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Different Strategies for Resilience to Wildfires: The Experience of Collective Land Ownership in Galicia (Northwest Spain)

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Abstract: Resilience is not a particularly novel concept, but it has recently become frequently used as a measurement indicator of adaptation capacity under different approaches depending on the field of study. Ideally, for example, forest ecosystems would be resilient to wildfires, one of the most serious types of perturbation they are subjected to. In areas such as the northwest of Spain, a region with one of the most severe records of wildfire occurrence in western Europe, resilience indicators should be related with changes in land planning aimed to minimize the effects of forest fires. This article aimed to analyze the fire resilience strategies of a selected group of forest communities in northwest Spain. More specifically, the perceived risk of wildfires was compared with the actual record of fire events in these communities and the presence or absence of adaptive changes in management practices to reduce risk and improve recovery capacity. A mixed quantitative–qualitative approach was used to gather information about good practices, innovative solutions, and major obstacles for forest fire resilience in Galician common lands. The results suggest that while there is no single form of successful management, a key characteristic of resilient communities is the integration of fire as a management tool.

Keywords: resilience; forest fires; common lands

1. Introduction

The most common definition of resilience describes it as "the ability of the system to react to perturbations, internal failures, and environmental events by absorbing the disturbance and/or reorganizing to maintain its functions" [1]. Resilience began to be used as a concept in the 1970s in ecology studies on interacting populations, such as predators and prey, and their functional responses. A classic reference on the subject is the work of Holling, who defines it as follows: "Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters, and still persist" [2]. Throughout the decades, the concept of resilience has been exported to fields such as policy and business, from poverty alleviation to political frameworks and business strategies, in order to anticipate and respond to change and crisis, not only to survive, but also to evolve [3]. Nevertheless, it has been in the field of scientific research where the use of the term has experienced an exponential increase. The number of scientific publications on resilience in environmental sciences has increased during this period from some 250 to well over 6000 publications. Annual citations have jumped from less than 100 in 1995 to more than 20,000 citations in 2015 [3]; however, despite being a popular policy goal, resilience is a challenging concept for land managers to grasp from a practical perspective [4].

Currently, a common interpretation of resilience is the one provided by Folke: "Resilience is having the capacity to persist in the face of change, to continue to develop with ever changing environments. Resilience thinking is about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways in the face of dynamic change" [3]. This is especially important in the case of communities affected by disturbances such as forest fires, particularly in a context of climate change, as small adjustments to the system may not be sufficient to ensure sustainability [5]

The concept of resilience has emerged as the touchstone for politicians, system managers and decision-makers, as they all attempt to ensure the sustainability of key societal systems that are subject to new kinds of internal and external threats. Sanitary, economical, ecological, social, psychological, organizational, and engineering perspectives all contribute to resilience as a challenging problem for society [6]. Applications have spread into multiple domains such as ecology, environmental science, management, economics, engineering, computer science, and psychology. Today, resilience is a multidisciplinary topic that spans across natural sciences, social sciences, and engineering [7–10]. The economic crises of the last two decades and current SARS-CoV-2 health crisis have indeed prompted an increased use of the term.

In the fields of environmental sciences and ecology, the work of Walker et al. [11] clearly stands out. These authors developed 14 propositions about resilience in social-ecological systems, which represent the authors' understanding of how these complex systems change and what determines their ability to absorb disturbances in either their ecological or their social domains. A review by Brand and Jax [12] proposed a classification of 10 definitions of resilience, distinguishing between purely ecological definitions (four definitions) and those that are also used in the context of other fields such as economics and sociology (six definitions). Smith and Stirling [13] studied the role of technology in the resilience of socio-ecological and socio-technical systems. Timpane-Padgham [14] analyzed how natural ecosystems and socio-ecological systems react to different types of disturbances: human behaviors, climate change, and changes in the economic and social environment. They concluded that resilience is primarily associated with the following dimensions: resistance, recovery, and adaptive capacity. Resistance is used, in this context, as the ability of individual species or communities to survive in the face of disturbance, while recovery is the process by means of which an ecosystem bounces back to its pre-disturbance status. Adaptive capacity is the internal ability of the system to reorganize its internal features so that returning to the pre-disturbance state is simply not required. Dinh et al. [15] proposed six principles (flexibility, controllability, early detection, minimization of failure, limitation of effects, and administrative controls/procedures) and five factors (design, detection potential, emergency response plan, human factor, and safety management) that contribute to the resilience of a design or process operation. Wilson et al. [16] addressed how rail engineering systems can be affected by disruptions generated by human factor issues. Crowther and Haimes [17] provided a holistic, methodological framework based on the multiregional inoperability input–output model, with which to model the interdependencies among economic sectors within a given region and among different regions.

The main reference in forest resilience is the work of the Scotland's Forestry Commission, which has proposed a set of measures to improve forest resilience, advocating for the application of current best practices to promote long-term resilience for Scottish forests [18]. These measures include the selection of the most suitable species and genotypes for each site, enabling the woodland to cope with future stresses; reducing pressures from deer, invasive species, and fires; maintaining and adding structural and species diversity; and accounting for the potential effects of climate change on forestry operations and design [19].

Laliberté et al. stressed the relationship between diversity and resilience. Complex structures formed by a mix of diverse species and plantation years, etc., are preferable because of the associated system redundancy in the resulting woodlands, which allows for the thinning down of the risks posed by different threats [20,21]. The goal of resilience would be achieved if forest management decisions (levels of structural diversity, species mix or intra-specific genetic diversity) were successful [22]. Besides this comprehensive approach to forest resilience, other approaches may focus specifically on resilience of concrete ecosystem services; the wider role of management; and outcomes within the region, such as watershed protection, carbon sequestration, timber production, or recreation [6].

Forest fires have traditionally been considered a perturbation in forest ecosystems. In this case, the most widely used concept of resilience fits the classic definition of Holling [2]. However, climate change projections may compromise the recovery of these ecosystems. Even more so, the increasing frequency of fires associated to extreme weather conditions in different parts of the world makes this approach rather questionable, as highlighted by Mc Wethy et al. [23]. These authors conclude that in fire-prone areas subject to predictions of climate change, changes in population distribution, and land use, restoring the pre-fire conditions of ecosystems and communities will be increasingly difficult. Thus, instead of the more traditional approach to resilience, which may maintain the vulnerability levels of the original system, they propose an alternative path based on the concepts of adaptive resilience and transformative resilience [24]. These different strategies imply the assumption of changes in planning by stakeholders and land managers that try to anticipate future conditions in order to minimize the effects of future fires [25]. For these objectives to be achieved, it will be essential to work inside and outside the landowner's communities [26,27]. An increase in the technical knowledge and education on fire behavior will be also critical [28,29]. This article aimed to analyze the fire resilience strategies of a selected group of forest owner communities in a region with one of the most severe records of wildfire occurrence in western Europe. More specifically, we compared the perceived risk of wildfires with the actual record of fire events in these communities and explored the presence or absence of changes in management practices aimed to reduce risk and improve recovery capacity.

2. Study Area

Galicia is a Spanish region (NUTS 2) located in the northwestern part of the country (Figure 1). Along the last half century, it has followed a path of dual productive specialization in forest and dairy production. Currently, it accounts for about 50% of national timber production and 40% of dairy production. During this process, areas covered by trees and other woody vegetation increased very significantly, both as a result of artificial plantations and spontaneous vegetation encroachment [30], which led to a considerable increase in the quantity and continuity of biomass present on the terrain. Therefore, the region is characterized by a high percentage of forest area, representing over 60% of the region's area and accounting for 11% of the total forest area in Spain [31].

Occasional, short but potentially intense periods of drought during summers mean that severe wildfire events usually take place every few years. For example, almost 62,000 ha were burnt in 2017, most of them (around 42,000 ha) in just a few days in early autumn [32]. From a wider perspective, during the period from 1968 to 2012, there were 249,387 wildfires in the region [33], and in the last 25 years over 8000 km^2 were burnt, about a quarter of total regional area (29.574 km^2). Several structural causes of fire ignition activity have been identified by different authors [34]. These include the disappearance of the traditional agrarian lifestyle, conflicts over land management and ownership, conflicts in the wildland urban interface, and socioeconomic situation.

Property fragmentation in the region is commonly perceived as a considerable obstacle to sustainable and profitable management of forests and rangelands. Current sources estimate that there are nearly 1.7 million landowners in the region (out of a total population of about 2.7 million people) and about 11 million parcels with an average size of 0.25 ha [35]. Most of the land is held by private owners—these hold more than two-thirds of forest area—but the average size of an individual private holding is usually around 1.5–2 ha/owner [31]. In stark contrast with this, private properties also include common lands, legally recognized as a non-divisible form of collective (albeit private) property. Community membership is restricted by law, and it includes any person living in the same area where the community is located. Therefore, communities are dynamic entities: people moving in become owners, while people moving out lose their ownership rights. Common lands account for the remaining third (public property in the region is almost negligible), at 656,000 ha, and are managed by around 3000 local communities, which gives an average area of 200 ha/community.

The social interactions present within communities and the required governance also contribute to their interest as subject of study for this work. Common land ownership has fallen to neighbors surrounding one or more villages or a parish. Neighborhood determines access, which is egalitarian and free and cannot be inherited or sold. The population engages in collective actions to manage their common lands without any external governing authority. This management has been historically linked with agrarian activities and the sparsely wooded lands were usually intended to produce firewood and other forest products for households. Since the 1950s, and related with the forest specialization mentioned above, the Spanish State began to actively work on common lands administration, and forestlands were reoriented towards forest production by means of their reforestation with fast-growing species, consolidating an economic business that tried to change the national deficit in forest production and make the country self-sufficient in forestry [36].

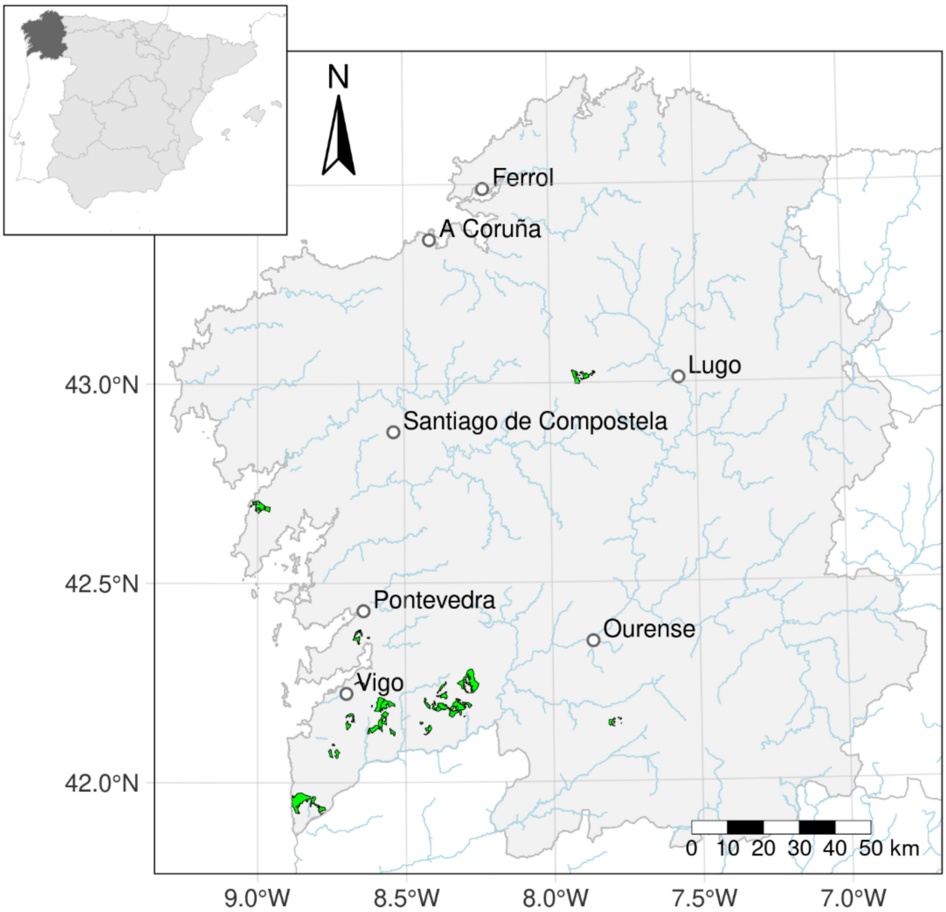

Figure 1. Location of the surveyed communities and location of Galicia in the Iberian Peninsula.

3. Materials and Methods

A mixed quantitative–qualitative approach was devised to gather information about good practices, innovative solutions, and major obstacles for forest fire resilience in Galician common lands.

First, a group of candidate communities was pre-selected with support from technicians from the Asociación Forestal de Galicia (Galician Forest Association, AFG). More specifically, we asked staff from AFG to provide names of communities known for having adopted practices of forest management aimed at reducing wildfire frequency or intensity (e.g., measures to reduce fuel presence or fuel continuity), particularly when those practices are relatively uncommon, involve bold departures from previous management practices, or otherwise make them stand out from the rest of communities in the region. Once pre-selected, they were first reached using contact details provided by the AFG and invited to answer a questionnaire using an online survey.

Questions aimed to produce a characterization of each community, their activities as forest managers, and their perception about several topics. A mixture of open questions and single- and multiple-choice questions was used. In every closed question, open space was provided so respondents could include additional qualitative information. A first group of questions was mainly quantitative and intended to provide data about the structure of the community (number of members, educational level) and the characteristics of the managed area (total area, number of plots, etc.). A second group of multiple-choice questions was intended to gather information about the productive model (management objectives, main products, additional sources of income). Additional parts covered topics such as forest management, soil and water management (quantity and quality), CO_2 fixation, forest fire risk control, pest and disease control, biodiversity conservation, landscape management, economy and employment, governance, culture and society, authenticity, and replicability. For more information about the questions performed, please refer to Appendix A.

Because not all communities' representatives felt at ease providing written feedback in an online form, technicians of the AFG often acted as intermediaries. They gathered answers via phone or direct interviews and filled in the questionnaires. Finally, received data included responses from all initially pre-selected communities as well as from some additional communities that showed up in the process and were invited to participate in the online survey or directly surveyed by phone. Phone calls and e-mails were used to gather further clarification or additional answers after the online survey had been completed and its initial results analyzed.

Additional information about wildfire occurrence in the studied communities was derived from the recordings of the wildfire database from PROePLA research group [33,35].

4. Results

Responses from a total of 19 common land communities were received. As it is usual with this kind of property, all of them manage a relatively large area of land (from 95 to 1800 ha, median 350 ha). Moreover, this amount of land is usually concentrated in only a few plots, often just one. Large size and absence of fragmentation makes common lands a class of its own, clearly separated from individual (i.e., not collective) private forest holdings in the region (Table 1).

Table 1. Basic descriptive statistics of the surveyed communities (n = 19).

Variable	Min	Median	Mean	Max
Total area (ha)	95	350	599	1800
Total number of plots	1	1	1.5	4
Average plot area (ha)	95	300	480	1575
Number of community members	32	130	196	800
Average area per community member (ha/member)	0.44	3.00	4.31	15.68
Profit at end of year (EUR)	0	18,000	19,000	60,000
Number of fire events per 100 ha and year (1999–2014)	0.07	0.42	0.50	2.38
Proportion of area burnt per year (1999–2014)	0.01	0.25	0.61	12.98

The need of governance mechanisms is also a distinctive feature, as the number of members in each community may vary significantly but is often high: the least numerous community in the selection has just 32 members, while the largest includes some 800. Community membership includes people that have received a mix of formal education or professional training including, sometimes, higher education. Nevertheless, secondary education is very often the highest level attained by members of most communities. Very often, a large part of the members works or have worked—at least part-time—in the primary sector.

While some communities declared to prioritize economic output over any other consideration, most declared to seek a compromise between economic, environmental, and social considerations or at least two of them. Only one community declared to give social considerations absolute priority, which suggests that this approach is infrequent but can happen sometimes. However, different declared priorities do not necessarily imply radical departures in terms of actual management, as we will see.

Timber production (most often *Pinus pinaster*, but occasionally other species as well) is present in all the interviewed communities. For the most part, most communities are involved in relatively conventional management, including the use of mechanical slashing, improvement felling, and clear felling as the preferred regeneration method in almost all communities. Nevertheless, this is often accompanied by the extraction of other forest products: game, fuelwood, and chestnuts being among the most common. While only two communities declared sustaining any kind of agricultural production, a fact that is probably linked to limitations associated to soil capacity, animal husbandry seemed far more common and was found to be present in almost a third of the communities. Tourism and other recreation activities are widespread, although their contribution to total income seems meager. On the contrary, other sources of income such as quarries, water supply installations, wind farms, and landfills are not uncommon and can amount a significant share of total income. Forest production, nevertheless, is largely seen as the uncontested primary production, and most communities have not even discussed alternative management models. When they have, the alternatives proposed (fungi, chestnuts, beekeeping, resin extraction) are oriented to complement rather than completely replace the existing timber-oriented model.

Most communities take day-to-day management decision making in their own hands, although they usually seek for supporting technical advice. Other solutions include occasionally hiring technical staff or, on the other side of the scale, completely relying on hired technical staff to organize daily work. Likewise, labor force is mostly local and normally resides in the same municipality where the community is based. Moreover, in a similar fashion to the hiring of technical staff, there is no single approach to the hiring of labor: some communities hire many workers for specific periods of time while others employ one or two full-time workers along the year. There seems to be a trend related to the physical size of the property, with around 1 full time worker for every 150–200 ha.

Most communities have technical management plans in place, particularly for the management of forest stands (usually a requirement for the reception of subsidies) but also for the management of pastures, for example. Most communities are satisfied with the level of compliance with plans, which they usually declare to be high or very high. Despite this, yearly profit can be very diverse: Some of the communities do not regularly make a profit at the end of the year, while others seem to make a large one (e.g., over EUR 50,000 per year). Similarly, the importance of public subsidies in the generation of this profit also seems to include a wide range, from 0 up to 50% of annual profit.

When participants were about the key elements for success, usual answers regularly mentioned a strong leadership, either concentrated in a single individual or a group of individuals. Regular or extraordinary economic inputs were mentioned in a second place. In general, most communities believe that their model could be easily replicated in other areas of Galicia and northern Portugal. Most of them also believe that their management model could be reproduced at other scales, particularly at larger scale. A strong sense of belonging to the community can align most community members with the management objectives, particularly when collective decisions are made under the guidance of a determined group of men and women with a strong vision of the future of the community. This, in principle, largely limits the use of fire as a demonstration of disagreement with management decisions.

Therefore, it could be surprising that, after all, wildfires seem to be rather frequent in all the studied communities (Figure 2): between 1999 and 2014, an average of 50 wildfires were identified in each community (about three fires each year). Average values are largely dominated by one extreme case: a single community in which 321 wildfires took place within the same period (around 21 per year). Accordingly, median values were found to be somewhat lower: 27 wildfires in 15 years, or around 1.8 wildfires per year. For most communities, this means less than one wildfire per year for each 100 ha managed, and less than 1% of total area of the common land burnt at the end of the average year (Figure 3). Only two communities showed values much larger than 1%: for each of them, this can be explained by only one major wildfire event in each case, affecting 360 and 272 ha, respectively. Had it not been for these two major fires, both communities would have been clearly located in the lower end of the scale, with less than 1 ha burnt in total along those 15 years.

The frequency of fires in the 19 selected communities (0.5 fires/100 ha-year) does not seem very different from the general values observed in the region during the same period (0.3 fires/100 ha-year), even somewhat higher. When the proportion of burnt area was considered, however, the selected communities showed much better results: 0.6% of total area per year, compared to 1.4% in the whole region (figures for events and area at the regional level were calculated, considering average values for the same time period, and assuming they took place exclusively in forest areas, wooded or not). This could mean that, although they might not be able to reduce the frequency of fires, these communities have implemented measures that actually allow them to reduce their impact in terms of total area. On the other hand, this could also be a hint that that fire is actually being used as an integral part of the management system, even if this is not explicitly mentioned. This would explain, for example, why communities in which game hunting or livestock raising are part of the management model tend to show slightly higher average frequencies of fire and large average percentages of burnt area (Figure 3).

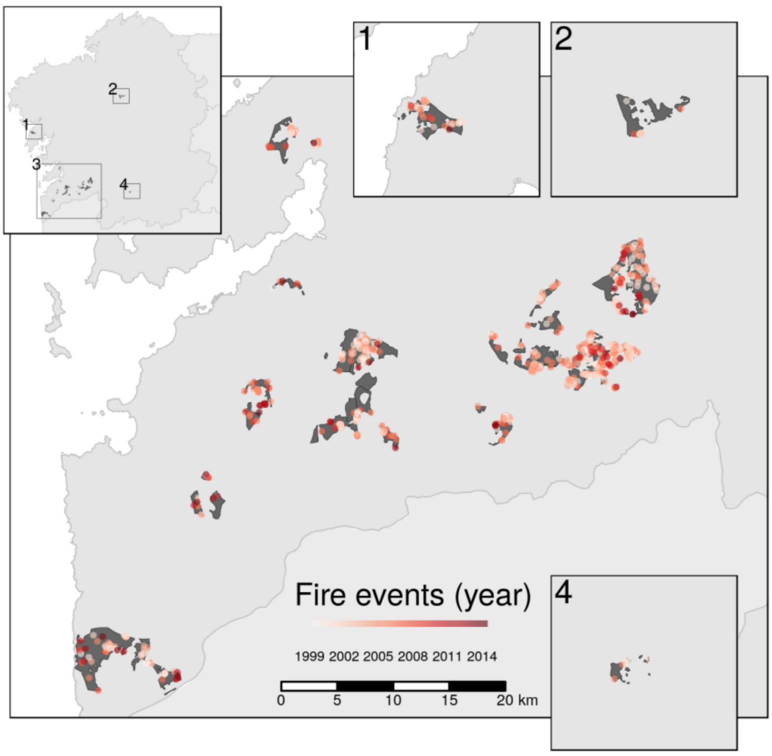

Figure 2. Recorded events of wildfires in the studied communities between 1999 and 2014.

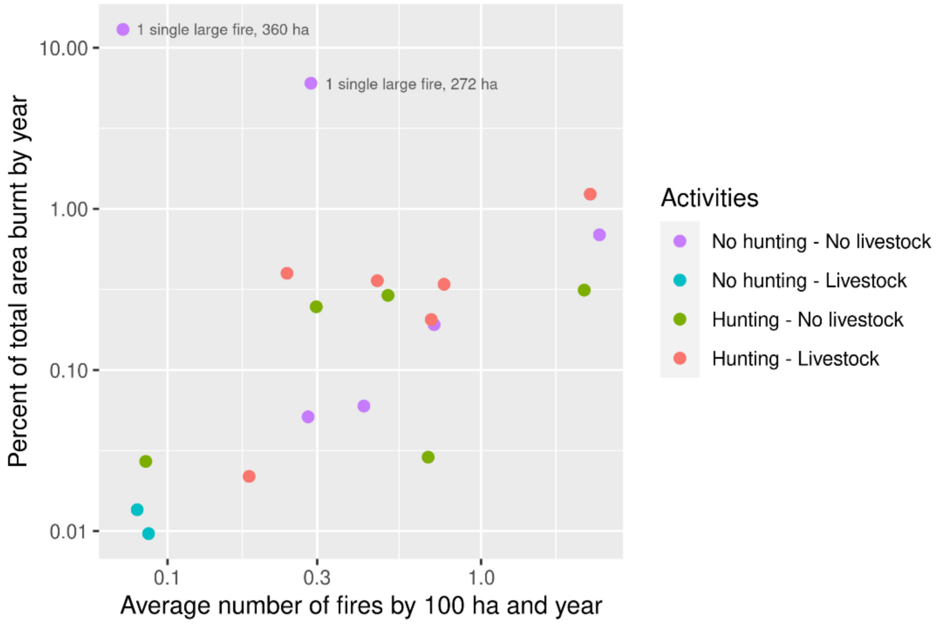

Figure 3. Relative importance of wildfires in the 19 selected communities in the period 1999–2014, considering hunting and livestock activities.

While definitely not resistant to wildfires, the interviewed communities seem reasonably resilient, and none of them mentioned the need to completely change their management models, in spite of fire events being very frequent in most of them. This suggests that those with lower wildfire incidence do not perceive that they have much room for improvement (or that a complete change of system would induce losses not necessarily compensated by a hypothetical lower wildfire risk), while those at the upper end probably consider wildfire as part of the management system. Whenever management changes were introduced, these were mostly oriented to further adapt the model rather than completely change it. Common examples of measures adopted after severe fires include reducing stand densities, increasing the presence of animals in order to reduce fuel on the ground, or introducing stands of alternative species to increase diversity. The overall feeling of those communities, however, is that they are reasonable resilient to wildfires and they would like to continue with business as usual. The cost at which this is eventually achieved (particularly because of the environmental and economic losses caused by frequent fire events), nevertheless, is definitely a different question which is seldom openly debated. In any case, many changes introduced by the communities in their management models were actually motivated (and often challenged) by wildfires initiated not in the community's land but on neighbor properties. This suggests that although the communities can reasonably introduce measures to improve resilience at the holding level, this is challenged by a lack of proper organization at landscape scale.

5. Discussion

Local communities have adapted in different ways to wildfires [37]. On many occasions, decisions to protect oneself from fire cause a loss of ecological resilience, but on other occasions, social power, ecological resilience, and fire management are united to improve the situation [38].

In a region such as Galicia with such a high incidence of fires and with its high forest productivity, the lack of planning that takes forest fires into account is surprising. As noted by authors such as [32,34,39–41], it is necessary that all territorial plans take into account the main environmental, economic, and social risk of the region [42,43], especially in areas with the highest incidence of fires and the highest wildland urban interface (WUI) [34,44].

The responses in most of the communities would be included in the resilience defined by Folke [3] that has somewhat more recently been applied to forests by Timpane-Padgham [15] and Bowdith et al. [6]. However, some responses observed in some communities after fire (e.g., reducing stand density) are aligned with the idea of co-existing with fire [45], anticipating future conditions to minimize the effects of future fires [27]. This type of response is similar to that observed in other areas of high fire incidence such as the southern United States and Australia [28,46]. In the present study, none of the studied communities thought that it is necessary to change the management model, a typical response when timber production is the main goal [28]. However, improving landowners' technical assistance and education about wildfire risk and fuel reduction could substantially reduce future economic and social losses [28,41,47].

Knowledge of landscape variables is essential for developing and applying forest fire prevention and suppression programs [48]. A forest landscape managed with a space-time fire program is less vulnerable to forest fires and, therefore, its resilience is greater, serving also as strategic spaces for wildfire management, in particular of planning of defense activities [45], as seems to be happening in the most successful cases. However, territorial planning on a larger scale will be necessary for satisfactory results at the landscape level, applying the principles of adaptive and transformative resilience [24,25]. This requires a change in land and fire management policies by the Regional Administration [49,50]. It is a priority to transform governance in other polices more on the basis of scientific and technical data as stated by the coerced resilience concept [43] as established globally and by the European Administrations [51,52].

The effects of forest fires are known in flora [53], in fauna [54], in water [55], in the socio-economy [56], and in soil [57,58]. The use of fire as a management tool by rural communities has also been studied [59,60], being considered a negative element and penalizing these actions by the forest administrations considering it as negative for the resilience of ecosystems. Recently, this consideration is changing. The works of Gillson et al. [61] and of Mc Wethy et al. [23] propose important changes in the way of considering the relationship between fire management by rural communities and the resilience of ecosystems. In this same direction, we would like to highlight the work of Fidelis [62] with its suggestive title "Is fire always the "bad guy"?", where the author balances out the positive and negative environmental aspects of fire.

It is in this sense where the results of our work provide an interesting and non-negative view of fire. Communities where the load of livestock is important, which do not directly support the use of fire, although they are obviously part of the management of the territory for pasture, do not show signs of a lower level of resilience. The integration of fire and territorial planning could be the solution in those communities that increase the use of prescribed fire under appropriate conditions as a management tool [5,37,63]. However, a recent study in the USA [29] highlighted that only 26% of interviewed landowners will pay the given payment amount for reducing wildfire hazard in their lands by means of prescribed fire. Thus, there arises the necessity of specific programs about the use of fire for forest management. In fact, several authors have also highlighted the necessity of promoting participative methods and incorporate environmental service assessment as key elements in the planning and decision-making processes [26–28]. In the present case in northwest Spain where communal forests are common but where the managed area is not very large, the challenge is to address the fire problem at the landscape scale in order to be effective. By building a sense of community, social relationships in wildfire-prone areas may facilitate the exchange of information and improve landscape planning [64].

6. Conclusions

1. The Galicia region stands out for its forestry production, among the highest in Europe, but also because a fifth of its territory is collectively owned and for being at the head of the European regions in number of fires. It is a very heterogeneous region, where very diverse examples of forest management and land use are observed in a relatively

small territory. In these fire-prone areas, a new concept of resilience is necessary to minimize the effects of future wildfires and forest owners' associations can actively contribute to this goal.

2. Common lands ("Montes Veciñais en Man Común") manage forest lands between from 95 to 1800 ha in northwest Spain. The analysis of common lands allowed us to know on the one hand the reasons why collectively managed communities achieve not only organizational but also productive success (number of members, level of education). On the other hand, it allows for knowing which are the keys so that your model can be applied by many others that have not been successful.
3. The results show that there is no single form of successful management and that success is not related to size, production orientation, or location, although forest production prevails. However, it is it should be noted that in the communities analyzed, the percentage of burned area is lower than the average for the region (0.6% of total area per year vs. 1.4%).
4. Some of the analyzed communities have not only solved the risk of fires but have integrated and managed it in such a way that the fire seems to be a key factor in their resilience. The strategy of managing the territory through the use of fire by those communities with livestock activity can provide solutions for the resilience of both the activity and the community itself that can be a reference for other similar communities.
5. However, the use of fire as a landscape management tool will require greater technical expertise and the need for closer collaboration between communities given the small average size of the current. This fact is very interesting and opens a future line of research in accordance with the new scientific approaches on the policies to be followed in areas with a high incidence of fires.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Summary of questionnaire:

Basic description of the community: Number of plots, total area in the community, and area per plot. Number of members.

What are the main objectives of management? Is economic profit the main objective? Does the community consider other management goals? In what way are these goals are made compatible?

Is the management model based on timber production? If so, which other forest products are obtained (if any)? Are there other economic activities or sources of economic income for the community (quarries, windmills, livestock, game hunting, etc.)? Do these represent a large part of total income?

What is the forest management model? Which are the main species? Which other management practices are carried out (slashing of undercover vegetation, different felling operations, etc.)?

What type of technical support does the community receive? Is management hired to external technical staff? Where does labor come from? How many full-time equivalent workers are usually employed in a year? What is the formal education level of community members?

Is there any management plan in place? How many different activities are included in the plan? Is the plan actually guiding management decisions?

How are fires affecting the community activities? How frequent/severe are wildfires? Have members questioned the management (and the management goals) as a result of severe wildfires in the past? What kind of adaptation measures have been adopted? If not challenged, why is the management team successful: is it based on one or several individuals, and are there any additional elements for consensus within the community?

Do you consider the method to be scalable to other areas/communities? Why?

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