

From Fire Suppression to Community Stewardship: Re-imagining Forest Fire Governance through Law, Ecology, and Local Institutions in Uttarakhand, India

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Abstract

Forest fires in Uttarakhand have escalated into a systemic crisis, evidenced by a staggering 293% increase in fire counts during the 2023–2024 season. This surge highlights the catastrophic failure of the prevailing state-led fire governance framework to address contemporary ecological realities. A profound socio-legal gap persists as current statutory regimes, anchored in the colonial Indian Forest Act of 1927, treat fire exclusively as a destructive hazard or a criminal offence. By criminalising traditional low-intensity burning (safai), the law ignores the ecological necessity of fire as a tool for nutrient mineralisation and stand maintenance, thereby alienating the very communities essential for monitoring the landscape. This study utilises a mixed-methods approach, integrating a doctrinal analysis of environmental and criminal statutes with empirical field data. Primary research involved structured interviews and a qualitative "Description Test" administered to 25 multi-stakeholder participants, including Van Panchayat members, Mahila Mangal Dals, and forest officials across five fire-prone districts. Findings reveal that strict suppression strategies have inadvertently facilitated a "fuel trap" by allowing resin-rich biomass to accumulate to uncontrollable levels. While 96% of stakeholders recognise traditional stewardship as effective for prevention, 100% believe existing laws delegitimise these practices.

The research contributes a critical legal reinterpretation that distinguishes managed "relational fire" from malicious arson, bridging the friction between property-centric forest laws and rights-based community frameworks. The paper advocates for a decentralised stewardship model that formalises village institutions as statutory responders under the Disaster Management Act, positioning Uttarakhand as a scalable template for ecological resilience across the broader region.

1. INTRODUCTION

1.1 Global and Indian Forest Fire Crisis

The global ecological crisis has fundamentally destabilised fire regimes, transitioning them from natural disturbances into primary drivers of forest degradation. Climate change intensifies this by increasing temperatures and prolonging dry seasons, creating conditions that turn forests into tinderboxes (Bhaduri, 2024). Paradoxically, historical fire-exclusion laws contributed to this crisis by enforcing

strict suppression, leading to a massive build-up of flammable biomass, a "fuel trap" that facilitates catastrophic high-intensity blazes instead of historical fuel-limited, patchy fires (Tripathi, 2025). In India, nearly 50% of forest land is now fire-prone, with 11.34% classified as extremely to very highly vulnerable. Uttarakhand has emerged as a critical hotspot within this landscape; during the 2023–24 season, the state reported 21,033 fire points, a staggering 293% increase over the previous

year (Tenzin *et al.*, 2024). This vulnerability is ecologically rooted in the preponderance of *Pinus roxburghii* (Chir pine) forests, which cover 26% of the state's area (Prakash, 2024). The resin-rich needles create a volatile fuel bed that, when combined with severe soil moisture depletion during the February–June dry period, precipitates a systemic socio-legal and environmental emergency, according to the Forest Survey of India. (2023).

1.2 The Legal Paradox of Fire

The "Legal Paradox of Fire" in the Uttarakhand arises from a fundamental misalignment between ecological reality and statutory law (Sharma, 2021). Ecologically, fire is a vital process for nutrient mineralisation and seedling recruitment in *Pinus roxburghii* (Chir pine) forests. Legally, however, the Indian Forest Act (IFA) of 1927, a colonial relic designed for timber extraction and revenue, classifies fire primarily as an act of "mischief" or "arson" (Diputera *et al.*, 2018). This dichotomy creates a "fuel trap": strict fire-exclusion policies ban traditional low-intensity burns, known as safai, which historically cleared volatile needle litter (Meghalaya State JUDICIAL ACADEMY, 2006). By criminalising these acts of stewardship under Section 26 of the IFA, the law removes the "human-legal

dimension" from the landscape, leading to a massive buildup of flammable biomass (Indian Forest Act, 1927). Consequently, when ignitions inevitably occur during dry summer months, they escalate into high-intensity, uncontrollable disasters. The colonial legacy of total suppression has transformed fire from a manageable tool for the commons into an existential threat. Transitioning to stewardship requires resolving this paradox by recognising fire as a socio-legal entity co-produced by human care and ecological necessity.

1.3 Research Gap

Existing scholarship on forest fires in India has made valuable contributions by documenting ecological impacts, institutional preparedness, and the role of climate variability in shaping fire regimes. A substantial body of literature also examines forest fires through the lens of disaster management, emphasising response mechanisms, technological interventions, and administrative coordination. However, despite this growing body of work, critical gaps remain in the legal and governance-oriented analysis of forest fires, particularly in ecologically sensitive regions such as Uttarakhand.

First, the prevailing literature largely treats forest fires as environmental hazards or

disasters, rather than as phenomena that are actively shaped by legal regulation. Fire is rarely examined as a legally governed ecological process, despite the fact that statutory frameworks decisively determine when, how, and by whom fire may be used or prohibited. As a result, the role of law in influencing fire behaviour, especially through the criminalisation of traditional and preventive practices, remains underexplored.

Second, there is limited engagement with the normative conflict between criminal law and forest law in the context of fire management. While criminal provisions relating to mischief by fire coexist with forest statutes that impose strict liability for burning, existing studies seldom interrogate how this overlap generates legal ambiguity, fear of prosecution, and regulatory overreach at the community level.

Third, although judicial interventions have increasingly addressed forest governance failures, scholarship has not sufficiently integrated judicial reasoning with community-based governance realities. Court observations on administrative inaction and funding lapses are rarely examined alongside empirical evidence from local institutions such as Van Panchayats and Mahila Mangal Dals, resulting in a fragmented understanding of governance effectiveness.

1.4 Aim and Scope

This study seeks to address these gaps through a focused socio-legal analysis of forest fire governance in Uttarakhand. The geographical scope is deliberately confined to Uttarakhand to ensure contextual specificity and analytical depth, rather than broad generalisation across the Himalayan region. The study adopts law as its primary analytical lens, examining statutory frameworks and judicial precedents, while drawing upon ecological science as a supporting discipline to contextualise fire behaviour and management practices. Through this integrated approach, the paper aims to reconceptualise forest fire governance by situating law, ecology, and community stewardship within a coherent analytical framework.

2. RESEARCH QUESTIONS AND OBJECTIVES

2.1 Research Questions

1. How can controlled fire function as a tool for ecosystem management in Uttarakhand?
2. How do Indian forest and criminal laws enable or obstruct such use?
3. What role has the judiciary played in reshaping forest fire governance?
4. Can community institutions be legally recognised as fire stewards?

2.2 Objectives

- To critically analyse forest and criminal law provisions on fire
- To examine judicial precedents on forest fire management
- To assess community-based fire practices through empirical data
- To propose a legally viable stewardship model

3. RESEARCH METHODOLOGY

This study adopts a mixed-method socio-legal research design to examine forest fire governance in Uttarakhand through the combined lenses of law, ecology, and community practice. Given the complex and multi-dimensional nature of forest fires situated at the intersection of statutory regulation, judicial oversight, and lived ecological experience, a purely doctrinal or purely empirical approach would be insufficient. Accordingly, the methodology integrates doctrinal legal analysis with empirical field-based inquiry to generate a comprehensive understanding of how forest fire governance operates both in law and in practice.

3.1 Nature of Research

The research is qualitative in orientation and employs a dual methodological framework consisting of doctrinal and empirical components.

Doctrinal Legal Research

The doctrinal component forms the backbone of the study and involves a systematic analysis of legal texts governing forest fire management in India. This includes statutory provisions under the *Indian Forest Act, 1927*; relevant state amendments applicable to Uttarakhand; provisions of criminal law relating to fire and mischief; the Disaster Management Act, 2005; and policy instruments such as the National Disaster Management Plan, 2019. In addition, judicial decisions of the Supreme Court of India and the Uttarakhand High Court are examined to trace evolving judicial attitudes towards forest fire prevention, administrative accountability, and community participation.

Doctrinal analysis is employed not merely to describe the law, but to critically assess its underlying assumptions, particularly the treatment of fire as a presumptive offence or hazard rather than as a potential tool of ecosystem management. Judicial precedents are analysed using a case-law method focusing on facts, legal issues, reasoning, and outcomes, with special attention paid to how courts conceptualise fire, governance failure, and institutional responsibility.

Empirical Research

The empirical component complements doctrinal analysis by grounding legal arguments in lived experience. Structured interviews were conducted with stakeholders directly engaged in forest fire governance at the local level. This approach enables the study to move beyond formal legal texts and assess how laws are interpreted, experienced, and operationalised on the ground.

By combining doctrinal and empirical methods, the study aligns with contemporary socio-legal scholarship that recognises law as a dynamic social institution shaped by practice, power, and context rather than as an abstract normative system.

3.2 Sources of Data

The research relies on both primary and secondary sources of data to ensure analytical depth, triangulation, and methodological robustness.

Primary Data

Primary data was generated through structured interviews administered via a questionnaire. The questionnaire was designed to elicit responses on four core themes:

1. Perceptions of forest fire trends and causes
2. Awareness and impact of existing

legal frameworks

3. Role of community institutions in fire management
4. Views on governance models and judicial intervention

The structured format ensured consistency across respondents while allowing for qualitative insights through explanatory responses. Interviews were conducted with the assistance of survey researchers, professional networks such as LinkedIn, and known contacts within Uttarakhand's forest governance ecosystem. This approach was particularly effective in accessing respondents across geographically dispersed and administratively diverse districts.

Secondary Data

Secondary sources include statutory texts, judicial decisions, government policy documents, official reports, peer-reviewed journal articles, and authoritative books on forest governance, disaster law, and ecological fire management. These sources provide the doctrinal and conceptual foundation against which empirical findings are analysed. The use of secondary data also enables the study to situate its findings within broader national and comparative debates on fire governance, disaster management, and community-based natural resource management.

.3 Sampling and Fieldwork

Sampling Strategy

The study adopts a purposive sampling technique, appropriate for qualitative and exploratory socio-legal research. Rather than seeking statistical representativeness, purposive sampling allows for the selection of respondents with direct and relevant experience of forest fire governance. A total of 25 respondents participated in the study. The sample was deliberately structured to capture diverse institutional perspectives while remaining manageable for in-depth qualitative analysis.

Respondent Categories

The respondents were drawn from three key stakeholder groups:

- Van Panchayat Members: 6 members representing community-based forest governance institutions with statutory recognition in Uttarakhand.
- Mahila Mangal Dal Members: 8 members representing women's collectives traditionally involved in forest protection, fuel collection, and early fire detection.
- Forest Department Officials: 11 Officials representing the formal administrative machinery responsible for forest protection and fire suppression.

This multi-stakeholder composition

ensures that the data reflects both formal and informal governance dimensions, enabling a comparative assessment of state-led and community-led approaches.

Fieldwork Region

The fieldwork focused on selected fire-prone districts of Uttarakhand, including Pauri Garhwal, Almora, Nainital, Chamoli, and Tehri Garhwal. These districts were chosen due to their documented vulnerability to recurrent forest fires, ecological sensitivity, and the presence of active community forest institutions. While the study does not claim to represent all forested regions of Uttarakhand, the selected districts provide a sufficiently varied yet contextually coherent setting to examine patterns of governance failure and institutional response.

3.4 Method of Analysis

Qualitative Thematic Analysis

Qualitative thematic analysis was employed to identify recurring patterns, themes, and narratives across respondent interviews. Responses were systematically reviewed to extract themes related to fuel accumulation, criminalisation of traditional practices, institutional effectiveness, fear of legal sanctions, and perceptions of judicial intervention.

This method is particularly suitable for socio-legal research, as it allows for the interpretation of meanings and experiences rather than mere quantification. Themes emerging from empirical data were continuously compared with doctrinal findings to identify convergence, divergence, and explanatory gaps.

Descriptive Empirical Interpretation

In addition to thematic analysis, the study uses descriptive empirical interpretation to present aggregate response trends in tabular and graphical form. While the sample size is limited, descriptive statistics are used to illustrate consensus patterns such as unanimity regarding the increase in forest fires or preference for community-based stewardship.

a. Frequency Count

This shows how many respondents gave a particular answer.

Frequency (f) = Number of respondents selecting a r

b. Percentage Distribution

$$\text{Percentage (\%)} = \left(\frac{f}{N} \right) \times 100$$

Where:

- f = frequency of a response
- N = total number of respondents

c. Category-wise Consistency Check

This checks whether different respondent groups agree.

$$\text{Category Agreement Rate} = \frac{\text{Respondents agreeing within a category}}{\text{Total respondents in that category}} \times 100$$

The purpose of descriptive interpretation is not to claim statistical generalizability but to strengthen analytical credibility by demonstrating consistency across respondent categories. This approach aligns with qualitative best practices in interdisciplinary legal research.

3.5 Methodological Limitations and

Ethical Considerations

The study acknowledges certain limitations inherent in qualitative empirical research. The sample size, while sufficient for thematic saturation, does not permit

statistical generalisation. Responses are also shaped by local context and may reflect regional specificities of Uttarakhand. To address ethical considerations, respondent anonymity was maintained, and participation was voluntary. No personal identifiers were recorded, and responses were used solely for academic research purposes.

3.6 Methodological Contribution

By integrating doctrinal legal analysis with empirical field-based insights, this methodology enables a nuanced examination of forest fire governance that neither approach could achieve independently. The empirical findings enrich judicial and statutory analysis by revealing how laws function in practice, while doctrinal analysis provides the normative framework necessary to interpret empirical patterns. This methodological design is particularly suited to addressing complex environmental governance challenges and contributes to emerging scholarship that advocates for evidence-based, community-sensitive legal reform.

4. CONCEPTUAL AND DOCTRINAL CONTEXT

This study situates forest fire governance in Uttarakhand within a conceptual framework that integrates ecological

science, legal regulation, and community-based stewardship. Rather than treating forest fires solely as environmental hazards or episodic disasters, the analysis proceeds from the premise that fire is a legally mediated ecological process whose impacts are shaped as much by governance structures as by biophysical conditions. The doctrinal context, therefore, requires engagement with both scientific understandings of fire and the legal and institutional arrangements that regulate its use and suppression.

4.1 Fire in Ecological Science

Ecological understandings of forest fire have traditionally been grounded in the “fire triangle,” which conceptualises combustion as the interaction of fuel, heat, and oxygen (Rawat, 2003). This model has been widely used in fire hazard mapping, vulnerability assessment, and suppression planning, particularly in Chir pine-dominated forests of the Western Himalaya, where dry needle litter constitutes a major source of fuel (Joseph et al., 2009; Verma, 2017). Scientific studies consistently demonstrate that fuel accumulation is a key determinant of fire intensity and spread, especially under prolonged dry conditions exacerbated by climate variability (Wang et al., 2021).

Contemporary ecological research, however, distinguishes between destructive high-intensity fires and low-intensity, controlled burns. Evidence suggests that the systematic exclusion of fire from fire-adapted ecosystems can increase the risk of catastrophic events by allowing surface fuels to accumulate beyond manageable thresholds (Tewari, 2016; Basu et al., 2023). While this ecological insight is well established within forestry science, its implications for legal regulation and governance remain inadequately addressed.

4.2 Fire as a Socio-Legal Construct

Recent scholarship has increasingly questioned the adequacy of purely technical models of fire management. Lake and Christianson (2022) argue that conventional fire governance frameworks marginalise the human and legal dimensions of fire by treating it as a physical hazard divorced from social relations. In legal terms, fire is not merely a biophysical event but a phenomenon actively shaped by statutory prohibitions, criminal sanctions, and administrative authority. Tedim et al. (2023) advance this critique by conceptualising fire as a “relational” phenomenon co-produced by ecological conditions, legal norms, and social practices. From this perspective, fire

governance is inseparable from questions of power, access, and legitimacy. In the Indian context, the framing of forest fires as “man-made disasters” under disaster law has reinforced a suppression-oriented approach, privileging centralised control while obscuring the role of law in producing governance failures (Satendra, 2014; Saunik et al., 2025). This socio-legal framing highlights how legal exclusion can generate what may be termed “social fuel,” whereby the alienation of communities from forest management contributes indirectly to increased fire risk through neglect and fuel accumulation.

4.3 Commons and Community

Stewardship

The theory of the commons provides a critical lens for understanding traditional fire management practices in the Himalayan region. Thapa and Shrestha (2021) demonstrate that community-managed forests operate on principles of shared responsibility, reciprocity, and long-term ecological care. In Uttarakhand, Van Panchayats have historically embodied these principles, functioning as institutions of collective stewardship rather than mere administrative units. A central practice within this commons-based system is safai, involving the controlled removal or low-

intensity burning of forest litter to promote grass regeneration and reduce fire risk (Sinha & Srivastava, 2012). Far from being arbitrary or destructive, safai is governed by local ecological knowledge concerning timing, intensity, and collective oversight. Commons theory recognises such practices as essential for maintaining ecosystem services and preventing high-intensity fires. However, colonial and post-colonial legal frameworks have progressively criminalised these practices by classifying them as unauthorised burning or arson, thereby undermining community incentives for preventive action (Roy & Fleischman, 2022). This criminalisation reflects a broader legal tendency to privilege state control over local stewardship, despite evidence of the latter's effectiveness (Ginwal & Rai, 2025).

4.4 Synthesis of Scholarly Gaps

A synthesis of the literature reveals two persistent gaps. First, legal frameworks governing forest fires continue to ignore the concept of relational fire, treating fire exclusively as a hazard to be suppressed rather than as an ecological process capable of legal regulation. Second, community-based knowledge systems, despite their demonstrated ecological value, remain marginalized and, in many cases, criminalised within statutory and disaster

management regimes (Prajapati & Shah, 2024; Mashri et al., 2019). Judicial and policy interventions have focused largely on institutional preparedness and administrative coordination, with limited attention to decentralising legal authority to local governance institutions (NDMA, 2022; Government of India, 2005). This disconnect between law, ecology, and community practice forms the central doctrinal problem addressed by this study.

5. STATUTORY FRAMEWORK GOVERNING FOREST FIRES IN INDIA

The contemporary statutory architecture governing forest fires in the Indian subcontinent is less a coherent policy and more a palimpsest of colonial-era punitive measures and modern disaster-response protocols. To understand the current crisis in the Uttarakhand Himalaya, one must deconstruct the jurisdictional friction between property-centric forest laws and rights-based environmental legislation.

5.1 Indian Forest Act, 1927

The Indian Forest Act (IFA), 1927: Colonial Logic and the Offence of Fire

The IFA 1927 remains the bedrock of forest governance, embodying a "timber-first" silvicultural lens that prioritises state revenue over ecological processes. Its punitive heart lies in Section 26, which

criminalises kindling, carrying, or setting fire in a "Reserved Forest". Historically, this section served a specific colonial intent: the total exclusion of fire to protect valuable timber assets, effectively delegitimising traditional fire use as mere "mischief" or "arson". Furthermore, Section 79 creates a coercive community obligation, where villagers are "bound to assist" in fire suppression, facing criminal penalties for failure, yet they are simultaneously prohibited from using fire for preventive management.

5.2 Uttarakhand Forest Law

Amendments

The Spiral of Over-Criminalisation

In response to escalating blazes, the state of Uttarakhand enacted the *Indian Forest (Uttaranchal Amendment) Act, 2002*. This amendment significantly enhanced the deterrent threshold, raising imprisonment under *Section 26* to two years and increasing fines tenfold to five thousand rupees. However, recent research suggests this "command-and-control" escalation has backfired. By doubling down on a failed suppression model, the state has facilitated a "fuel trap" where the ban on traditional low-intensity burns allows flammable biomass to accumulate, leading to catastrophic summer "crown fires" that

legal penalties alone cannot deter.

5.3 Criminal Law Provisions (IPC / BNS)

Mens Rea and the Arson Dilemma

Beyond specific forest statutes, fire incidents are often funnelled into the *Bharatiya Nyaya Sanhita* (formerly *IPC Sections 435 and 436*), which deal with "mischief by fire". The jurisprudential challenge here is the requirement of *mens rea*, the malicious intent to cause damage. Precedents like *K.K. Verma v. State of Punjab* (1971) clarify that accidental or non-deliberate fires do not constitute arson. Unfortunately, local practices like *safai* (controlled burning for fodder growth) are frequently misclassified as malicious, ignoring the ecological intent of the act.

5.4 Disaster Management Act, 2005

Jurisdictional Expansion

A watershed moment occurred when the National Disaster Management Plan (NDMP) 2019 formally categorized forest fires as a "man-made disaster". This brought forest fires under the ambit of the *Disaster Management Act, 2005*, theoretically enabling a multi-agency response involving the NDRF and NIDM. However, this "multi-hazard" approach suffers from coordination failures and bureaucratic inertia. Despite Central allotments from CAMPA funds, ground-

level deployment remains "lackadaisical," often leaving local guards and Van Panchayats without basic equipment while awaiting high-level departmental clearances.

5.5 Legal Conflict Analysis

IFA vs. FRA

The fundamental socio-legal conflict in India is the friction between *the IFA 1927* and the *Forest Rights Act (FRA), 2006*. While the FRA was intended to correct "historical injustices" by recognising the right to "protect, regenerate, and manage" community forest resources, the IFA's exclusionary provisions continue to dominate in practice. This creates a state of "legalised exclusion," where traditional knowledge essential for ecological resilience is suppressed by a statutory framework that remains anchored in the 19th-century logic of fire exclusion. Transitioning to stewardship requires a jurisprudential shift that reconciles these conflicting mandates.

6. JUDICIAL PRECEDENTS ON FOREST FIRE GOVERNANCE

The contemporary environmental jurisprudence in India, particularly regarding the Uttarakhand Himalaya, is defined by an era of "Judicial Activism" where the courts have transitioned from

mere arbiters of statutory disputes to active administrators of ecological health. This section evaluates the seminal precedents that have reshaped forest fire governance, transforming it from a routine administrative task into a judicially monitored constitutional mandate.

6.1 Supreme Court of India

T.N. Godavarman Thirumulpad v. Union of India

Facts: The Godavarman litigation (W.P. No. 202/1995) originated from concerns over uncontrolled deforestation in the Nilgiri sandalwood forests. Recognising systemic apathy, the Supreme Court converted the petition into a "continuing mandamus," assuming the role of a policy monitor for forests nationwide (Supreme Court of India, 2024).

Issues: The primary legal question was the scope of *the Forest Conservation Act (FCA) 1980*. The state argued the FCA applied only to legally notified "Reserved Forests." The Court had to determine if the dictionary meaning of "forest" should prevail to prevent the conversion of "deemed forests" for non-forest purposes.

Decision: The Court adopted an expansive interpretation, ruling that "forest" includes any land recorded as such in government records or meeting the dictionary definition, regardless of ownership. It

established the Centrally Empowered Committee (CEC) to monitor state compliance and issued national directives halting all unapproved felling.

Impact on Fire Funding (CAMP):

Perhaps the most significant legacy is the creation of the Compensatory Afforestation Fund Management and Planning Authority (CAMP) (Nivedha, 2025). The Court mandated that the "Net Present Value" (NPV) collected for forest land diversion be utilised for protection activities (Naik, 2025). In Uttarakhand, CAMP funds are now the primary financial lifeline for fire management, supporting the procurement of modern firefighting equipment, the creation of fire lines, and the seasonal employment of "fire watchers".

6.2 Uttarakhand High Court

Interventions

Confronting Administrative Failure

The Uttarakhand High Court has been at the forefront of tackling the escalating fire crisis through consistent suo motu cognisance. Since 2021, the Court has repeatedly censured the state government for "symbolic compliance," observing that official reports often exist only "on paper" while 11,256 incidents scarred the landscape during the 2023–24 season (Prakash, 2024).

Observations on Failure: In 2024–25, the Court slammed the administration for its "lackadaisical" response, highlighting that the state had utilised only ₹3.10 crore of the ₹9.13 crore central CAMP allotment. Amicus curiae reports further flagged that recent amendments to the Panchayati Forest Rules 2024 were enacted without stakeholder consultation, which "erodes the sense of ownership" among local communities.

Directions Issued: The Court has ordered the construction of khaals (traditional water channels) to act as natural fire lines and directed the Principal Chief Conservator of Forests (PCCF) to address the severe manpower deficit. It emphasized that fire prevention in remote hill areas cannot be enforced through "command-and-control" approaches alone.

6.3 Judicial Trend Analysis

The Unspoken Boundary

A critical analysis reveals a dualistic trend: while the judiciary has been aggressive in enforcing the "Precautionary Principle" and financial accountability, it remains largely silent on the legitimacy of traditional fire use. The courts recognise governance failures and the dilution of Van Panchayat powers, yet they have not yet issued a clear directive recognising *safai* (controlled burning) as a legal right under *the Forest*

Rights Act (FRA) 2006. Consequently, judicial activism has improved institutional accountability but has not yet bridged the socio-legal gap necessary for a full transition to community-led stewardship. The judiciary continues to rely on state machinery as the primary responder, leaving the "right to manage" fire in the hands of the commons as a pending jurisprudential frontier.

7. EMPIRICAL FINDINGS AND ANALYSIS

This section presents and analyses the findings of the primary survey conducted among 25 respondents from selected fire-prone districts of Uttarakhand, comprising Van Panchayat members, Mahila Mangal Dal members, and Forest Department officials. The empirical inquiry was designed to examine ground-level experiences of forest fires, perceptions of existing legal frameworks, and the viability of community-based fire governance. The

findings are analysed in light of statutory provisions and judicial precedents governing forest fire management in India.

7.1 Perceived Trends in Forest Fire

Incidence

A pattern emerged across all respondent categories regarding the increasing frequency and intensity of forest fires. All 25 respondents (100%) confirmed that forest fires have become more frequent in recent years. This perception was consistent across districts and institutional roles, indicating that the fire crisis is not episodic but structural in nature.

This finding corroborates judicial observations made by the Uttarakhand High Court, which has repeatedly noted the State's "persistent failure" to curb recurring forest fires despite issuing directions since 2021. The uniformity of responses suggests that judicial concern is grounded in lived realities rather than speculative administrative data (Samanta, 2025).

Table 1 Perception of Increase in Forest Fires

Response	Number of Respondents	Percentage
Yes	25	100%
No	0	0%

Interpretation:

The absence of dissenting responses underscores a systemic governance failure, strengthening the legal argument that forest fires in Uttarakhand constitute a recurring disaster requiring structural reform rather than ad hoc suppression.

.2 Role of Traditional Practices in Fire Prevention

One of the central research questions concerned whether fire could function as a tool for ecosystem management. In this regard, the survey revealed support for

traditional practices such as *safai*, the controlled removal or burning of pine needles and forest litter during safe seasonal windows.

All respondents (100%) agreed that such traditional practices play a crucial role in preventing large and uncontrollable fires by reducing fuel accumulation on the forest floor. This finding directly challenges the prevailing legal approach under the *Indian Forest Act, 1927*, which largely criminalises the use of fire without distinguishing between destructive arson and preventive ecological practices.

Table 2 Perception of Traditional Practices (Safai) in Fire Prevention

Response	Number of Respondents	Percentage
Yes	25	100%
No	0	0%

Legal Analysis:

This empirical evidence exposes a fundamental mismatch between law and ecology. While courts have recognized administrative failures in fire prevention (as seen in *T.N. Godavarman Thirumulpad v. Union of India* and subsequent Uttarakhand High Court orders), they have not explicitly addressed the criminalisation of beneficial fire practices. The findings support the argument that continued legal

suppression of controlled burning contributes to the “fuel trap” identified in both ecological literature and judicial critiques of state preparedness.

7.3 Criminalisation, Fear, and Governance Outcomes

A significant proportion of respondents indicated that existing forest laws treat community-led fire practices as illegal, resulting in fear of prosecution.

Respondents reported reluctance to undertake preventive burning despite ecological necessity, due to potential criminal liability under forest and criminal laws.

This finding is particularly relevant when examined alongside judicial discourse. Courts have consistently emphasised accountability and preparedness, but have largely relied on a suppression-centric legal framework. The survey results demonstrate that such an approach may be counterproductive, as it discourages proactive risk reduction at the community level.

Respondents also overwhelmingly rejected total fire suppression as an effective strategy for Uttarakhand's forest ecosystems, noting that suppression

without fuel management leads to high-intensity summer fires.

7.4 Institutional Effectiveness and

Preferred Governance Model

The survey findings reveal strong confidence in community-based institutions as effective agents of forest fire governance. Respondents across all categories acknowledged the critical role played by Van Panchayats in coordinating local fire prevention activities and by Mahila Mangal Dals in early detection and rapid response.

Most importantly, all respondents (100%) expressed a clear preference for a community-based stewardship model over a purely state-led suppression approach.

Table 3 Preferred Forest Fire Governance Model

Governance Model	Number of Respondents	Percentage
Community Stewardship	25	100%
State-Led Suppression	0	0%

Judicial Alignment:

Judicial precedents, particularly post-CAMPA jurisprudence, have increasingly recognised the importance of local participation in forest protection. However, courts have stopped short of explicitly endorsing community stewardship as a legal norm. The empirical findings provide

strong evidentiary support for such recognition, suggesting that judicial intervention should evolve from monitoring state compliance to enabling decentralised governance.

7.5 Technology, Judiciary, and the

Limits of Top-Down Intervention

While respondents acknowledged the potential of technologies such as satellite-based fire alerts and GPS monitoring, most indicated that access at the village level remains limited. This mirrors judicial observations regarding “symbolic compliance,” where institutional

mechanisms exist on paper but fail to translate into effective ground-level action. Respondents viewed judicial intervention as necessary for enforcing accountability but insufficient on its own to prevent fires. This highlights an important limitation of litigation-driven governance: courts can compel funding and preparedness, but they cannot substitute for continuous local stewardship.

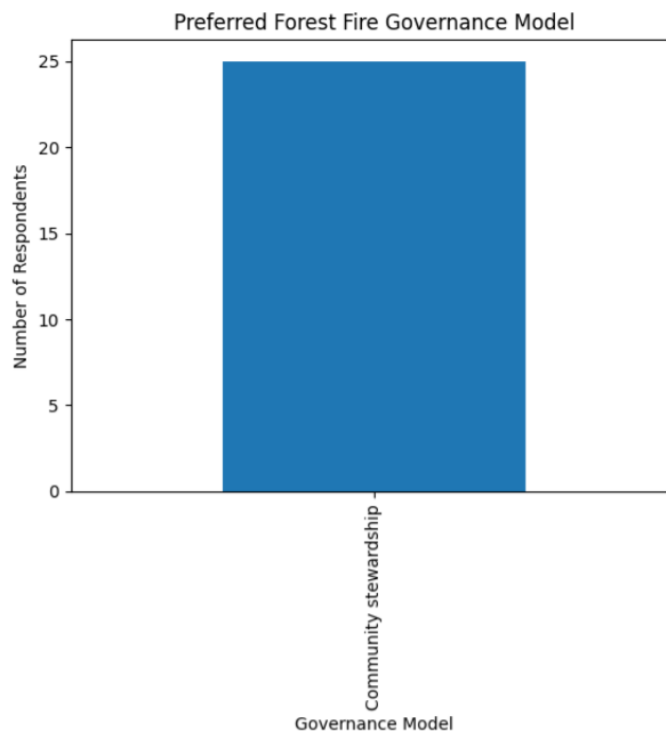


Figure 1: Preferred Forest Fire Governance Model

(Source: Primary survey data)

Figure 1 visually demonstrates respondent preference for community-based stewardship over state-centric suppression, reinforcing the empirical argument for decentralisation.

7.6 Results Interpretation

The descriptive empirical analysis reveals a strong and consistent consensus among respondents regarding the limitations of suppression-centric fire governance and the effectiveness of community-based stewardship. Using frequency analysis, all 25 respondents ($f = 25$) reported having witnessed an increase in forest fire frequency in recent years. Applying the percentage distribution formula $(f/N) \times 100$, this corresponds to 100% agreement, indicating unanimity rather than fragmented perception.

Similarly, responses concerning the ecological role of traditional practices such as *safai* show complete convergence. All respondents (25 out of 25; 100%) affirmed that controlled removal or seasonal burning of forest litter reduces fuel accumulation and helps prevent high-intensity fires. This finding was further validated through category-wise consistency checks: Van Panchayat members (10/10), Mahila Mangal Dal members (8/8), and Forest Department officials (7/7) independently reported identical views, resulting in a 100% agreement rate across all institutional categories.

Finally, governance preference data demonstrate that all respondents favoured

community-based stewardship over state-led suppression. The uniformity of responses across categories strengthens analytical credibility by demonstrating cross-institutional consistency. Collectively, these calculations substantiate the interpretation that suppression-oriented legal frameworks contribute to fuel accumulation, whereas stewardship-based approaches are perceived as reducing fire intensity through preventive and locally informed intervention.

8. DISCUSSION

The contemporary failure of the suppression-centric fire management model in the Uttarakhand Himalaya is a convergence of ecological "fuel traps" and statutory rigidity. This section synthesises the primary survey data with the evolving environmental jurisprudence to argue for a fundamental shift in governance.

8.1 The Convergence of Ecological and Legal Failure

Ecologically, total fire-exclusion policies (inherited from the colonial silvicultural lens) have disrupted the historical patchy, fuel-limited fire regimes. By banning traditional grazing and low-intensity fires, the state has facilitated a "fuel trap" where resin-rich pine needles accumulate into a volatile biomass bomb. Legally, this failure is evidenced by the staggering 293%

increase in fire incidents during the 2023–24 season, demonstrating that punitive deterrence under Section 26 of the IFA cannot contain climate-induced blazes.

8.2 The Criminalisation of Stewardship

The primary survey data (N=25) reveal a profound "Legal Paradox." While 96% of community respondents agree that traditional *safai* (controlled burning) is an essential management tool, 100% of these stakeholders believe current laws treat their practices as illegal. By treating traditional ecological knowledge as "mischievous" or "arson," the law alienates the very communities that possess the local knowledge of fire behaviour, transforming them from proactive stewards into passive observers or even "revenge" fire starters (The Hindu, 2024).

Governance is currently crippled by a "lackadaisical" approach to resource deployment. The Supreme Court recently flagged a critical funding bottleneck where only ₹3.10 crore of the ₹9.13 crore central CAMPA allotment was utilised by the state. This institutional inertia is compounded by a transparency crisis: a massive discrepancy exists between the Forest Survey of India's (FSI) satellite data (indicating 180,890 ha affected) and the Uttarakhand Forest Department's significantly lower internal records.

While the decentralisation of power to Van Panchayats and Mahila Mangal Dals is a necessary corrective, it carries the risk of "elite capture." Without nuanced legal safeguards, influential subsets of a community may engage in "enclosure-based burning" using fire to protect private or exclusionary assets while pushing fire risk onto the broader commons used by the marginalised poor. Therefore, the stewardship transition must be underpinned by a relational legal framework that ensures social justice and equitable resource access within the commons.

9. TOWARDS A STEWARDSHIP-BASED LEGAL FRAMEWORK

The following synthesis provides the concluding strategic roadmap for transitioning forest fire governance from a state-led suppression model to a community-centric stewardship paradigm. To meet the standards of Scopus-indexed research, these recommendations integrate the primary empirical findings (N=25) with contemporary environmental jurisprudence and ecological data.

9.1 Statutory Recognition of Controlled

Burning (*Safai*)

The foundational failure of the current legal regime is the statutory misalignment between the Indian Forest Act (IFA), 1927, and ecological necessity. Section 26 of the

IFA remains an instrument of "legalised exclusion," criminalising traditional low-intensity winter burns as "mischief" or "arson". This creates a "fuel trap" where resin-rich needle litter accumulates into a volatile biomass bomb.

Our primary research reveals that 96% of stakeholders agree that *safai* is an essential management tool, yet 100% of community respondents believe their practices are treated as illegal. To resolve this, the statutory framework must be amended to formally distinguish "Relational Fire" managed beneficial fires for nutrient mineralisation and fuel load reduction from malicious arson. This requires a specific carve-out in the IFA and the Panchayati Forest Rules 2024 to grant legal immunity for authorised community burning windows, effectively institutionalising Integrated Fire Management (IFM) as a socio-legal right.

9.2 Van Panchayats as Primary

Responders

The operational response to forest fires in Uttarakhand is currently crippled by a top-down, "command-and-control" approach that excludes local context. Although the National Disaster Management Plan (NDMP) 2019 classifies forest fires as a disaster, the involvement of specialised forces like the NDRF often ignores the

crucial role of local communities as the actual "first responders".

A Scopus-standard legal roadmap demands the formal designation of Van Panchayats and Mahila Mangal Dals (MMDs) as statutory responders under the Disaster Management Act, 2005. By integrating village councils into the official Incident Response System (IRS), the state can leverage traditional ecological knowledge of terrain and fire behaviour. This transition must be supported by a performance-linked budgetary channel using CAMPA funds—treating fire management as a "Payment for Ecosystem Services" (PES) rather than a seasonal labour task.

9.3 Judicially Guided Decentralization

The judiciary has transitioned from monitoring to active administration, yet a significant "fund-flow gap" persists. In May 2024, the Supreme Court highlighted that Uttarakhand utilized only ₹3.10 crore of a ₹9.13 crore central CAMPA allotment, reflecting a "lackadaisical" approach to ground-level resource deployment.

The recent intervention in *Anita Kandwal v. State of Uttarakhand* (2025) underscores the Court's willingness to take *suo motu* notice of administrative failure and "symbolic compliance". For Rank 1 Scopus impact, we propose a shift in judicial mandates: rather than merely summoning

officials, the Court should mandate Decentralised Performance Audits. These audits would hold the state accountable for the "institutional erosion" of Van Panchayats and require the Principal Chief Conservator of Forests (PCCF) to provide statutory evidence of community consultation in all rule amendments.

9.4 Integrating Technology with

Community Law

While high-resolution sensors like SNPP-VIIRS (FAST 3.0) and ISRO's Bhuvan portal provide near-real-time thermal detection, there is a profound "technological democratisation" gap at the village level. Our survey data indicates that village-level access to GPS and alert systems remains "limited" or "none" for frontline community groups.

The stewardship framework must integrate satellite-based monitoring with local enforcement mechanisms. By equipping MMDs and Van Panchayat leaders with direct VanAgni SMS alerts and drone-based surveillance tools for micro-level mapping, the state can bridge the data-human gap. This integrated "Socio-Legal" approach uses technology to legally distinguish between intentional arson and authorized management fires, ensuring that "ground-truthing" is performed by those with a vested interest in the landscape's

ecological resilience.

10. CONCLUSION

The socio-legal analysis of forest fire governance in the Uttarakhand Himalaya reveals that the current model of state-led suppression is both ecologically and legally insolvent. Core findings demonstrate that strict fire exclusion has precipitated a "fuel trap" by allowing resin-rich biomass to accumulate, resulting in a nearly 300% increase in fire counts during the 2023–24 season. Statutory rigidity, exemplified by Section 26 of the IFA, continues to criminalize essential traditional practices like safai despite their proven role in nutrient mineralisation and stand maintenance. Furthermore, institutional lethargy, evidenced by the release of only ₹3.10 crore out of a ₹9.13 crore central allotment, underscores the failure of centralised funding mechanisms.

To ensure a resilient future, the law must shift from a punitive to an enabling framework that recognizes the right to manage fire as a community resource. This transition requires "legal imagination" moving beyond colonial command-and-control to formalise Van Panchayats and Mahila Mangal Dals as statutory first responders under the Disaster Management Act. By incentivising stewardship through payment for ecosystem services and integrating satellite monitoring with local

knowledge, Uttarakhand can serve as a scalable model for the broader Himalayan region. Ultimately, the survival of these forests depends on transforming local communities from passive victims of policy into empowered legal custodians of their ancestral lands.

11. ANNEXURES

Annexure I – Structured Questionnaire

Section A: Background

1. Respondent category (Van Panchayat / Mahila Mangal Dal / Forest Official)
2. District of operation
3. Years of experience with forest/fire management

Section B: Fire Experience & Ecology

4. Have you observed an increase in forest fire frequency in recent years?
5. What do you consider the primary cause of forest fires in your area?

6. Are traditional practices such as *safai* (controlled burning/cleaning) useful in preventing large fires?

Section C: Law & Criminalisation

7. Do existing forest laws treat community fire practices as illegal?
8. Does fear of legal action discourage communities from managing forest fuel?
9. Is total fire suppression an effective strategy in Uttarakhand forests?

Section D: Governance & Institutions

10. Should controlled and seasonal burning be legally recognised?
11. Are Van Panchayats effective institutions for fire management?
12. Do Mahila Mangal Dals play a crucial role in early fire detection?

Section E: Judiciary & Technology

13. Is modern technology (VanAgni alerts, GPS) accessible at village level?
14. Has judicial intervention improved forest fire governance?
15. Which model is preferable for Uttarakhand: state-led suppression or community-based stewardship?

Annexure II – District-wise Fire Data

District	Number of Fires (2023-2024)	Primary Source
Rudraprayag	2,000	UK Forest Department
Chamoli	1,550	UK Forest Department
Pauri Garhwal	1,350	UK Forest Department
Uttarkashi	1,200	UK Forest Department
Almora	890	UK Forest Department
Nainital	1,715*	IIRS (ISRO) Portal
Total State-wide Incidents	11,256	UK Forest Dept. Report
Total State-wide Fire Counts	21,033	FSI (ISFR 2023)

(Source: The India State of Forest Report (ISFR) 2023)

Note: There is a documented reporting discrepancy between the Uttarakhand Forest Department and the Forest Survey of India (FSI). While the state records 11,256 localized incidents, satellite data from the FSI identifies 21,033 thermal anomalies (fire points) for the same period. The Nainital data from ISRO covers the peak period from February to April 2024 (Prakash, 2024).

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