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ORIGINAL ARTICLE

"This community will grow" — little concern for future wildfires in a dry and increasingly hotter Swedish rural community

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Abstract

Increased risk of wildfires is often highlighted in media coverage of climate change in the Nordic countries. How an increased risk is reflected in the concerns and adaptive measures within the most likely affected communities is nevertheless not known. This study investigates concerns and adaptation to wildfires in a rural community in south-eastern Sweden. The comparatively dry study area has a history of frequent but often low-consequence wildfires and is projected to experience Sweden's largest increase in severe fire weather towards 2100. Through narratives, this study elucidates potential wildfire concerns in this area and motivations behind adaptation measures. The narratives are compared to a physical causal network extracted from the literature on fires and their consequences in the region. Residents foresee an increased wildfire risk but do not consider it a threat to the future well-being of the community. Forest owners and homeowners express low commitment in preventive or adaptive measures. Instead, contrasting the reality of the twentieth century, the fire service is currently considered to be responsible for both preventing and suppressing fires. This attitude is attributed to the lack of severe implications from the generally well-managed fires in the region. Actions for prevention and adaptation seem triggered by media attention or experience from real high-consequence events occurring elsewhere, rather than local wildfire occurrence or climate change projections.

Keywords Wildfire · Storyline · Narratives · Climate adaptation · Sweden

Introduction

There are numerous reports on how climate change will affect the magnitude, frequency, and impact of natural hazards (e.g. Pörtner et al. 2022). The wildfire hazard is often exemplified by the increasing impact in Southern Europe (Dupuy et al. 2020) or the boreal forests (Hanes et al. 2019). However, not all regions are expected to exhibit the same change in wildfire exposure; in the Nordic region, projections vary spatially from no increase in parts of the north to increased occurrence of droughts and higher weather-driven fire danger in the already dry regions of the south-east (Yang et al. 2015). Nevertheless, the Nordic countries are often described as a region facing a massively growing hazard and a whole new fire regime (Björklund 2019; Brohult 2019; EAA 2021).

While most wildfires in the Nordic region occur close to densely populated areas, the largest, most intense, and impactful fires occur in rural areas. Rural regions usually suffer from fiscal constraints for prevention and suppression (Malmberg 2010) and difficulties in detecting and responding to wildfires (Sjöström and Granström 2023). Consequences of Nordic wildfires include (1) economic burdens for landowners and municipalities responsible to protect resources at risk (Björnheden and Johannesson 2019), (2) damages to buildings and property (DSB 2014; Vermina Plathner et al. 2023), and (3) occasional threats to the health and lives of individuals. But little is known about less quantifiable consequences such as increased concerns for future safety or changes in the social relationships within communities.

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Studies of human and social consequences of wildfires often focus on devastating events (e.g. Vallianou et al. 2020) and have short perspective of recovery (e.g. Edgeley and Paveglio 2017). This study contributes by targeting a spatially scattered and small community in the forested south-east of Sweden. The area has a history of many, but often spatially limited, wildfires of low consequences and is expected to become drier due to climate change (Sjöström and Granström 2024). The aim of this study was to understand how this community copes with and adapts to wildfires and concerns thereof given its collective experiences, and the expected regional climate change emerging from contemporary media. The following questions were investigated:

1. What are the regional causal factors for wildfires and their consequences, based on previous research?
2. What is the probable community development, given the local forecasted climate change towards 2100?
3. How do the community's experiences and memories of wildfires shape local concerns?
4. How does expected climate change add to the perceived hazard and the inclination towards adaptive measures?

The purpose of these questions was to elucidate the local wildfire concerns in the community and enhance understanding of what motivates concerns and what the drivers for adaptive measures are. Concerns and adaptation described from within the community are thereafter compared to causal factors and the probable future fire regime from the scientific literature. A community's own understanding of hazards, risks, and adaptation will most likely be pivotal for increasing public incentives for implementing adaptation measures. The study is therefore important for guidance to authorities as much of the adaptation measures must be implemented by local actors and residents in high-risk areas, even those without previous experience of high-consequence events (Cohen 2000).

Coping and adapting to wildfires

Today, approaches where the authorities are solely responsible for climate adaptation are described as ineffective and inadequate (Thaler and Seebauer 2019). Instead, public involvement (Paveglio et al. 2019) and a shared responsibility between communities and authorities (Reid et al. 2020) are seen as vital to improve local resilience (Dickson-Hoyle et al. 2020; Reid et al. 2018).

However, local resilience improvements after a crisis depend on how the event is retrospectively interpreted. The narratives of past events determine how future risks are perceived (Bateson 2007) and thus also how to practice (or not practice) adaptation (Paschen and Ison 2014). The post-event narrative also influences collaboration between stakeholders. Post-crisis work is known to influence the level of trust among different stakeholders, but the literature reveals both strengthened and deteriorated post-crisis trust (e.g. Carroll et al. 2006; 2011; Lidskog 2018; Silver and Grek-Martin 2015). Conflicts may arise from e.g. bureaucratic procedures acting as additional intrusion into already difficult times (Carroll et al. 2006).

The work in this paper is based on the assumptions that local concerns about wildfire hazards will be shaped by narratives of both the community's collective experience of past events and the anticipated future hazards (Reid et al. 2020; Lidskog 2018). The narratives, extracted from letting people tell their histories, are assumed to represent the local concerns, expectations, and actions (Lidskog 2018; Paschen and Ison 2014). Two community attributes were assessed: the level of concern, given the high wildfire occurrence in the area; and whether the narratives explained how the local community regards responsibilities and commitment for adaptation. Additionally, the narratives were compared to the physical causal factors for wildfires in the region based on wildfire research, without disclosing the network of factors to the respondents, to determine whether the concerns and attitudes towards adaptation derived from the narratives are in line with the scientific literature.

Method

This study combined two methods. First, a narrative approach (e.g. Paschen and Ison 2014; Russ et al. 2015) that describes the perception of the hazard; and second, a subsequent link to the physical causal factors for wildfire risk in the region presented as a storyline (Sheperd et al. 2018).

Study area

The area comprises Högsby, Mönsterås, and Oskarshamn municipalities in Sweden. The population is concentrated in each municipality's main urban area but slightly less than 50% of the inhabitants reside in rural areas, which constitutes the actual study area (Fig. 1a). While the urban population during the last 50 years varied, the rural population exhibited a slow, steady decline of −15% between 1968 and 2020, during which time the Swedish population grew by 31% (SCB 2022). Forestry, agriculture, and mechanical industries have dominated the economy. The area is 80% forested, with the bulk being developed production forests (SCB 2022). Individual farms, clusters of properties, and small villages intermix with the forest and are thus vulnerable to wildfires (Fig. 1b).

The Finsjö community recently experienced a large wildfire when 100 hectares (ha) of forest burned in late June

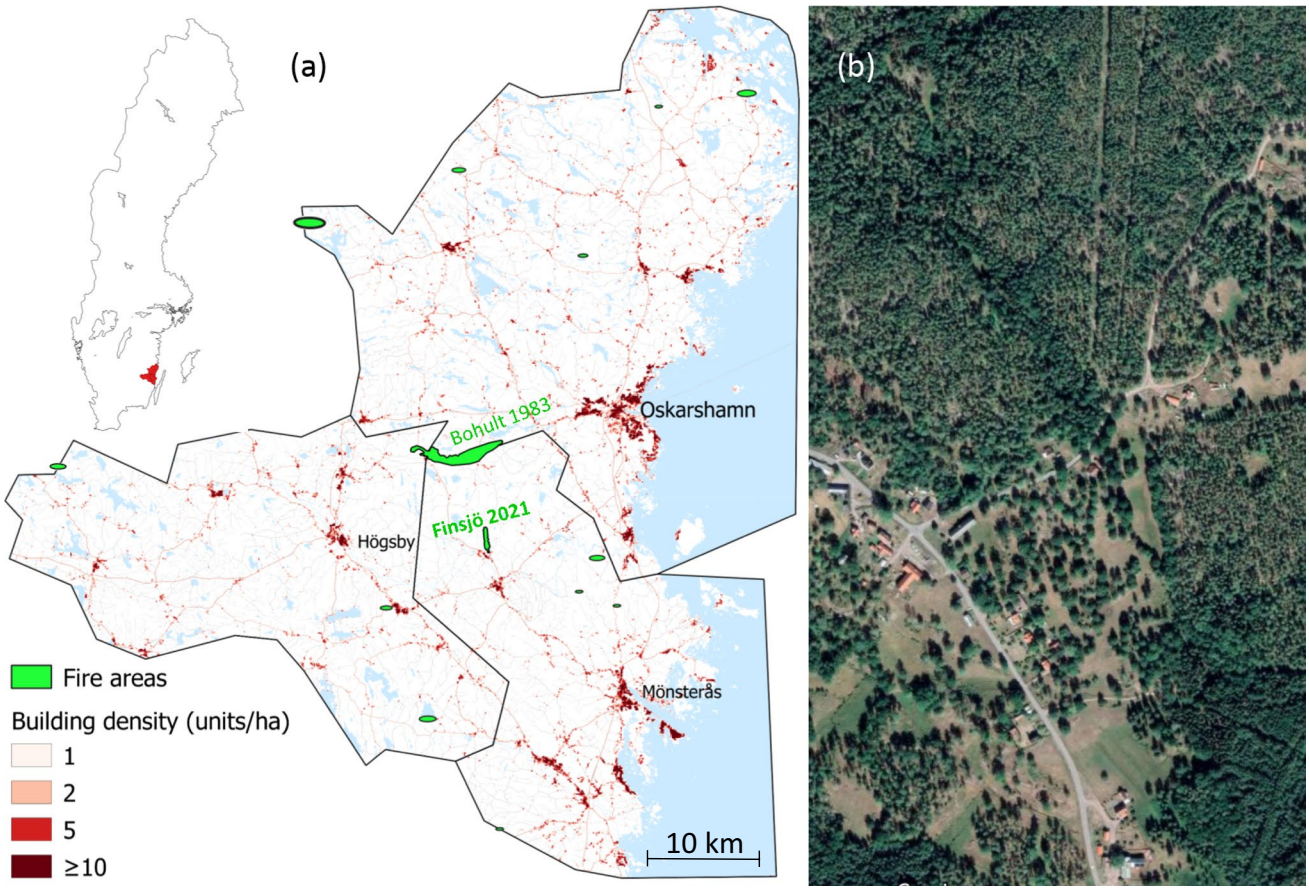

Fig. 1 **a** Map of the study area with building density and forest fires (since 1996) that were ≥10 ha. Included is the 1983 Bohult fire for reference. Only the Finsjö and Bohult fires are indicated by actual fire perimeters, the rest are ellipses scaled to match the final burnt area. **b** Example aerial photo of the rural area (Google Maps)

2021. It was 2021's largest fire in Sweden and drew nationwide suppression resources and media attention. It would have threatened several homes had there been small differences in wind direction. Aerial resources deployed to the incident was the highest ever for any fire below 1000 ha, and they contributed to the successful extinguishment of the fire despite a continuously difficult weather situation. The area was also the scene for the 1983 Bohult fire, burning 670 ha of forest and several homes.

A storyline for physical causal factors of the wildfire hazard

Current and future wildfire hazards to people and property are commonly described by predictive wildfire models, taking fuel, topography, and assumed weather conditions into account (Andrews 1986). Quantifying such uncertain data has been criticized for hindering broad communication and use (Arias et al. 2021) and for falsely representing objectivity (Shepherd 2019).

In this study, instead of using a quantitative method, the local physical causal factors of wildfires derived from the literature were mapped and presented as a storyline, aiming to unfold the factors leading to and from a historical event or a plausible future event. Past local wildfires and physical causal factors, from a historical perspective, were identified using the scientific literature. The factors, related to current trends in climate, preventive actions, and consequences, were linked in a causal network of the hazard (Shepherd 2019). This presentation aids comparisons to the narratives from the interviews and overcomes obstacles of balancing the very large uncertainties associated with climate change research and the difficulties of visualizing an uncertain future (Shepherd et al. 2018).

The current and recent historical fire regimes were characterized using the national incident database (MSB 2022) assessing fire season data (1996–2022) with respect to the number, area, cause, and consequences of fires (Sjöström and Granström, 2023). Prior incidents during the modern age, the past 100 years, and a multi-century perspective have been mapped by local studies of past events (Granström and

Ehnström 1990), land use (Aronsson 1980), and dendrochronology (Niklasson 2011), respectively. Regional vegetation and land use were studied by explorative fieldwork.

The weather characteristics of the past 70 years (from the start of data collection) were studied by noon-daily weather parameters (temperature, relative humidity, windspeed, and cumulated precipitation) from a weather station (SMHI 2022) just outside the study area (Västervik). Based on this data, an annual wildfire Seasonal Severity Rating (SSR) was calculated from May to August, estimating the region's weather-related seasonal severity. The term "severity" relates to the difficulty of suppressing a potential wildfire during present weather conditions (Van Wagner 1970; 1987).

The expected future climate was obtained from projections for regional maximum daily temperature and daily precipitation (SMHI 2021) based on RCP2.6, 4.6 and 8.5, the most commonly used pathways defined by the Intergovernmental Panel on Climate Change (IPCC, Van Vuuren et al. 2011).

Local wildfire concerns and adaptation analyzed through narratives

Interviews were performed with forest owners ($n = 7$), volunteers from the 2021 Finsjö wildfire ($n = 7$), residents ($n = 12$), and civil servants (mainly from the fire service) ($n = 14$). Several interviewees belonged to more than one of the above groups. A total of 26 respondents were interviewed, including a homemade tape recording from 1977 of a student interviewing her grandparents. Of the informants, 6 were women and 20 were men; the uneven distribution related to the fact that most forest owners and fire service personnel were men. The informants were between 30 and 80 years old, the majority of working age.

The interviewees were identified by video calls with people living close to the 2021 fire and found in either the phone book or from local media coverage. A snowballing technique (Berg 2001) was used to identify more interviewees, i.e. the interviewees were asked to suggest another person to interview. The interviews were conducted in Swedish mainly as video calls but also as three driving interviews (c.f. walking interviews; Evans and Jones 2011) on forestry roads through the landscape. The driving interviews were performed with two forest owners that had lost forest in the fires of 1983 and 2021, respectively, as well as with a firefighter.

All interviews were semi-structured with open-ended questions, recorded, and transcribed. They followed an interview guide relating to three themes: (1) their experience of the response to wildfires (if any), (2) their place of residence and the surrounding landscape, and (3) the community's future related to climate change. The same themes were used during all the interviews, but there was a different emphasis on the themes depending on the interviewee. The driving interviews with the two forest owners had a focus on the wildfire effects on the landscape. The interviews with the fire service personnel mostly focused on response to wildfires, but some of them also lived in the community and/or were forest owners. The 1977 interview did not follow the same guide but focused on memories of a large and intense fire in 1917 and the subsequent recovery of the landscape. The quotations are translated by the authors and respondents are identified with numbers in square brackets, e.g. [2].

Riessman's (2008) thematic narrative analysis approach was applied to the interviews, where recurrent themes across interviews were identified. The term "community" is used in this paper in two ways: as representing the people in the study area (e.g. Norris et al. 2008), and as a subset of people from which a shared narrative emerged (e.g. Twigg 2009; Andresen 2017).

Analysis and result

A network of physical causal factors of the wildfire hazard is presented in which the factors resulting in fires and consequences thereof are assessed without balancing their uncertainties against each other. This is followed by an analysis resulting in three distinct narratives on hazard and climate adaptation from the interviews.

Wildfire policies and stakeholder responsibilities

Anthropogenic fire use is regulated by the municipalities or counties (Kalmar, for this study area) (SFS 2003:789, 7§), by invoking a fire ban during high-risk conditions. Thus, the specific policies vary across Sweden.

The municipalities are responsible for wildfire suppression (apart from e.g. aerial resources); however, when the immediate danger is controlled, post-fire surveillance and extinction of smouldering material (mop-up) is a responsibility of the landowners (SFS 2003:789, 1–6§). During the last 5 years, considerably more nationally funded support of aerial and mobile land resources are available without affecting municipal budgets.

A wildfire preparedness programme for homeowners and landowners at the wildland-urban interface (WUI), such as the Canadian FireSmart programme, has not been implemented in Sweden, nor has any programme for fuel management. There is thus no legal requirement related to wildfire hazards for any property owner. All landowners are expected to keep up-to-date forestry plans to ensure production values are met without interfering with ecological values (Swedish forest agency 2023), but these plans do not incorporate action plans or risk assessments regarding wildfires.

Components of the wildfire hazard in the study area

Wildfires are ubiquitous in the study area; several small fires of a few hectares or less burn every year. In the last two decades large fires have burnt in 2021 (100 ha), 2018 (50 ha), 2016 (50 ha), 2006 (75 ha), and 2002 (60 ha). In 1983, after 6 weeks of drought, sparks from a railroad ignited a fire in Bohult, burning 670 ha of forest and destroying several houses (Granström and Ehnström 1990). Dendrochronological studies show that there were large (>500 ha) fires with return periods of 20–50 years for several centuries before the onset of industrial forestry in the early nineteenth century (Niklasson 2011). The region is among the driest in the Nordic countries and is also one of those expected to be most affected by increased fire danger according to the projected climate scenarios until 2100 (Yang et al. 2015).

Causal factors of the wildfire hazard in the study region follow much of those known for Sweden as a whole (Sjöström and Granström 2023) but the most important ones for this region are highlighted in Figure 2. The *wildfire occurrence* depends mainly on three primary factors: (1) *Fire danger* describes how fast and intense a model fuel type will burn based on past and current weather (Stocks et al. 1989); (2) the *fuel conditions* in terms of species, flammability, and lateral and horizontal distribution and connectivity (Granström and Ehnström 1990; Vermina Plathner et al. 2022); and (3) the frequency of *ignitions*. After a wildfire, there are two primary consequences: (i) an *area* is scorched with possible loss of land values and (ii) *damage* to people and/or their assets, such as homes. Additionally, there are two primary prevention factors regulating these consequences: (a) *suppression* efforts to control further fire spread and (b) *management* of the WUI (Fig. 2).

Fire danger and future climate

Higher temperatures, prolonged drought periods, and lower air humidity will all contribute to drier live and dead fuels. Lower moisture content will increase both spread rate and fire intensity, as will a higher wind speed during the incident itself (Van Wagner 1987). The study region is known for high summer temperatures and suffers from longer droughts, being shadowed from precipitation by the bulk of southern Sweden's landmass.

In addition, IPCC Representative Concentration Pathways (RCP) (IPCC 2019) point towards a warmer climate in the area. Depending on the climate scenario, an increase of 1.5–4 °C for the summer's hottest daily average, $\overline{T}_{max}$, is expected by the end of this century (compared to 1961–1990). Likewise, an increase in summer precipitation is estimated at 0–10% and an increase in the vegetation period by 20–90 days (Fig. 3, top and middle).

The historical severity of each season (SSR) constitutes better indicators of annual fire danger compared to mean temperatures and precipitation. The SSR varies significantly, but several points emerge from the trend between 1951 and 2020 (Fig. 3, bottom). Two-thirds of the seasons have relatively low weather severity (<1.2) and in these years the number of forest fires is moderately low (on average ≤5). A few years have a high weather severity, notably 1955, 1959, 1983, 1989, 1992, 1994, 2018, and 2022. All of these are on par with 2018, generally considered to be an exceptionally hot and dry year. Also, for the last 27 years (excluding 2018 and 2022), most seasons are characterized by poor fire weather, driven by larger than normal summer precipitation, clearly exceeding those projected towards the end of the century (Fig. 3, bottom). From the marginal projected change in precipitation and markedly increased temperatures, a steadily increased severity is therefore expected for the future.

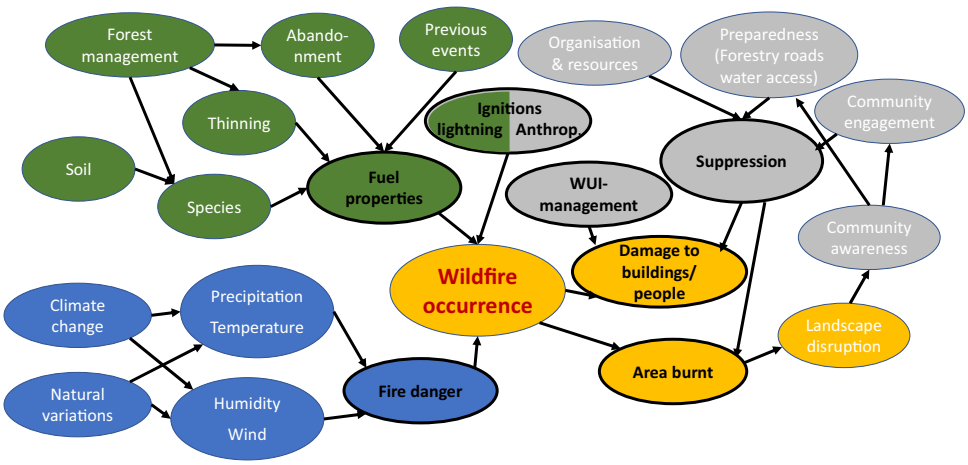

Fig. 2 Causal network of the wildfire hazard in the study area. Bold/black circumferences indicate entities that are the primary causal factors to wildfire risk (blue and green), the primary consequences of a wildfire (yellow), and the primary preventing factors to these consequences (grey). Based on Shepherd 2019

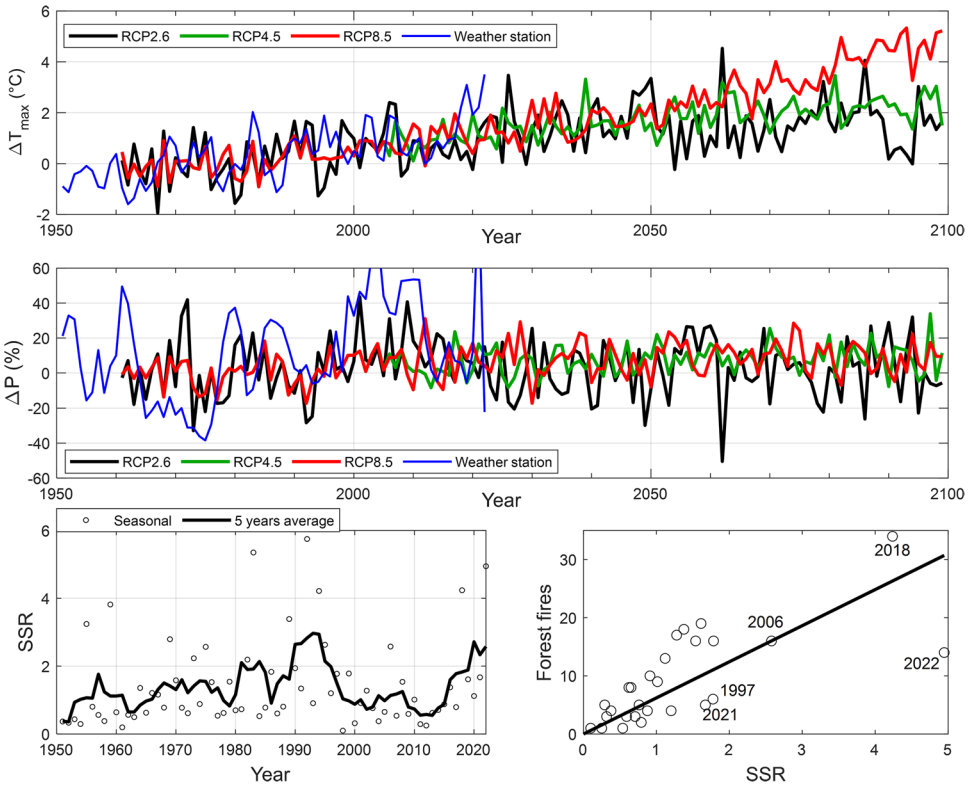

Fig. 3 (Top) Projected ΔT_{max} (change in the highest daily averaged temperature compared to the 1961–1990 period) in the region for three climate scenarios. Also included is ΔT_{max} registered by the Västervik weather station. (Middle) Projected ΔP (regional change in summer precipitation) for three climate scenarios. Also included is the change in summer precipitation registered by the weather station. (Bottom left) SSR (Seasonal Severity Rating) concerning forest fire weather calculated from the Västervik weather station, 1951–2022 (see Sjöström and Granström 2024. (Bottom right) Number of forest fires against SSR for each season between 1996 and 2022 ($r^2 = 0.45$)

Fuel conditions

The region belongs to the hemiboreal vegetation zone that includes most of southern Sweden, the Baltic states, Russia's southern taiga, and southern Canada (Ahti et al. 1968). Conifers with *Erica* and *Vaccinium* shrubs dominate the landscape, but an understory of smaller deciduous trees (mostly birch (*B. pendula*) or oak (*Q. robur*)) is also common. The lean soil favors Scots pine (*P. sylvestris*) over Norway spruce (*P. abies*), which in turn increases the coverage of lichen and deep feather mosses, all features leading to more fire-prone vegetation (Vermina Plathner et al. 2022).

The regional forests are owned in patches by large enterprises and small private forest owners, all focused on commercial forestry. Species distributions are therefore heavily influenced by forest management. The climate allows for a substantial portion of deciduous species; even small portions of birch or aspen in a coniferous forest will reduce the fuel's propensity for burning with rapid spread and high intensity (Vermina Plathner et al. 2022). With more flexible modern machinery, aggressive precommercial thinning of deciduous species has become the standard routine and this practice increases the fuel contribution to wildfire risk.

As fewer people tend to engage in small-scale agriculture or grazing livestock activities, the utilization of open land patches around communities is more prone to carry high fuel loads of the past season's dead grass litter, often labelled "abandoned agricultural land". This is a highly flammable fuel, causing low-intensity but rapidly spreading fires during springtime, and is responsible for about half the fire service dispatches.

Whereas grassland fires can occur in the same spot annually, a hemiboreal forest fire protects the land from fire for several years, until the fuel has accumulated again (Schimmel and Granström 1997). The 1977 tape recording that describes a large and intense fire in 1917 bears witness to how the land was barren even 20+ years after the incident, and regrowth really commenced in 1940. Thus, burnt areas can act as transient fire breaks for future fires. However, modern land use practices favor seedling establishment which probably reduces the fuel deficiency protection period.

Implications of fires

The Nordic forests have been shaped by centuries of natural wildfire disturbance in vegetation succession. Ecologically, wildfires create natural habitats and increase biodiversity when salvage logging is kept low. From a human perspective, the threat to lives and property has been substantial, and laws from the eighteenth century laid the responsibility on neighbors to swiftly aid at a wildfire event. Although the threat is significantly less today than 100 years ago and such laws no longer apply, wildfire-related injuries, fatalities, and building ignitions still occur annually in Sweden. Despite the attention given to the large wildfires in 2014 and 2018 that destroyed 40 and 27 buildings, respectively,

most buildings are damaged by small wildfires (Sjöström and Vermina Plathner 2023). No injuries and only a few ignited outbuildings occurred within the study area due to wildfires during the last 27 years. The last two confirmed losses of dwellings are from the 1983 Bohult fire.

Conversely, for landowners, especially small private forest owners, wildfires can be disastrous. Without proper insurance, the salvage logging can only partially account for the anticipated pre-fire timber value. The landowner is also responsible for the mop-up and surveillance after an incident, which can be costly for large areas or during severe droughts.

Spatially large incidents are often associated with traumatic experiences (Knez et al. 2021; Vallianou et al. 2020). However, during four decades, no fire in the study area has been large enough for the whole surrounding landscape (often regarded as "natural") to drastically change, contrasting the 2014 Västmanland fire, with kilometres of only scorched land.

Anthropogenic ignitions and prevention activities

On par with most of Sweden, no trend in fire occurrence in the study area is noticeable during 27 years (Sjöström and Granström 2023). In a long-term perspective, both numbers and causes of ignitions vary. Agricultural burning was a frequent ignition cause even into the nineteenth century (Aronsson 1980), succeeded by railroad sparks during the early twentieth century (Granström and Ehnström 1990). Nowadays, trains account for only 0.2% of ignitions. The local forests are typically ignited through lightning (29%), campfires (18%), and arson (14%), while grasslands are ignited by residential burning of grass (15%) or other debris (12%) as well as arson (14%).

Building damage from wildfires is significantly reduced by managed lawns, deciduous trees around gardens, and low amounts of combustible material adjacent to (typically wooden) façades (Vermina Plathner et al. 2023). However, Vermina Plathner et al. (2023) show that most homeowners in recent large wildfires did not take preventative actions on their properties. Instead, decisions of maintenance are based on enhancing natural light in the garden and safeguarding façades from moisture damage, which fortuitously also decreases wildfire risk.

Centuries ago, suppression was built upon mass mobilization of residents, and later organized by modern forestry organizations. Fires are now dealt with by municipal fire services that are legally required to respond to wildfires at no cost to landowners. Wildfire knowledge, developed through local experience rather than national practices (Granström et al. 2023), varies significantly between organizations. Within the study area, several respondents recalled how the local community helped with the suppression of the 1983 Bohult fire. However, during the 2021 Finsjö fire, only a few private landowners supported the suppression work *per se* (although many volunteers provided logistics and food aid).

As a result of several recent high-profile fires (although not in the study area) that have overwhelmed suppression capacities, national actions of prevention and suppression have accentuated. These include preventive measures within the forestry industry, a state- and EU-funded programme for helicopter and fixed-wing suppression support, and updates in the Civil Protection Act (SFS 2003:778) that effectively demand cooperation between fire services at the level of command and control.

From the fire season data represented by the number of forest fires (Fig. 3), both 2021 and 2022 had very low forest fire outcomes compared to the high fire weather severity. These are both years where regional coordination and resource availability were high. Thus, variations in anthropogenic factors seem to compensate for the effect of severe fire weather.

Community narratives and their relation to climate change adaptation

The respondents shared an overarching narrative of responsibility within an increasingly fire-prone landscape. However, the perceived impacts of previous fires, and respondent's inclination towards adaptation varied, leading to three distinct narratives; "This community will grow", "They discuss broadleaves along roads and such", and "Fires will always be there".

"This community will grow": wildfire as part of the place but not a cause for concern

Elderly respondents recall several wildfires since the 1950s, typically divided between one major and clearly defined event with high community impact and several smaller inseparable events. Many respondents can also give first-hand witness statements of the 1983 fire, which during the first night had 500 men working with extinguishment (Granström and Ehnström 1990).

> There was a fire many, many years ago.[…] we had to work for weeks […] I had that in the back of my mind already when the wildfire [2021] broke out [6]

The somewhat younger respondent's memories from the 1983 fire include childhood recollections of fathers or uncles who were away fighting the fire and leaving their families at home. "Dad was out [fighting the wildfire] at night and worked during the day..." [7].

Most respondents described previous incidents in a factual manner. There was little fear revealed during the interviews and it became clear that fire is something that most

residents see as a part of where they live, c.f. Australian communities learning to live with wildfire threats (Dickson-Hoyle et al. 2020). Again, even though wildfires are frequent in the region, very few have led to serious consequences for people other than forest owners.

Although fires are part of the place, concern thereof is not part of the narrative. Instead, the community is expected to flourish, as our respondents describe:

> I still believe this community will grow and that people will move here, not leave because of fires, absolutely not. We are very close to Oskarshamn, Mönsterås, and Kalmar. If you consider housing prices there, many people will still choose to settle down in smaller places, for the sake of the children and the lower costs [9]

Regarding the image of the community growing, statistics (SCB 2022) show, however, that the rural population in the area exhibited a decline. But it is clear from the interviews that there is a strong devotion to the area.

> If you live in paradise then perhaps you don't need to travel elsewhere as soon as you have some time off [5]

Many residents and local businesses volunteered by aiding the fire service with transport, food, and drinking water. There are several accounts of how the community spirit is strengthened during the fires, concurring with previous studies within a Nordic context (Lidskog 2018). The collaborative work with a collective goal seems to reinforce the connection between the residents long after the incident itself.

> You really see how collaboration succeeds when everybody joins in. […] we came closer to each other in many ways […] I felt that we kept that collaboration going [long after the incident] although we help each other in other ways [9]

The willingness to help is also shown in respondent's reasoning to engage as part-time firefighters or volunteers in unmanned fire stations. Similarly, Dickson-Hoyle et al. (2020) mention that involvement in local brigades is connected to a sense of responsibility to the community. In some of our interviews, firefighter duty runs in the family, and it is mentioned more than once that a person followed their father's footsteps.

> I've always lived here. You got involved in the fire service because you wanted to support the community. My father was a firefighter, thus it came naturally to me [12]

None of the respondents has taken any preventative measures safeguarding themselves or their property from wildfires and neither do they consider such actions for the future, albeit all believe in more frequent wildfires henceforth. While they reveal little worry discussing the local incidents, their triggers for concern are instead related to the 2014 and 2018 fire seasons. These brought much media attention and large consequences but occurred far from this study area. Also, incentives to join as a volunteer firefighter were formed during these high-profile incidents, and not in relation to incidents with closer proximity but fewer consequences. When asked about mitigating actions in a future climate, most residents turn to the fire service and hope that their ability to respond effectively will increase. The average resident does not communicate confidence in wildfire suppression competence, except for the older respondents, which likely have experience with both controlled burning and volunteering in accidental fires.

In the interviews, future wildfires constitute a smaller concern compared to drought resulting in irrigation bans, poorer growth, and lower levels in lakes and rivers.

> …shortage of water is often discussed [10]
> The last few years have been scary here in Mönsterås. It's so dry and we have a water shortage [14]

Still, the discussions about drought and water shortages are also linked to the risk of lack of water in the event of a wildfire in some of the interviews.

In summary, the community's narrative about future climate change clearly relates to the history of frequent and mostly well-managed wildfires. This reflects how they cope with increasingly fire-prone weather, for which they express little concern. The narrative highlights a friendly community that supports each other when needed and helps to maintain practices (or lack thereof).

"They discuss broadleaves along roads and such": forest owners display a varying degree of commitment

Forest owners, just like the residents, acknowledged the high wildfire frequency in the area. While an ongoing trend in rural Sweden is an increased portion of absentee owners (Swedish forest agency 2021), most of the interviewed private forest owners live in the community. Among them, the climate adaptation measures vary, where forest owners that have been affected by wildfire (either recently or decades ago) have taken more action. The most frequently mentioned adaptation concerns enabling more efficient suppression measures by the fire services. It includes providing access to water (ponds or streams) from forestry roads by clearing vegetation and stabilizing ground. The landowner with the highest level of commitment also states that he has reconfigured his dead-end forestry roads. Other suggested adaptation measures encompass increased broadleaf inclusion and incorporating action plans for unwanted events within the forestry plans.

> I've transformed all my forestry roads to through roads, with fire suppression in mind, such that one can direct the traffic one-way. There's a thought, a strategy of where one can access water [2]
> […] people are more thorough since 2018 making sure that paths to water courses are cleared, for using one's own or the fire service's pumps. [..] It was far from accessible water in Mönsterås and Finsjö [wildfires], so we ran out and had to wait 10-15 minutes for the next tanker. Water is a concern and is discussed a lot among forest owners and people living nearby [21]

Most landowners expect more fires in a future climate, but do not discuss whether the increased hazard will stop them from conducting forestry. None of them has acted to modify the tree species composition for fire safety reasons. They all know that stands of deciduous trees "burn less" but cannot describe more in-depth knowledge on how much inclusion is needed or how it affects the forestry operations. Reasons for why they would (or would not) change the tree species composition in their forest differ, some highlighting the intrinsic value of the forest and its biodiversity while others have a more economically focused management.

The only non-private landowner among the interviewees states that fires occur almost annually on their land and that this is really of no concern. Their insurance covers mop-up costs for large incidents and they cover subcontracting costs for smaller incidents. After an event, they can account for the burnt area in their biodiversity certification, which aims for prescribed burning of 5% of the annual clear-cut area (Niklasson and Granström 2004). Thus, the costs associated with small incidents are balanced against the costs saved by not having to conduct prescribed burning the following year. "[…] it might sound blunt to label it 'work savings', but that's how it works in practice" [2].

An increased likelihood of fires should be tackled by a more efficient response time for the fire service and efforts to reduce ignitions, but there are few preventive actions to be done from the corporative landowner's perspective.

> A really difficult question [regarding strategies to prevent large fires in a warmer climate]. They discuss broadleaves along roads and such. Then again, a fire doesn't start by coincidence. We have a very dry early summer climate, and the soil is quite lean with a lot of pine and shrubs, so there are not many options for the vegetation. These lands are highly flammable. [2]

Entrepreneurs who perform work in forests are described as more cautious after the high-consequence fires further north in Sweden during 2014 and 2018.

Some forest owners also bring up conflicts and negative feelings related to both the 1983 and 2021 fires. Conflicts between the fire services in different villages are depicted to have influenced the response to the 1983 fire, since they did not cooperate across municipal borders. However, these parochial tendencies had almost vanished by the 2021 fire. One interviewee describes that he tried to engage the forest owners and people in the local community in 1983 to create a "call-chain" of people during events, "but nothing ever happened, there was too little interest" [2]. Another forest owner expressed irritation about authorities blocking his plans for salvage logging of his burnt forest. They have "found some plants that... they don't want to talk about exactly what it is" [3]. The economic uncertainty caused by matters that are difficult to grasp is described as troublesome. Likewise, landowners appear to not always be clear about their legal responsibilities compared to the obligations of insurance companies or the fire service, especially related to the transition from initial suppression to mop-up.

> … Two that performed mop-up have called today. I had no idea that I was obliged to pay them from the start since that was not what the insurance company said. [4]

In summary, forest owners, which are among the most affected by wildfires, are aware that management practices can alter wildfire risks but most display low level of detailed knowledge and emphasis is instead to aid the fire service. Likewise, responsibilities during and after an incident are not always known.

"Fires will always be there": the need to increase the fire service resources

Current and future wildfire frequency is a central theme in the narrative found among the fire services, yet the small size of most wildfires today is especially pronounced.

> there has been a lot [of fires]. 2018 was extreme […] This year there were also quite a lot of incidents I would say, and quite early. Not huge ones, but around 5-10 hectares. [19]
> there will probably not be fewer [wildfires] with the changing climate [17]

Fire service personnel describe that their wildfire competence has developed in recent years, emphasizing the importance of continuing that trend.

> We have taken a lot of measures since 2016 when we had the first large [wildfire]. […] We [now] have wildfire instructors and a completely different attitude toward this. The staff is motivated and wants to develop [their competence] [15]

Both local firefighting ability and national preparedness have increased (Eriksson et al. 2023; Petridou et al. 2023).

The large 2014 and 2018 incidents revealed deficiencies in response and resources which triggered changes in the Civil Protection Act (SFS 2003:778) and access to aerial suppression forces without local municipal costs. This is described as the dominating reason the 2021 Finsjö fire did not grow beyond 100 ha.

Yet, concern is raised for the decreasing municipal economy funding the fire services. Reduced resources and population is highlighted as one of the key factors for the large incidents in 2018.

> I've been working with this for quite some time now […]. Even the part-time fire organizations are considerably slimmer now than they were before. People do not have the opportunity to help to the same extent. […] Now it is difficult to employ part-time firefighters [17]

Resources to locally build an effective organization during large incidents are still lacking and assistance from volunteers, such as distributing food and drinking water, was both needed and acknowledged. However, the interviewees argue that the fire service cannot always rely on volunteers and need to build this capability themselves.

Both the 1983 Bohult fire and the 2021 Finsjö fire burnt areas over three municipalities responding with individual fire service organizations, which had coordination repercussions. Since 2023, they are incorporated into a union and thus act as one single organization. Principal future action focuses on continuing this reorganization, identified as a pathway to increased resource access.

> The [fires] will probably always be there. [We need to] deploy more resources, faster, and raise the red flag before it has time to develop into a large [fire]. [14]

Wildfire response is regarded as a fire service responsibility while forest owners are described as important for information about water accessibility and their post-incident responsibilities.

In summary, the fire service highlights a continued need to maintain their capacity and capability built on the improvement last few years. Their primary focus is efficiency of suppression, and the role prevention and adaptation are considered more difficult to define in an unknown future.

Discussion

The aim of the article is to understand how a community with high wildfire frequency copes with and adapts to wildfires and concerns thereof given its collective experiences and expected regional climate change.

Regional causal factors for wildfire occurrence and consequences include climate (longer dry spells), land use practices, and organization of suppression operations. IPCC predictions entail more frequent and severe fire weather, but the actual outcome is largely dependent on adaptive measures taken regarding response and prevention. Improvements in these two can most likely compensate for a more fire-prone climate (Sjöström and Granström 2023).

Residents' narratives involve high trust in the fire service, presumably strengthened by the locally low consequences. Despite a dry climate, no incidents during recent decades have led to dramatic changes of the landscape, destruction of private property, evacuations, or casualties. Narratives for the future seem based on memories of successful wildfire responses (Reid et al. 2020). Thus, despite the largest expected increase (nationally) in future fire danger, local narratives seem essential for shaping concerns for the future. These narratives are partially supported by the physical causal factors emphasizing that response improvements are important for the outcome. On the other hand, the narratives exclude the other compensating factors related to prevention and adaptation.

Low concerns may explain the lack of local adaptation measures (Mortreux et al. 2020), despite scientific evidence that small measures taken in gardens significantly increase building survival likelihood (Vermina Plathner et al. 2023). No homeowners describe preventive actions to safeguard homes from wildfires. The expected change in climate and the known fire-prone local landscape is therefore not enough to raise concerns in light of the historically well-managed incidents. The main perceived hazard related to climate change among the local community is drought. Droughts have a direct consequence to most residents with irrigation bans and is clearly visible with e.g. loss of garden greenery.

Recovery is mostly regarded as a forest owner problem and response a task for fire services, unlike e.g. the Australian context (Dickson-Hoyle et al. 2020; Reid et al. 2018; 2020) emphasizing shared authorities-communities responsibilities. Fewer people make their living from the primary sector and general wildfire knowledge is decreasing. This is clear when relating the 1983 and 2021 incidents, and even more so with memories of the 1917 incident. Historically, the local community faced larger consequences and participated to a higher degree in suppression work. Without local high-consequence incidents, few things seem to trigger the need for individual responsibility.

The results align well with American and Australian studies showing increased risk perception and adaptation tendencies with increased experience, if that experience includes high consequences (Mortreux et al. 2020; Brenkert-Smith et al. 2012), but the opposite effect for low-consequence experience (Winter et al. 2000). Thus, the Swedish context

does not appear unique and the high fire occurrence rather act habituating for residents. Also, the generally high Swedish trust in authorities seems to agree with downplaying of risks and allocation of responsibility to the fire services, as found for other hazards (Seebauer and Babcicky 2018) and in other countries (Mortreux et al. 2020).

The fire services clearly highlight capability increases during last few years and stress the need to continue this within their organization as well as with national/international collaboration. Like most of Sweden, dispatch sizes are significantly larger and aerial resources used more frequently today compared to pre-2018. While landowners and residents show little interest in adaptive actions but discuss the need to cope with a fire once it occurs, the fire services are actively planning for more future wildfires. Consolidation into a more resourceful suppression organization is generally appreciated by the fire services, but was a direct consequence of legally binding regulations.

The role of forest owners during an incident is described as limited, with forest owners directing their efforts towards suppression support, e.g. wayfinding and water availability, rather than prevention. Thus, they focus on aiding fire services more than adapting forestry practices such as tree species composition, although they have basic knowledge of its effect. This result follows previous studies showing that forestry practices are considered less effective for preventing future wildfires compared to other forest hazards, such as storms (Lidskog and Sjödin 2016). However, prevention against bark beetle infestations or storms, such as early thinning and broadleaf inclusion (Valinger and Fridman 2011), is often identical to those against wildfire. The network of causal factors also identifies high potential for preventive actions regarding forest practices.

It appears that high-consequence incidents in recent years (elsewhere in Sweden) have triggered incentives for adaptation more than locally relevant events or climate change projections. Examples include increasing suppression capacities for fire services, public engagement for voluntary firefighting, or safeguarding watercourse access. Future prognoses are complex in relation to experiences of a presently manageable situation. Actions for increasing public awareness could therefore benefit from focusing on consequences rather than on wildfire occurrence.

Locals acknowledge the recurrence of wildfires without regarding it as a threat to the community. They describe coping with wildfires when they occur and will support fire services if needed, for example with food logistics (for similar results see Johansson et al. 2018). The two larger fires (1983 and 2021) in the area are described as improving intra-community collaboration long after the incidents. Similar results (but in a short-term perspective) were found after the Västmanland fire (Lidskog 2018). The shared experience builds cohesion (extent of connectedness and solidarity among groups, as per Manca (2014)) and trust in the community, whereas individual landowners might lose trust in authorities mainly due to post-incident administrative and economical burdens (Edgeley and Paveglio 2017). The latter consequence therefore holds future improvement potential.

Methodological reflections

As a case study, this work does not permit generalizations. Still, it contributes to understanding a community with mostly minor wildfires where other studies commonly focus on devastating fires. The study also combines physical causal factors of the wildfire hazard with citizen's perspective on the future. Narratives determine people's actions, which is crucial to bring about a change. To aid our comparison of physical data and resident's narratives, the physical data is compiled as a storyline, which can also be seen as a narrative.

The three driving interviews revealed respondent's relations to the landscape. Together with prior fieldwork in the area, knowledge of the local geography and culture was gained. This enabled discussion of specific places and fire events, thereby facilitating the interviewees to convey their narrative. The recording from 1977 gave valuable input to historical landscape recovery as well as consequences and local engagement long before modern mechanized suppression. This information fit the trends found in the causal factors as well as the local narratives.

Conclusion

This study describes how communities in a south-eastern Swedish area cope with and adapt to an increasing wildfire hazard associated with climate change. The area is one of the driest in the Nordic countries and is expected to become drier. Wildfires are generally well-managed in the region and typically described as "low consequence – high frequency". However, given the plausibility of increasing droughts, high-consequence events can be expected, especially if the community does not adapt accordingly. But a continued focus on mitigating actions in response, forestry, and WUI management can most likely balance projected risk increase related to weather, such that regional development is not jeopardized.

Despite experiences of previous fires, and general knowledge of increasing hazards in a changing climate, residents do not consider wildfire a risk for the future well-being of the area. Instead, they foresee a bright future and a growing community. This attitude is attributed to the lack of severe wildfires in the region, such that consequences do not constitute

a significant part of the local narrative. Wildfires are not a big concern compared to other climate change effects, such as drought, so active adaptation measures for safeguarding homes are not considered. Instead, locals express faith in the ability of the fire service and community to cope with wildfires as they occur, supported by the social cohesion within the community.

Thus, for raising concerns and incentives for adaptation, narratives that address large losses supersede those about high fire occurrence and that exposure to real events (either personally or through media) triggers actions more than unprecise projected scenarios for the future.

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Declarations

Conflict of interest The authors declare no competing interests.

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