas with natural amenity value, the County is inhabited by both residents who live there full-time and those who own a secondary home.

3.2 Data Collection and Analytical Strategy

To address the research goal noted above, we adopted a qualitative approach. This strategy allows us to grasp the multifaceted and profound nature of place meanings that can vary from person to person. Thus, through qualitative methods, researchers can "explore the spectrum of place meanings that participants assign to places, as well as experiences through which these meanings are created" (Brehm et al., 2013, p. 524).

Specifically, we relied on semi-structured interviews as instruments that allow researchers to "tap the depth and intricacy of the ways humans make meaning of place" (Nicolosi & Corbett, 2018, p. 98) and participants to offer "rich descriptions" and "talk in their own terms" about their relations to place (Raymond & Gottwald, 2021, p. 145). All interviews were structured in three main parts. Part I focused on questions about the area of interest,

including requiring participants to describe the locations, highlight what they consider important about them, and discuss the changes and challenges they have observed. In this section, participants were also asked about the recent fire and how it affected them. Part II was focused on questions about environmental and climatic change. This included questions about natural resources and perceptions of climate change. Finally, Part III covered demographic questions such as gender, age, and occupation.

The sampling approach involved contacting potential participants who could provide a range of perspectives on the location, including permanent and non-permanent residents and individuals who work in the area but do not reside there. To recruit participants, we contacted individuals involved in local organizations through email, e.g., citizens councils, fire district departments, public schools, libraries, local businesses, NGOs, mountain centers, and volunteer associations. Their email addresses were listed on public websites. Of 95 emails sent, 21 participants responded and agreed to be interviewed (22% response rate). Seven people were interviewed through snowball sampling. In addition, one participant responded to an ad about the study posted in a local newsletter. Finally, five permanent residents were contacted through personal connections in the area.

The final sample involves a total of 34 participants (see Table 1), a mix of full-time and part-time residents (n=30). Other participants included three employees of local environmental organizations and one political representative from Larimer County, who were well-informed about the area and its environmental challenges. The interviews were conducted from February to December 2021, via telephone or Zoom and lasted 20 to 100 minutes. At the request of the participant, one interview was conducted via Qualtrics, which allowed answers to be typed.

Table 1 here

The study received Institutional Review Approval (IRB)**.** Before each interview, the author who conducted the fieldwork informed participants that she was a Ph.D. candidate at the time. She also explained that she was somewhat familiar with the area as her relatives live in Colorado. Further, per IRB requirements, participants were informed about their rights and provided informed consent. At the end of each interview, all participants were asked if they could provide a contact that fit the sampling strategy. To protect participants' privacy, the assigned names in this paper do not correspond to their real names.

Transcriptions of the interviews were analyzed using text-analysis software. We applied a thematic analysis technique guided by the place attachment and meanings theories described above, allowing new themes to emerge. We followed a modified version of the steps proposed by Creswell (2009). First, the data was organized and prepared for analysis, including the interview transcriptions and data logs. Second, transcripts were read to get a general sense of the content. Third, the data was coded, identifying distinct descriptions of the location, including common ways of describing the place and identifying disruptions. Fourth, broader code categories that best fit the descriptive codes were identified. These procedures allowed the coding to capture details in the sentiments reported while organizing them along broader dimensions of place meanings, attachments, and disruptions.

4. Findings

This section is structured following the primary goal of identifying the relationships between place meanings and change. First, we identify place meanings in the study site, paying particular attention to how these meanings relate to place attachment. Second, we turn to three sources of change identified in the study: demographic dynamics, wildfires, and climate change. We unpack themes focusing on alterations in place meanings within each type of change.

4.1 Place Meanings

Table 2 presents nine (9) distinct codes that arose from the analysis of interviews about place meanings in rural Colorado. Under "concepts," we provide notions and words that participants mentioned when discussing specific place meanings. The first five meanings were commonly expressed up front when participants were asked to describe the area where they live: *scenic, calm, healthy, community, solitude/private.* Descriptions ascribed to these meanings tended to be based on personal significance and associated with ideal or intangible values, such as peace or beauty. The last four meanings (*wildfire danger, remote/access challenges, water scarcity, and work-intensive)* mainly emerged from participants' answers about challenges. However, these four meanings were also present in participants' descriptions of the spaces they lived in. They tended to be described in detail through practical knowledge associated with material concepts such as water, fire, and roads.

Table 2 here

Findings point to how two dimensions of place attachment, i.e., affection and awareness, are connected to different types of place meanings: personal significance and ideal meanings or practical knowledge and challenge-based meanings. On the one hand, participants tended to refer to ideal and intangible meanings such as *scenic* by invoking some degree of affection for their places. For example, most participants (n=23) referred to scenic attributes such as *beautiful* or *paradise* when asked to describe the place where they lived. On the other hand, challenge-based meanings such as *water* or *wildfire* were presented through concerning visual and material landmarks such as dry wells or forest damage, which are linked to the recognition and interpretation of landscape change. Furthermore, these meanings were invoked by expressing awareness of place. Participants explained how they were aware, concerned, and prepared for *water scarcity*, *fire danger, lack of access to resources,* or *hard work.*

These findings suggest that place attachment is not exclusively expressed through affection but also by awareness of place. Participants demonstrated affection for places by referring to abstract concepts such as *scenic beauty*. Additionally, the analysis reveals that participants exhibit attachment by being aware of the conditions of their surroundings.

4.2 Place Change and meanings in the study site

Change and disruption affect place meanings. Therefore, it is important to evaluate how participants understand the drivers of change. Respondents highlighted three key drivers of change that contribute to place meaning modification. We focus on the changes most identified by participants: demographic dynamics (n = 25), wildfires (n = 18), and climate change (n = 8). We therefore organize our discussion of findings around these three changes, in the order of their frequency of mention by participants. That said, because of our focus on wildfires, we dedicate particular attention to that theme. For each of these, we draw connections between perceptions of the assigned codes and changes of place meanings, identifying these connections in terms of how they reinforce or weaken place meanings (see Table 3).

Table 3 here

4.3 Demographic dynamics

Participants identified demographic dynamics that impacted them, such as a perceived increase in part-time residents and visitors to the area. They also referred to younger residents with a professional profile coming to the area due to the increase in real estate prices in Fort Collins.

These demographic dynamics clearly disrupt ideal place meanings. In Roy's words, "This is a very special place, and (…) the land doesn't tolerate a lot of people." Indeed, a higher population influx affects the *scenic, calm*, *and solitude*-related environment. For example, devices such as ATVs, four-wheelers, and guns create noise disturbances. *Martha* explains how younger generations who commute to town tend to overuse resources and degrade the environment.

> The changes (…) are partly generational. (…) People were coming in, lots more ATVs, lots more snowmobiles, lots more noise... just kind of free for all. Without a sense of appreciation. (…) People were [also] coming in and commuting these long distances and just using it as a bedroom (…), without taking much notice of being in a very special environment.

This situation also affects the *community* and its social cohesion as it can create a feeling of lack of control, exacerbated by the area's lack of public authority as an unincorporated community. Furthermore, many noted that their locations are becoming "bedroom communities" inhabited by people who work in bigger towns. This dynamic is perceived as undercutting social cohesion. For example, *Julia* observes that people who commute "get out of their car and go into their house, and you never see [them], and you don't know your neighbors." However, others maintained that population growth can lead to *community* development**.** This is because newcomers are assumed to bring resources, community engagement, and identity. For instance, *Bruce* explains that new people bring new energy and the "opportunity to reflect on who we are and how we want our community to be. (…) People are more involved in their community when they first move up".

Demographic dynamics also impact practical knowledge place meanings, such as *water, wildfires*, and *work-intensive*. For instance, population growth in Northern Colorado contributes to greater aggregate water demand. The increased use of septic systems in rural areas exacerbates water pollution risks, potentially leading to a drop in property values. Moreover, full-time residents sometimes perceive visitors and non-full-time residents as less prepared to cope with the threats of the mountains due to a lack of experience, knowledge, equipment, or time. For example, visitors sometimes ignore rules that prohibit campfires in the area. Some participants noted that newcomers prioritize picturesque views over wildfire mitigation, as they may be reluctant to cut down trees on their properties. *Heather* says, "People prioritize the ambiance of being in the trees and no judgment, I understand that, over the risk of fire mitigation." Similarly, newcomers may not realize

the work-intensive demands of mountain living and have unrealistic expectations regarding resources commonly available in cities or "flatlands," such as the internet, plowed roads, and full access to recreational areas. *Roy* notes: “They come with an expectation of living a city life."

Participants also expressed how population dynamics impact the meaning of *access challenges*– specifically, road challenges**.** Newcomers sometimes expect to commute regularly to bigger cities, which increases traffic and, in turn, adds to the challenge of road maintenance. *Thomas* and *Sandra* noted how heavier traffic leads to more car accidents, including those involving wildlife. The increase in population and visitors further intensifies the unsustainable use of natural amenities and limited community resources. *Alan* explains that the population is starting to overwhelm “simple things like libraries, food banks, and community gatherings." However, population growth can also reduce *access challenges* as newcomers can potentially bring economic benefits such as an increase in property values and customers for local businesses.

4.4 Wildfires

The study area was impacted by two major fires in the last decade, i.e., the High Park in 2012 and the Cameron Peak Fire in 2020[2]. Thus, participants related how wildfires have been a major change source, causing the following impacts in place meanings.

Loss and damage of properties and natural spaces related to the wildfires disturb personal significance and ideal place meanings such as *calm*, *scenic,* and *healthy places*. *Sean* notes, "The two big fires (…) have really changed the landscape." Hiking areas remained closed for several months after the fires. The smoke and ash from the fires also received frequent mention in the interviews. For example, *Mary* explained that the fires left black dust on the landscape, and when

[2] Most of the impacts in the categories below refer to the Cameron Peak Fire; many also apply to the High Park Fire, as several participants had been affected by both fires and referred to fire impacts in general. Participants also discussed other related events, such as smaller fires and floods.

high winds occur, “It just picks up all that soot and dust from west of here and brings it right down.” Further, fires brought other environmental threats, such as soil erosion, floods from rapid runoff, and polluted well systems that affect *healthy* places. The unpredictability of the fire situation, combined with the multiple evacuations, negatively impacts mental health. *Danielle* says that after she was back from the first evacuation, they had to evacuate again, and “there was no pre-evacuation, it was just an immediate ‘leave now.’ And ash falling from the sky (…) it was pretty traumatic for a lot of people”. Participants described their reactions to the fire as *miserable, lack of control, nerve-wracking time, disturbing, unbelievable, stressful, awful, frightening, scary*, and *anxious*. Two participants likened the lingering anxieties to Post-Traumatic Stress Disorder.

Another wildfire-related impact on place meanings is both *community* loss and development. The Cameron Peak Fire forced many residents to evacuate, some multiple times, with others being displaced for up to two months. Some neighbors relocated permanently due to losing their homes, evacuation fatigue, or the persistent threat of wildfires. However, wildfire exposure also led to *community* resource mobilization and wildfire preparedness. Participants shared wildfire-related lessons from past experiences. Having lived through several wildfires, the community developed organizational strategies to manage crises more effectively. *Alexis* says:

> There was a lot learned from [the High Park fire] and many things were put into place after that to prepare for future fire. So when Cameron Peak happened, (…) we were pretty well prepared as a community to come together and start planning for post fire mitigation and restoration, and the emergency services were very well prepared, or organized.

At the same time, evacuation orders and reduced visitor influx heightened the place's meaning of *solitude / privacy* as the locations momentarily emptied. This meaning of *solitude / privacy* connected to a freedom-related identity can go against following fire mitigation rules, i.e., disregarding mandatory evacuation orders.

Participants also noted the difficulty of seeing the devastated landscape and observing the loss of what made the place *scenic*. For example, *Julia*, who has always lived in the area, says that driving through the damaged areas is heartbreaking: "It's just a whole bunch of emotions that I don't even know how to describe. Because it just hurts so much to see it like that." Other participants were concerned about the threat of damage to emblematic places. *Alexis* explains that the stupa in the local Buddhist temple was saved, but: "the forest all around burned, and at one point (…) there were reports that the stupa had burned, (…) I just immediately started crying because it is such a special place."

In parallel, changes in the wildfire-affected landscape reinforce a sense of *wildfire danger* while unexpectedly strengthening *scenic* place meanings. Some residents noted the regrowth occurring in the burned areas and appreciated the beauty of the contrast. *Elizabeth* explains how coming back to the cabin and seeing ash everywhere brought a mix of emotions, including awareness of the risk and respect for nature:

> There was ash everywhere. We're surrounded by burn scars. There is a (…) feeling of being weary and cautious and really careful about our fuels and really having even more respect for mother nature and the power of these devastating wildfires. [It was] very dry and very windy (…), and ash and... cleaning, ash was everywhere.

Other participants, like *Danielle,* noted how they gradually accepted the impacts of the fire and even appreciated their beauty:

> I think maybe right after the fire, I would have thought that it was negative, but, you know, 10 years later now, you get used to it over time (…) things kind of settle in. (…) It's been really beautiful watching how nature changes over time. So, you saw different plant communities, and animals returned to the area that weren't there before. (…) From an observational standpoint, that's actually been really interesting to be able to experience.

The fire also increased *wildfire danger* by shifting priorities from fire mitigation to fire restoration due to the fire impacts. As *Sean* says

> A lot of the projects and areas where we wanted to work to reduce wildfire risk burned. (…) You would think (…) that's a net positive because now you don't have to manage them (…) but they burned in a way we didn't want them to burn (…) in a very extreme way -(…). -Now we have to moderate (…) the landscape that is actively eroding due to thunderstorms (…). [So]instead of doing the wildfire mitigation work that I had planned and wanted to do, I [am] helping out with post fire restoration and post fire recovery [work] (…) So, [the fire] shifted (…) priorities and workload.

However, fire exposure can also facilitate the *work-intensive* place meaning, in turn weakening *wildfire danger*. Compared to pre-fire times, communities are more willing to adopt strategies that they previously considered risky. *Sean* mentions that after the fire, his organization faced less resistance to fire mitigation techniques such as cutting, piling, and burning small-diameter trees. They received calls from concerned neighbors in previous years, but "this year, we burned 1000s of piles and got zero complaints, which I think is really telling. People know that fuels have to be reduced (…) so, they're tolerant (…), in a lot of cases they are actively supporting these techniques."

Finally, wildfire also affects other practical knowledge and challenge-related meanings. *Barbara* mentions how fire damage produces chemicals that pollute, exacerbating *water scarcity*. The fire also increased *access challenges* by causing material damage, such as property harm, loss, and related flooding. In addition, those who lost their homes have unequal resources for rebuilding. *Sean* mentioned that sometimes those who own older family cabins could not afford insurance, while those who own second homes in the area are well-insured and can afford to rebuild. Apart from the physical damage to properties, the local economy suffers due to a lack of business activity, power outages, employees under evacuation orders, and smoke exposure.

4.5 Climate change

Eight participants identified climate change or weather changes as major drivers of change in the area. Toward the end of the interviews, participants were asked about their opinions on

several issues related to climate change[3], such as rating their concern about climate change on a scale from 1 to 10. The average concern for the rest of the participants was 7.5. Of the participants interviewed, twenty-three connected human activities and climate change. Of these, ten referred to fossil fuels.

Climate change can impact the meanings of personal significance or ideal places. Generally, participants referred to phenomena that can impact what makes the place *scenic*, such as decreased moisture, snow, and rainfall. For example, *Sarah* notes, "way back before we moved up here, we used to have rain every afternoon; those do not happen [anymore]." Participants also talked about seasonal changes such as shorter and warmer winters. *Albert* explains that summers are hotter by referring to an A/C machine purchase, "we have seen the summers are hotter, we actually had to buy a room air conditioner (…) [for] the first time (…) in the 12 seasons we have lived here."

Climate change can also positively impact personal significance or ideal meanings. Thus, participants mentioned several *community* climate mitigation and adaptation policies at the county and local levels, such as installing solar panels in the local library or a microgrid in the local fire station. This will also provide power during power outages due to extreme weather events.

While the connection between climate change and personal significance or ideal place meanings is not as strong, participants mentioned a clearer relationship between climate change and more specific environmental threats that affect practical knowledge or challenge-related meanings, such as *water scarcity, wildfire danger*, and beetle epidemics. Participants tended to explain the impacts of climate change by referring to visual reminders related to rain variability and temperature changes. *Albert* explains the mountains would remain with snow all year "when

[3] Here I only include the opinion of those participants who are full-time or part-time residents in the area (N=30).

we first moved up here in 2010 (…). Now it's gone, late June, early July. (…) So that is the most visual reminder of the changes that are occurring." Others also relied on physical landmarks to refer to changes they noticed in snow patterns or lake water temperatures. *Roy* accepts scientific evidence about climate change because he has seen it throughout his life: "I used to be able to go up to the very high mountain lake and to jump into ice water. And now that lake is just not cold, you (…) can swim". *Frank* also explains that he sees climate change firsthand when he goes to the mountains: "The glaciers are getting smaller and smaller. And that is not the nature of the glaciers. Usually, they get bigger, or they stay the same, but now they are just melting away." Other participants mentioned how they notice the climatic changes referring to a specific memory from their childhood. *Julia* claims that as a kid, "we got a lot more snow and not as much wind, and now it seems like it is just (…) stronger winds and not as much snow".

Further, a total of eleven participants drew explicit connections between climate change and *wildfire danger*. For example, *Gerald* links climate change to the pine beetle epidemic, contributing to wildfires. He explains that "our winters are not getting consistently cold enough to kill off the larva or the adult beetles, year after year their numbers grew and proliferated. And so that contributed to the situation." Furthermore, when *Sophia* was talking about the changes she noted around her, she talked about climate change and how "we do not have as much snow or moisture during the winter; we just got a huge storm, and we are really grateful for the moisture [because] it is constantly on edge for fire." She later adds that she feels frustrated over the lack of inaction around her, especially considering the effects of climate change on wildfire.

Finally, twenty-one out of thirty participants reported that climate change has impacted them. Among these impacts are changes in their daily activities facilitating the *work-intensive* lifestyle, such as changing how they dress or stocking more food to prepare for stronger storms,

changing how they farm or feed their animals, wells drying, damages from stronger storms, and an increase in concern.

Climate change's impacts on personal significance meanings are perhaps less obvious as wildfires and water scarcity mediate them. Indeed, only about half of the participants identified climate change as relevant in the area, and less than half drew a connection between climate change and wildfires. At the same time, climate change increases the magnitude of practical knowledge or challenge-related place meanings, such as *wildfire danger* and *water scarcity*, affecting in turn abstract place meanings, such as *calm* and *scenic*.

5. Discussion

Identifying place meanings as related to place attachment is essential because it reveals how communities perceive the impacts of environmental changes in their region. This study contributes to understanding the relatively neglected relationship between place attachment and place meanings (Masterson et al., 2017; Stedman, 2008) in areas affected by the cumulative impacts of wildfire, population dynamics, and climate change. Building on various previous conceptions of place attachment (Bailey et al., 2021; Fresque-Baxter & Armitage, 2012; Devine-Wright, 2009; Low & Altman, 1992; Raymond et al., 2010; Rollero & De Piccoli, 2010; Vorkinn & Riese, 2001), this study distinguishes between the affective and awareness dimensions of place attachment as they relate to place meanings.

The findings show how affection and emotional attachment express personal significance and idyllic place meanings. Thus, participants articulated through affection place meanings associated with ideal conditions such as scenic beauty, health, solitude, privacy, and community. However, study participants also explained how these meanings were modified by disruption. For instance, place disturbances such as wildfires induced solastalgia, negatively affecting

communal place meanings e.g., by contributing to isolation, impacting their mental health, producing loss of community members, or creating intergenerational differences.

Consistent with post-fire research (e.g., Brown, 2023; Butler et al., 2018), the study shows how place disturbances can also positively reshape communal place meanings, e.g., by mobilizing community resources and creating new action channels. However, maintaining ideal place meanings through affection alone, without awareness of challenge-based meanings, can increase the disruptive impacts of place changes; for example, expectations of a scenic and "green" place can hinder proper fire preparedness. This is further complicated by a loss of trust in local institutions (Tinoco, 2023) and the independent identities of remote residents, which may lead them to avoid necessary safety measures, thereby increasing wildfire risks.

In contrast, places' more challenging realities tend to be channeled through place awareness, which includes understanding the work-intensive lifestyle, wildfire dangers, and water scarcity inherent to mountain living. Participants articulated local practical knowledge meanings through place awareness, providing detailed descriptions that tended to be based on material landmarks of the landscape. Indeed, a clear relationship exists between practical knowledge, place meanings expressed through awareness, and every other source of disruption in the area, e.g., changing demographics, wildfire exposure, and climate change. Surprisingly, despite the recent wildfire impacts in the area at the time of the interviews, residents tended to identify persisting demographic changes as the disruption that predominantly impacts place meanings. However, many respondents related demographic change to environmental disruptions, informing their place meanings based on place awareness. For example, demographic change is sometimes seen as a threat to access and water security. Likewise, wildfires often came up when participants described disturbances due to population dynamics.

Place meanings grounded in place awareness were often present when participants described the many material forms of environmental disruption in the area, from "ash everywhere" to dry wells. However, as Masterson et al. (2017) noted, place meanings evolve at different rates over time and can be contested. Like Brown (2022), this study finds that by being reminded of the impacts of wildfire, participants observe and appreciate the beauty of nature's regrowth. Short-term disruptions may weaken scenic place meanings, but longer-term modifications to the landscape—observed through awareness—can reinforce practical knowledge and, in turn, intensify place affection.

Further, the findings contribute to previous research that notes how place attachment is heightened by witnessing landscape and property damage (Burley et al., 2007; Greer et al., 2020) and, in turn, motivate adaptation to environmental threats. Our findings suggest that both the awareness and affection dimension of place attachment can be enhanced as residents observe how practical knowledge place meanings are disrupted. In this way, when residents observe cues related to challenge-based meanings (e.g., ashes, burned trees, danger in the roads, dry wells), their awareness of environmental threats is amplified. Simultaneously, when these same disturbances put in danger place meanings channeled through affection (such as healthy, scenic, calm), residents “weaken” challenge-based place meanings, e.g., accepting and working on fire mitigation, preparing for stronger storms. This supports the idea that modifying place meanings can help communities adapt to future challenges (Folke et al., 2005; Masterson et al., 2017; Stedman & Ingalls, 2014; Tidball, 2012).

These findings also highlight practical strategies for addressing climatic and environmental changes. Firstly, disturbances can serve as catalysts for new collaborations and forms of collective action, enhancing what Manzo et al. (2021) describe as "agentic capacities."

For example, Murphy (et al. 2019) study of urban lakes in Bangalore (India) show how collective memories and ecological knowledge of a landscape can help encourage a shared vision for the long-term restoration of a place. Additionally, in the context of New York City – a major urban center affected by and vulnerable to climate disaster, Hölscher et al. (2019) have shown the transformative potential of climate governance capacities. Among other things, these involve co-production networks in decision-making processes, flexible regulations, and/or strengthening social networks. In Larimer County, rural communities can set up and utilize co-production local networks to educate part-time residents and newcomers about collective memory, knowledge and local norms. This education is crucial not only for conserving resources but also for mitigating risks such as wildfires.

Secondly, effective responses to climate change and other environmental threats require acknowledging their connection to changing local realities. In contrast with other research that documents a lack of climate change acknowledgement in some post-disaster communities (e.g. Koslov 2019), participants in this study broadly expressed concern about human-caused climatic change, even if two-thirds of them did not specifically suggest a connection between wildfires and climate change. Further, some participants used local spatial and temporal references to discuss climate change, indicating an insightful understanding of global issues within their local contexts. In this way, the relationship between climate change and personal significance place meanings is complex and often mediated through local challenges, such as water scarcity and wildfire danger. Thus, these findings align with previous research (e.g., Folke et al., 2005; Gislason et al., 2021; Scannell & Gifford, 2013; Stedman & Ingalls, 2014; Tidball, 2012), advocating for the importance of localizing environmental disturbances. Emphasizing the

connection between such disturbances, including climate change, and local place meanings can significantly engage communities in meaningful action.

Nevertheless, the current study has several limitations. For example, the findings are primarily based on information from a small sample of semi-structured interviews. Other forms of engagement with the study site, such as field observations and focus groups, would help contrast and corroborate the findings. Further, these interviews were conducted in 2021, thus, participants may have developed new insights relating to the most recent fires in Larimer County. Additionally, while the study includes interviews with different stakeholders, there some perspectives that are missing – notably representatives from the Forest Service.

Despite these limitations, the findings generate new questions for future research. Following Wallis et al. (2022), who assert the importance of different scales of attachment in the context of disaster preparedness, the relationship of place attachment and affection with place meanings at different scales – i.e., home and neighborhood – deserves investigation. Further, the study demonstrates that most place meanings channeled through awareness are related to challenges (such as water scarcity or wildfire danger), as these are derived from a question that asked participants about challenges in the area. Questions remain about how different degrees of place affection and place awareness relate to each other and how they are affected by disruptions' long-term and short-term impacts. Further research could explore additional types of practical knowledge meanings by asking questions related to local physical landmarks and orientations affected by environmental anomie (Brown 2024). These "orientation-based" place meanings could be impacted differently by drastic events like wildfires and long-term disruptions such as climate change.

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Table 1. Demographic description of research participants.

Name	Town within Larimer County, CO	Years living in Larimer County	Permanent/ Part-time	Age	Gender
Ruth	Crystal Lakes	1	Permanent	64	Female
Judy	Crystal lakes	6	Permanent	63	Female
Julia	Glacier View	30	Permanent	53	Female
Diana	Glacier View	4	Permanent	33	Female
Bruce	Glacier View	11	Permanent	69	Male
Heather	Glacier View	5	Permanent	37	Female
Albert	Glacier View	8	Permanent	67	Male
Bryan	Glacier View	4	Permanent	76	Male
Alice	Glacier View	25	Permanent	79	Female
Danielle	Livermore	3	Permanent	47	Female
Louis	NA	NA	Political Leader	NA	Male
Alexis	NA	13	Local organization	37	Female
Logan	NA	7	Local organization	36	Male
Sean	NA	12	Local organization	48	Male
Gerald	Pingree Park	22	Part-time	50	Male
Frank	Poudre Park	22	Permanent	71	Male
Barbara	Red Feather Lakes	18	Permanent	67	Female
James	Red Feather Lakes	21	Part-time	78	Male
Thomas	Red Feather Lakes	10	Part-time	67	Male
Sandra	Red Feather Lakes	33	Permanent	62	Female
Pamela	Red Feather Lakes	25	Permanent	71	Female
Sophia	Red Feather Lakes	10	Permanent	49	Female
Martha	Red Feather Lakes	30	Permanent	78	Female
Rose	Red Feather Lakes	27	Part-time	64	Female
Roy	Red Feather Lakes	6	Permanent	74	Male
Alan	Red Feather Lakes	6	Permanent	42	Male
Ethan	Red Feather Lakes	11	Permanent	72	Male
Mary	Rustic	13	Permanent	83	Female
Sarah	Rustic	21	Permanent	84	Female

Marissa	Rustic	19	Permanent	62	Female
Elizabeth	Rustic	8	Permanent	50	Female
Richard	Rustic	16	Permanent	72	Male
Joe	Rustic	4	Permanent	73	Male
Victoria	Rustic	13	Part-time	80	Female

Table 2. Conceptualization of qualitative codes for place meaning and frequencies

Place meaning	Concepts	Description	Value	Place attachment dimension	Frequency / Place description	Frequency / Challenge	Total
Scenic	Beautiful, gorgeous, magical, paradise, natural ambiance, pretty	Personal significance	Ideal	Affection	23	0	23
Calm	Peaceful, quiet, serene	Personal significance	Ideal	Affection	14	0	15
Healthy	Outdoor recreation activities, wellbeing, fresh air	Personal significance	Ideal	Affection	12	0	12
Community	Friends, good neighbors, close-knit, nice community	Personal significance	Ideal	Affection	10	0	10
Solitude / Private	Remote, rustic, isolated, desert	Personal significance	Ideal	Affection	8	0	8
Wildfire danger	Fear and worry, connection to floods, burned trees and closed trails, campfire control.	Practical knowledge	Challenge	Awareness	5	10	15
Access challenges	Remote, hard access to goods and services, complex communication, dangerous and scare roads, expensive	Practical knowledge	Challenge	Awareness	2	16	18
Water scarcity	Water shortage, lack of sewer infrastructure, well and septic systems challenges, complex water rights	Practical knowledge	Challenge	Awareness	1	10	11
Work-Intensive	Hard, preparation for fires and winter, patience, compromise,	Practical knowledge	Challenge	Awareness	3	12	14

	duty, property maintenance

Table 3. Examples of impacts of demographic changes, wildfire danger and related landscape change, and climatic and weather change by place meaning codes.

Meanings	Demographic changes		Wildfire danger & related landscape change		Climatic & weather change	
Scenic	+		+	Landscape contrast, increased respect for nature	+	
	-	Disturbance, unstaible resource use	-	Landscape and building damages, floods, trail closures, smoke	-	Less snow and water
Calm	+		+		+	
	-	Disturbance due to increase in visitors	-	Landscape and building damages, floods, wildfire threat	-	
Healthy	+		+		+	
	-		-	Mental health impacts, smoke sposure, water pollution	-	
Community	+	Opportunities for development	+	Mobilization of community resources	+	Local renewal energy program
	-	Unrealistic expect., intergen. differences, social cohesion threats	-	Evacuations, loss of residents, mental health impacts	-	
Solitude / Private	+		+	Evacuation orders, reduced visitor influx	+	
	-	Disturbance due to increase in visitors	-		-	
Wildfire	+		+	Fire mitigation interest, fire danger acceptance, learned leassons	+	
	-	Unsustainable resource use, inadequate fire mitigation	-	Competing priorities	-	Wilfire intensity and frequency
Access	+	Opportunities for development	+		+	
	-	Road challenges, waterand resource constraints	-	Economic loss, unequal resources for recovery	-	Stronger storms, wells drying
Water	+		+		+	
	-	Threats to water systems	-	Water quality damages	-	Wells drying, droughts, stronger storms
Work Intensive	+		+	Fire management and fire mitigation	+	Preparing for stronger storms, dry wells
	-	Unrealistic expect., resource pressure, fire manag. negligence	-		-	

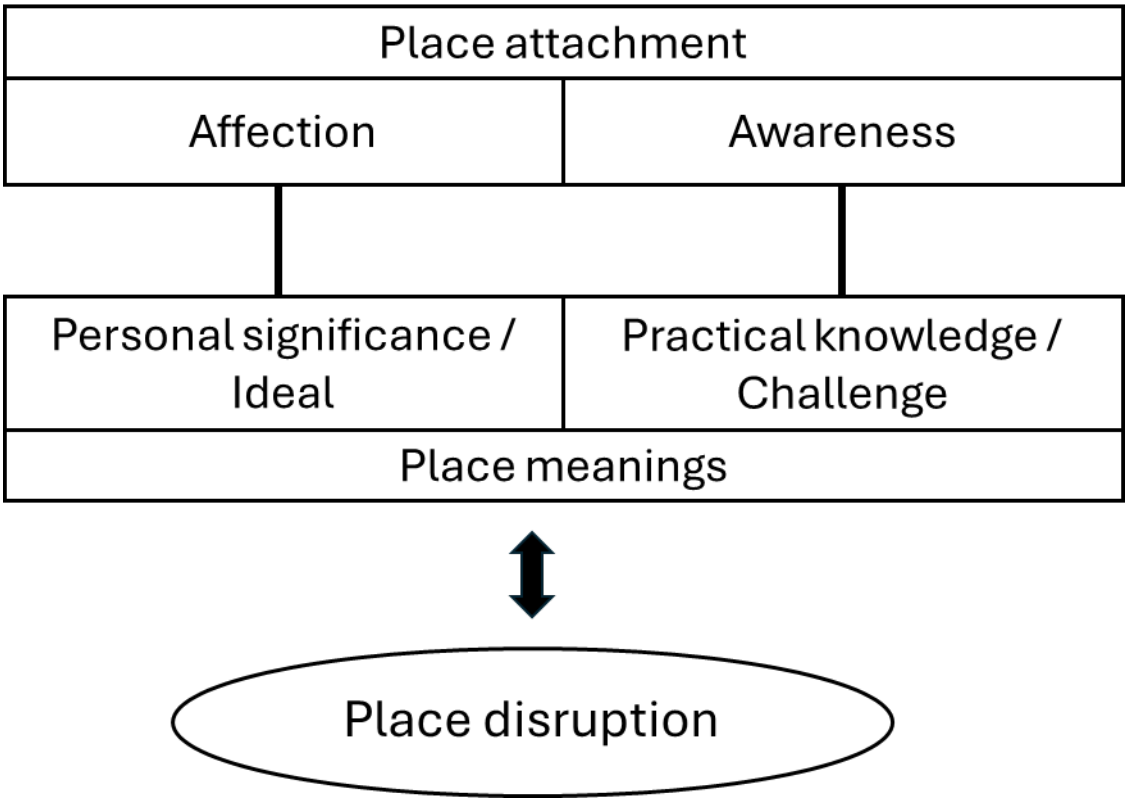

Figure 1. Framework for Place Attachment: Integrating Affection, Awareness, Place Meanings, and Place Change Dynamic

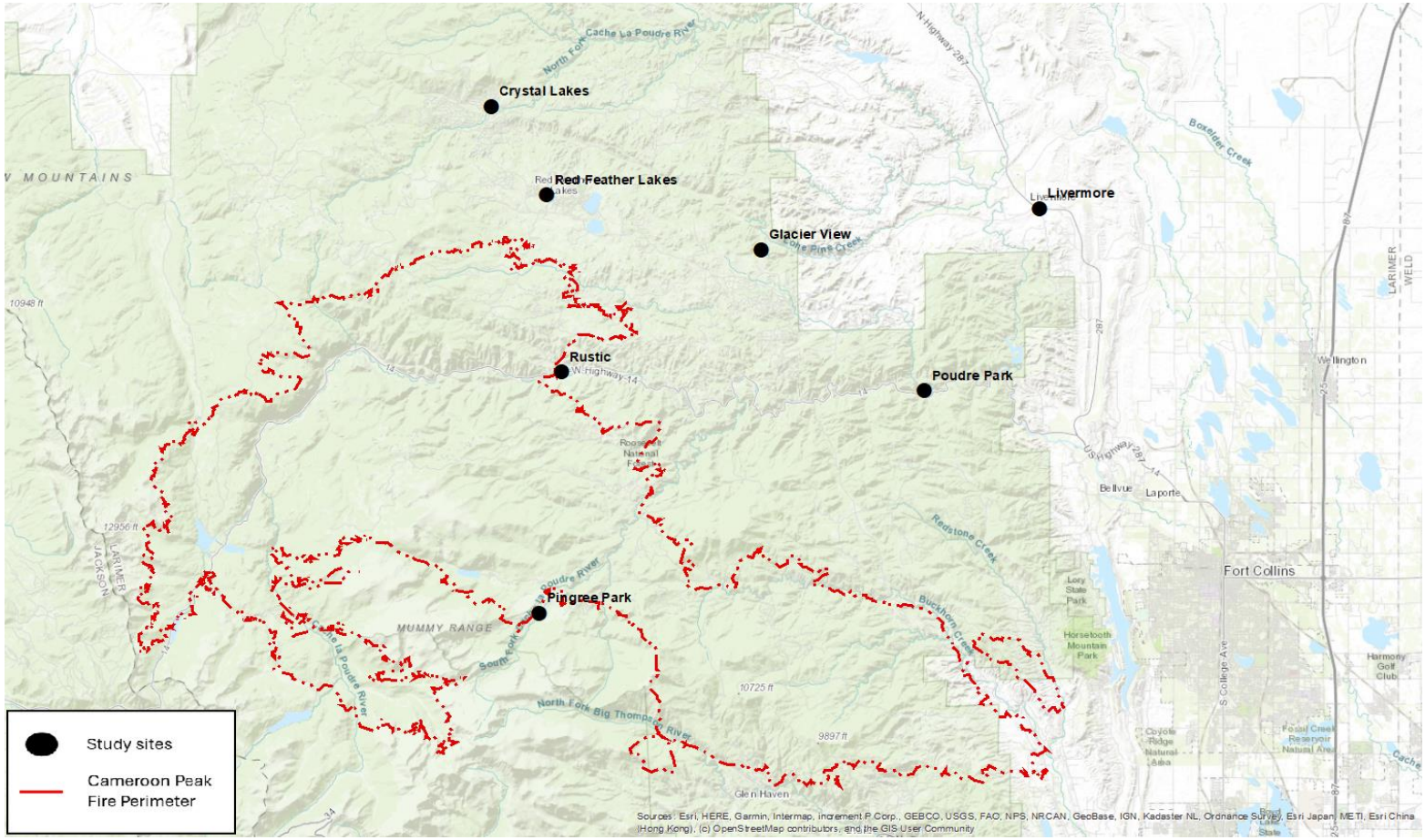

Figure 2. Study sites map[4]

[4] This map was created with ArcGIS, version Pro 3.1, using a layer that delineates the Cameron Peak Fire Perimeter (ESRI, 2022)