

BOOK OF ABSTRACTS

International Conference

Forest fire ecology and restoration strategies in mountain regions

22nd – 23rd October 2026
Faculty of Engineering, Aula Magna
Campus NOI Techpark Bozen-Bolzano

Organised by

unibz Kompetenzzentrum für Nachhaltigkeit
Centro di Competenza per la Sostenibilità
Competence Centre for Sustainability

unibz Fakultät für Agrar-, Umwelt- und Lebensmittelwissenschaften
Facoltà di Scienze agrarie, ambientali e alimentari
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Facoltà di Ingegneria
Faculty of Engineering

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LICENCE AND RESPONSIBILITY

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ACCREDITATION

Event accredited by the Order of Agronomists and Forestry Doctors of the Autonomous Province of Bolzano.

COVER

Forest burnt by the 2025 wildfire above Laces/Latsch (Val Venosta/Vinschgau, South Tyrol). UAV image, 27 August 2025.

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About the conference

The International Conference “Forest fire ecology and restoration strategies in mountain regions” brings together researchers, practitioners, land managers and conservation specialists working on wildfire ecology, fire-risk management, ecological restoration and biodiversity conservation in mountain environments.

Fire regimes in the Alps and in other mountain regions are changing. Longer fire-weather seasons, the abandonment of traditional land use and disturbance interactions such as windthrow and bark-beetle outbreaks are bringing wildfires to forests that have rarely experienced them. Understanding how mountain forests respond to fire, and how their recovery can be supported, is therefore becoming a priority for science and management alike.

The programme is organised in five thematic sessions – fire ecology and forest recovery; resilience of mountain forests under changing fire regimes; air quality, monitoring and fire impacts; post-fire management and forest regeneration; and fire behaviour and post-fire effects – followed by a round table with experts from research, forestry services and civil protection. On the second day, a field trip leads participants to the fire-affected landscapes of Laces/Latsch and St. Martin am Kofel in Val Venosta/Vinschgau, burnt in 2025.

The conference is organised in collaboration of the Competence Centre for Sustainability, the Faculty of Agricultural, Environmental and Food Sciences and the Faculty of Engineering of the Free University of Bozen-Bolzano.

DATES	22nd – 23rd October 2026
VENUE	Faculty of Engineering, Aula Magna – Campus NOI Techpark, Via Bruno Buozzi 1, Bozen-Bolzano
MODALITY	In presence
LANGUAGE	English
ORGANISERS	Camilla Wellstein, Enrico Tomelleri, Andrea Gasparella, Gianmarco Tavilla (Free University of Bozen-Bolzano)
ACCREDITATION	Order of Agronomists and Forestry Doctors of the Autonomous Province of Bolzano

Scientific programme

22nd October 2026

08:30	Registration	
09:00	Welcome and opening ceremony	
	Session 1: Fire Ecology and Forest Recovery	
09:15	KEYNOTE PRESENTATION **Scott Franklin** (University of Northern Colorado) Forest Fire Ecology and Restoration Strategies in Colorado, USA	1
	Session 2: Resilience of Mountain Forests under Changing Fire Regimes	
09:50	KEYNOTE PRESENTATION **Davide Ascoli** (University of Torino) European beech and fire: resilience across past, present and future fire regimes	2
	Oral communications	
10:20	**Stefano Chelli et al.** (University of Camerino) From ashes to old-growth forests: how do long-term changes in forest structure affect understory plant diversity in Yellowstone National Park?	3
10:35	**Dubravka Dujmović Purgar et al.** (University of Zagreb) When fire meets invasion: invasive alien plants and fire related risks	4
10:50	Short break	
	Session 3: Air Quality, Monitoring and Fire Impacts	
11:15	KEYNOTE PRESENTATION **Andrea Gasparella** (Free University of Bozen-Bolzano) From Forest Fires to Indoor Air: Pollutants, Paths, Health and Protection	5
12:00	**Marco Baratieri** (Free University of Bozen-Bolzano) Biomass thermochemical conversion and atmospheric dispersion of combustion emissions	6
12:15	**Gianmarco Tavilla & Camilla Wellstein** (Free University of Bozen-Bolzano) Wildfires in South Tyrol: past, present, future, and implications for vegetation	7
12:30	**Cinzia Passamani et al.** (University of Torino) Disturbances and salvage logging reshape fuel complex, fire behaviour and hazard in Norway spruce forests of the Province of Bolzano	8
12:45	Lunch break	
	Session 4: Postfire Management and Forest Regeneration	
14:00	KEYNOTE PRESENTATION **Thilo Heinken** (University of Potsdam) Forest regeneration following large wildfires under different management regimes: a perspective from the Northeast German Lowlands	9
	Oral communications	
14:30	**Flavio Taccaliti et al.** (University of Padova) Dolomites open-air FireLab: first year results from a test on assisted migration, biological legacies, and propagule types	10
14:45	**Alessandro Paletto et al.** (CREA, Research Centre for Forestry and Wood, Trento) Post-fire forest ecosystem restoration in Italy: insights from a national survey and the Monte Pisano case study	11

15:00	**Sara Pischedda et al.** (University of Udine) Beyond species richness: divergent patterns of taxonomic and functional diversity in long-term post-fire succession	12
15:15	**Max Nooijen et al.** (Free University of Bozen-Bolzano) Microclimate and soil moisture dynamics along a fire severity gradient in an alpine forest ecosystem	13
15:30	**Nela Jantol et al.** (Karlovac University of Applied Sciences) Assessing landscape heterogeneity around burned forest areas using LiDAR in Karlovac County, Croatia	14
	Session 5: Fire Behaviour and Post-fire Effects	
15:45	KEYNOTE PRESENTATION **Stefan Mayr** (University of Innsbruck) Post-fire effects on tree hydraulics of European forest species	15
16:20	**Emanuele Gissi** (Italian National Fire and Rescue Service) Operational deployment of wildfire simulation models: limitations and future perspectives	
16:35	Coffee break	
17:00	Round Table Scott Franklin, Matteo Vischi, Marco Pietrogiovanna, Giovanni Giovannini, N.N.	
19:00	End of Day 1	

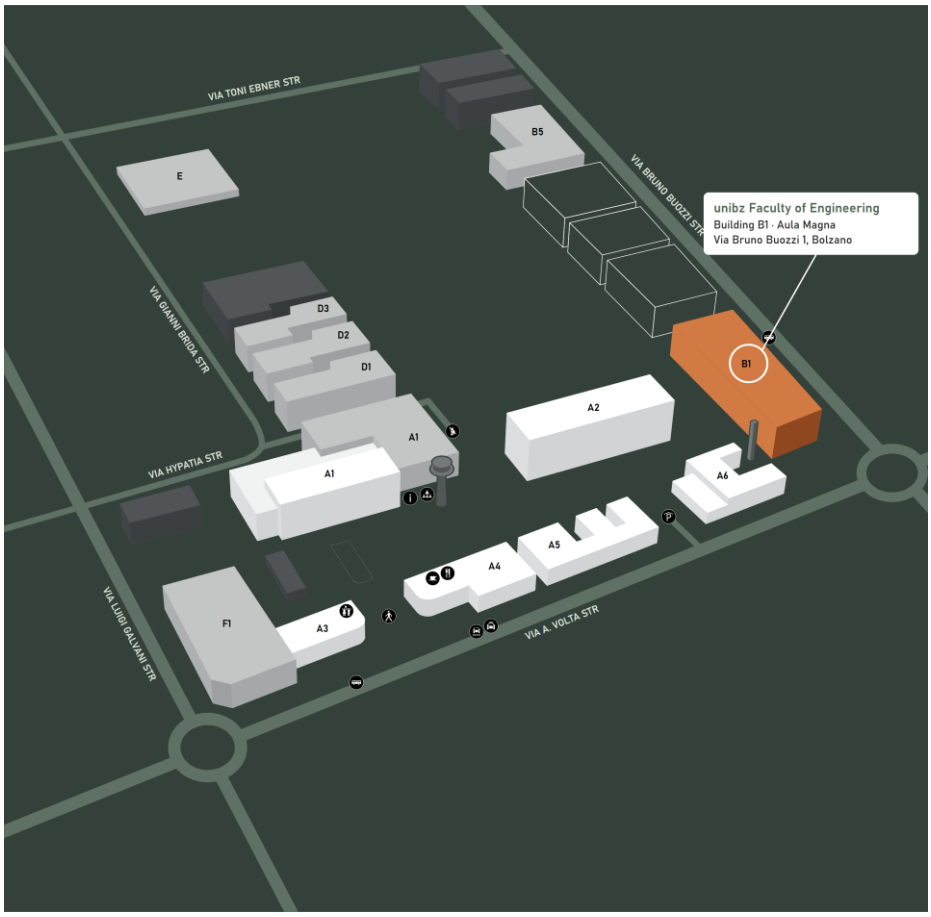
23rd October 2026

09:01	Departure by train (Bolzano main train station)
10:34	Meeting point at Laces/Latsch train station
10:45	Field trip (Latsch / St. Martin area) Guided excursion to Alpine fire-affected landscapes (approx. 4 hours, packed lunch in the field)
14:45	Closing remarks
15:00	Return by train to Bolzano

Venue

The conference takes place in the Aula Magna of the Faculty of Engineering of the Free University of Bozen-Bolzano (unibz), in building B1 of the NOI Techpark.

Faculty of Engineering, building B1 – Via Bruno Buozzi 1 / Bruno-Buozzi-Straße 1, 39100 Bozen-Bolzano
NOI Techpark main entrance – Via Alessandro Volta 13/A, 39100 Bozen-Bolzano



Site plan of the NOI Techpark.

Getting there

By train	Bolzano Sud/Bozen Süd railway station is about a 10-minute walk from the NOI Techpark.
By bus	Line 111 connects the NOI Techpark with the city centre, the main railway station and Bolzano Sud/Bozen Süd; lines 111-S, 6, 10A and 10B also stop in front of the main entrance in Via Volta.
By car	Underground car park with entrance/exit in Via Volta (east side of building A5), € 1.50 per hour; free street parking in Via Alessandro Volta and Via Ipazia.
By bike or on foot	Two entrances in Via Volta (next to the NOISTERIA restaurant) and one in Via Ipazia; bike racks are available on site.
Field trip, 23 October	Departure by train from Bolzano main station at 09:01; meeting point at Laces/Latsch train station at 10:34.

SESSION 1 · FIRE ECOLOGY AND FOREST RECOVERY

KEYNOTE PRESENTATION · 22 OCTOBER 2026, 09:15

FOREST FIRE ECOLOGY AND RESTORATION STRATEGIES IN COLORADO, USA

Scott Franklin

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Wildfire is a fundamental ecological process in Colorado's forests, influencing forest structure, species composition, regeneration, and landscape heterogeneity. However, prolonged fire exclusion in the 20th century and other anthropogenic influences have altered forest structure, particularly in ponderosa pine and dry mixed-conifer ecosystems, increasing tree density and reducing structural heterogeneity. We examined coarse woody debris through FIA data and a 25-year post resampling of plots, finding that coarse woody debris increased in all but one plot that experienced definite fuel management and was primarily associated with growing season precipitation. The altered structure, along with other factors, has led to varying levels of severity that may negatively impact forest regeneration. We tested this idea by examining Douglas-fir (*Pseudotsuga menziesii*) regeneration along a fire severity gradient and found significantly less regeneration on sites with higher severity burns. Mitigation strategies increasingly emphasize mechanical thinning, prescribed burning, and their combination to reduce stand density and modify fuel loads. Studies show thinning followed by prescribed burning altered forest structure toward conditions associated with historical surface-fire regimes, demonstrating the potential for integrated treatments to restore fire-dependent ecosystems. While this is true, we also found an increased level of available fuels in mastication sites compared to thinning sites, but not when compared to the fire site, especially class 3 and class 4 woody biomass. Collectively, our and others' studies indicate that effective restoration should recognize historical variability rather than seek uniform forest conditions, combine thinning with fire where appropriate, and incorporate long-term monitoring to evaluate ecological responses.

SESSION 2 · RESILIENCE OF MOUNTAIN FORESTS UNDER CHANGING FIRE REGIMES

KEYNOTE PRESENTATION · 22 OCTOBER 2026, 09:50

EUROPEAN BEECH AND FIRE: RESILIENCE ACROSS PAST, PRESENT AND FUTURE FIRE REGIMES

Davide Ascoli[1], Marco Conedera[2]

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Large and recurrent fires in European beech forests (*Fagus sylvatica* L.) raise concerns about their resilience under changing disturbance regimes. We examine beech fire ecology across past, present and future fire regimes by integrating palaeoecological evidence, a 15-year research program on mortality, gap dynamics, fecundity, regeneration and restoration, and projections of future fire recurrence. Holocene records document beech persistence and dominance under fire regimes generally characterized by intervals exceeding 100 years and low- to moderate-severity fires. Contemporary observations reveal mixed-severity patterns shaped by fuels and topography, with convective heating on steep slopes potentially producing localized high-severity patches. Surviving trees maintain seed production, while delayed mortality, influenced by tree size and growth habit, fire injuries and fungal infections, progressively expands gaps and creates spatial and temporal light gradients favourable to regeneration. Recruitment occurs mainly within 15 years after fire, depending on masting and gap formation. Severely burned patches may recover where seed sources, moisture and facilitation by pioneer vegetation support establishment. Juvenile resprouting can sustain persistence after repeated low- to moderate-severity fires. However, extensive severe burning, drought and short fire intervals can constrain recovery. Tree instability and deadwood accumulation increase windthrow and subsequent fire risk, while protection against gravitational hazards may be impaired 5–30 years after moderate- to high-severity fire. Future projections indicate increasing recurrence, particularly along southern and southeastern range margins. Understanding these mechanisms can guide post-fire management that preserves seed sources, supports regeneration and uses fire-created gaps as opportunities for closer-to-nature silviculture, strengthening resilience of European beech forests.

SESSION 2 · RESILIENCE OF MOUNTAIN FORESTS UNDER CHANGING FIRE REGIMES

ORAL PRESENTATION · 22 OCTOBER 2026, 10:20

FROM ASHES TO OLD-GROWTH FORESTS: HOW DO LONG-TERM CHANGES IN FOREST STRUCTURE AFFECT UNDERSTORY PLANT DIVERSITY IN YELLOWSTONE NATIONAL PARK?

Stefano Chelli[1], Zhengxue Zhu[2], Robert W. Pal[3], Luciano Ludovico Maria De Benedictis[1], Marco Cervellini[1], Roberto Canullo[1], Giandiego Campetella[1]

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[2] Research Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry, Beijing, China

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The increasing frequency and intensity of wildfires are having a profound and lasting impact on forest structure, succession, and biodiversity. Understanding these processes is essential for predicting successional trajectories and developing management and conservation strategies. We aim to investigate the long-term (> 140 years) dynamics of understory plant diversity following wildfires and assess how post-fire changes in forest structure influence these diversity patterns in Lodgepole pine forests of Yellowstone National Park, USA. We surveyed 25 forest stands representing five post-fire successional stages, including old-growth forests. At each plot, we measured forest structure, canopy features, and plant diversity (richness, composition, and between-community beta diversity) to assess how post-fire succession shapes forest structure-diversity relationships. Additionally, we assessed the association between successional stages and beta-diversity. Species richness and compositional diversity exhibited a U-shaped pattern along post-fire successional stages, with greater diversity observed in the early and late phases of forest succession. Between-community beta diversity did not show any trend with increasing temporal distance. Species turnover was the dominant component of beta diversity variation. Forest structure and canopy features influenced plant diversity. Deadwood amount and heterogeneity-related variables (e.g., variability of Leaf Area Index) had a positive relationship with species richness and compositional diversity. These findings suggest that maintaining or enhancing structural heterogeneity through deadwood retention, canopy structural complexity, and variability in tree size can promote plant diversity in fire-affected forests. Conservation strategies should recognize the ecological value of early and late successional stages and avoid management practices that reduce structural complexity.

KEYWORDS Beta diversity, Compositional diversity, Forest succession, Temporal distance decay.

SESSION 2 · RESILIENCE OF MOUNTAIN FORESTS UNDER CHANGING FIRE REGIMES

ORAL PRESENTATION · 22 OCTOBER 2026, 10:35

WHEN FIRE MEETS INVASION: INVASIVE ALIEN PLANTS AND FIRE RELATED RISKS

Dubravka Dujmović Purgar, Vesna Židovec, Mihael Kušen, Jana Šic Žlabur, Anamarija Peter, Martina Šipek Penić

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Wildfires alter vegetation structure, resource availability and competition, shaping post-fire vegetation recovery. Where invasive alien plant species (IAPs) are already present, their pre-fire occurrence may represent a factor affecting post-fire succession by persisting, expanding or modifying fuel characteristics, and fire behaviour. Traits such as vegetative regeneration, resprouting and rapid colonisation may enable some IAPs to persist or establish following fire. However, the contribution of pre-existing ornamental IAP populations to post-fire invasion remains insufficiently understood.

Within the LIFE OrnamentalIAS project, we assessed alien and invasive plant taxa in public green spaces and private gardens across five counties in north-western Croatia, complemented by an assessment of the Croatian ornamental plant market. The survey recorded 1,142 plant taxa, including 776 alien taxa and 16 classified as invasive within the project assessment. Recorded species possess traits relevant to post-fire persistence or establishment, including *Miscanthus sinensis*, *Robinia pseudoacacia*, *Ailanthus altissima*, *Paulownia tomentosa*, *Solidago canadensis* and *Cortaderia selloana*. These species were recorded across sites, indicating that ornamental populations may represent propagule sources.

Published evidence indicates species-specific responses to fire. *M. sinensis* can regenerate from rhizomes, while *R. pseudoacacia* has strong vegetative regeneration capacity. *P. tomentosa* and *S. canadensis* may benefit from disturbance creating suitable establishment conditions. *A. altissima* may resprout after fire but requires favourable conditions for expansion.

We hypothesise that pre-existing IAP populations may represent an overlooked component of post-fire invasion risk. The LIFE OrnamentalIAS baseline provides a foundation for integrating occurrence data with post-fire monitoring to identify invasion risk and support early detection and management.

KEYWORDS ornamental horticulture; propagule pressure; plant community composition

SESSION 3 · AIR QUALITY, MONITORING AND FIRE IMPACTS

KEYNOTE PRESENTATION · 22 OCTOBER 2026, 11:15

FROM FOREST FIRES TO INDOOR AIR: POLLUTANTS, PATHS, HEALTH AND PROTECTION

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Recent events, from the 2023 and 2026 Canadian seasons that sent smoke across North America and Europe to the 2026 Southeast Asian haze and the 2017 fires in Piedmont, show that wildfire smoke is becoming a recurrent, large-scale exposure, also in the Alps. Using these cases as context, the talk aims to provide guidance on four questions. 1. Impact: landscape fires are associated with about 1.53 million deaths per year worldwide, and in Alpine valleys they add acute peaks to the chronic burden of residential wood heating. 2. Nature of the risks: smoke is a mixture of fine particles rich in organic and black carbon, carbon monoxide, volatile organic compounds and secondary pollutants, whose composition changes with fuel, distance and ageing; per microgram, smoke PM2.5 appears more harmful than generic urban particles. 3. Quantification: how exposure, limit values, health indices and disability-adjusted life years translate concentrations into risk, why standard risk functions may underestimate the burden, and how current Italian, European and international norms, mostly annual or daily, fit episodes that change hour by hour. 4. Intervention: since people shelter indoors, buildings largely determine the dose. An indoor-air-quality approach explains why ventilation, effective against indoor sources, imports outdoor smoke, and quantifies the performance of filtration, filtered recirculation, portable air cleaners, envelope tightness, pressurisation and respirators, together with their limits, including CO_2 build-up and gaseous pollutants. Practical options for homes, schools and public buildings, including clean-air spaces and smoke-ready operating protocols for future events are presented.

SESSION 3 · AIR QUALITY, MONITORING AND FIRE IMPACTS

ORAL PRESENTATION · 22 OCTOBER 2026, 12:00

BIOMASS THERMOCHEMICAL CONVERSION AND ATMOSPHERIC DISPERSION OF COMBUSTION EMISSIONS

Marco Baratieri

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Wildland fires couple biomass thermochemical conversion with atmospheric dynamics, creating challenges for predicting fire propagation and the dispersion of combustion emissions. This talk describes modelling approaches across spatial and temporal scales, focusing on how model selection depends on the processes of interest, intended application and computational resources.

The discussion compares empirical models, e.g. simplified to coupled fire–atmosphere simulations, highlighting trade-off between physical detail, computational cost and operational applicability. Biomass conversion encompasses drying, pyrolysis, ignition, volatile combustion and char oxidation, with stoichiometry, thermodynamics and kinetics providing the foundations for combustion modelling. Simplified approaches estimate fire spread through empirical relationships and represent heat release and emissions as atmospheric source terms. Physics-based models, represent fuel decomposition, combustion, heat transfer and buoyant flow more explicitly, allowing fire propagation and plume development to emerge from interacting processes, although their computational demands limit operational deployment.

The presentation also outlines a coupled framework linking atmospheric conditions, fire dynamics and air quality. Through examples, it explains how meteorological fields drive fire behaviour while fire-generated heat and moisture modify the local atmosphere. Fuel characteristics, terrain, land cover and ignition information support simulations that provide fire spread, intensity, plume height and pollutant concentration fields. Finally, it is shown how atmospheric chemistry extensions connect emission estimates with pollutant transport and transformation.

Overall, the presentation provides a framework for the understanding of the different modelling approaches for operational forecasting, risk assessment and detailed research, emphasising the importance of matching process representation and resolution to the question and the intended application.

SESSION 3 · AIR QUALITY, MONITORING AND FIRE IMPACTS

ORAL PRESENTATION · 22 OCTOBER 2026, 12:15

WILDFIRES IN SOUTH TYROL: PAST, PRESENT, FUTURE, AND IMPLICATIONS FOR VEGETATION

Gianmarco Tavilla[1,2], Camilla Wellstein[1,2]

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Wildfire research in Europe focuses mainly on the Mediterranean region, but Alpine fire regimes are different (Conedera et al. 2018). In South Tyrol (Italian Alps), larger fires burn mostly in late winter and spring. We analysed the provincial fire record from 1977 to 2025, burn severity and vegetation response for the 2025 fires, and fire weather under CMIP6 scenarios. In 49 years, a total of 1,152 fires burned 1,135 ha of forest, however, the number of fires shows no trend. The burnt area decreased until 2024 and peaked sharply in 2025. Fires of 2 ha or more peak from February to April in the dry inner valleys, and 17 of 20 have a human or undefined cause. In 2025, the fires of Prato allo Stelvio (Prad am Stilfserjoch) and Laces (Latsch) burned 237 ha, with 57% and 49% of the scars at moderate to high burn severity, mostly in Scots pine forest (*Pinus sylvestris* L.). Sixteen months after the Prato allo Stelvio fire, 30% of the burnt tree cover still had no canopy. The burnt slope became patchier; however, this structural change says nothing about species richness, which field surveys can assess. Additionally, snow free fire weather days between January and June have increased by about three per decade since 1981, and they are projected to rise from 20 today to 32 by midcentury (SSP3-7.0) and to 45 to 55 by 2100 under high emissions. Moreover, weather poorly predicts fire numbers, which depend on ignitions. Instead, weather shapes the area burned. By midcentury, the forest left without canopy per decade could be 1.7 to 3.4 times the present one. From a management point of view, prevention in South Tyrol will need to cover a longer season, and restoring pine forests may become a recurring task.

REFERENCES

Conedera, M., Krebs, P., Valese, E., et al. (2018). Characterizing Alpine pyrogeography from fire statistics. Applied Geography, 98, 87–99.

KEYWORDS burn severity, fire ecology, fire regime, fire weather, Sentinel 2

SESSION 3 · AIR QUALITY, MONITORING AND FIRE IMPACTS

ORAL PRESENTATION · 22 OCTOBER 2026, 12:30

DISTURBANCES AND SALVAGE LOGGING RESHAPE FUEL COMPLEX, FIRE BEHAVIOUR AND HAZARD IN NORWAY SPRUCE FORESTS OF THE PROVINCE OF BOLZANO

Cinzia Passamani[1], Anna Candotti[2], Enrico Tomelleri[2], Rachele Gamba[1], Gian Luca Spadoni[1,3], Marco Pietrogiovanna[4], Imelda Ellecosta[4], Davide Ascoli[1]

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Climate change is increasing the frequency and severity of forest disturbances, with potential implication for their interactions. Italian Alpine forests have recently been affected by windthrow and bark beetle outbreaks, followed by extensive salvage logging, which alter the fuel complex with potential effects on fire behaviour at stand and landscape scales. This study analysed the dynamics occurring in Norway spruce forests of the Province of Bolzano. Five conditions were compared: unmanaged bark beetle-affected stands at 2-5 months and one year after the outbreak, salvage-logged areas after windthrow and after bark beetle outbreaks, and undisturbed control stands. Surface and canopy fuels were characterized by field data and laser scanning, to build fuel models and characterize fire behaviour at stand scale. These models were integrated into the FlamMap model to simulate pre- and post-disturbance fireline intensity and burn probability, which were combined to assess fire hazard across the province. At the stand scale, fuel loads increased in bark beetle stands, due to greater fine fuels accumulation, and in salvage-logged areas due to the presence of slash, leading to higher simulated fire spread and intensity. In bark beetle-affected stands dead crowns showed a reduction in crown bulk density, increasing torching potential and lower crowning potential. At the landscape scale, fireline intensity increased in disturbed areas, whereas burn probability increased also in a buffer zone around them, resulting in greater fire hazard. Results suggest that disturbance interactions and their implications for fire hazard should be considered in fire risk assessment.

REFERENCES

Beetz, K., Marrs, C., Busse, A., Poděbradská, M., Kinalczyk, D., Kranz, J., & Forkel, M. (2025). Effects of bark beetle disturbance and fuel types on fire radiative power and burn severity in the Bohemian-Saxon Switzerland. Forestry: An International Journal of Forest Research, 98(1), 59–70.

Hicke, J.A., Johnson, M.C., Hayes, J.L., & Preisler, H.K. (2012). Effects of bark beetle-caused tree mortality on wildfire. Forest Ecology and Management, 271, 81–90.

KEYWORDS disturbance interactions, fuel models, landscape modelling, Terrestrial Laser Scanner

SESSION 4 · POSTFIRE MANAGEMENT AND FOREST REGENERATION

KEYNOTE PRESENTATION · 22 OCTOBER 2026, 14:00

FOREST REGENERATION FOLLOWING LARGE WILDFIRES UNDER DIFFERENT MANAGEMENT REGIMES: A PERSPECTIVE FROM THE NORTHEAST GERMAN LOWLANDS

Thilo Heinken

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Recent wildfires have burned large forest areas in NE Germany. Within the interdisciplinary research project PYROPHOB the ecological effects of wildfires and subsequent forest management strategies were investigated in two large wildfire areas, with the aim of formulating practical recommendations for the effective restoration of post-fire forest areas. In my talk, I will present key findings from this project, but also include results from other wildfire areas to get a thorough picture on ecosystem effects and forest regeneration of burned pine forests.

We analysed the effects of fire severity and post-fire forest management (different levels of salvage logging and soil disturbance) on vegetation. Intensive forest management experienced increased heat and drought stress and reduced nutrient availability. The species richness was lower on completely salvage logged sites, but tree biomass recovered also on sites with intensive forest management. Tree regeneration was mainly driven by the wind-dispersed pioneer species European aspen. Unlike the aspen, birch and Scots pine decreased with increasing distance to the next potential seed tree. A comparison with other wildfire areas reveals that the natural regeneration of pine forest stands in Central Europe is always driven by birch, aspen, willow and Scots pine, but the proportions and total amounts are highly variable, making forecasts difficult. Regeneration of ground vegetation mainly occurred from wind-dispersed seeds and the soil seed bank. Many colonising species are identical across a wide geographical range, while others appear to depend on local diaspore availability. Vegetation in our study areas changed rapidly in the short period of up to six years after the fire. The temporary increase in nutrient availability dissipates quickly, probably due to nutrient leaching, and the recolonisation of salvage-logged plots was slower.

Natural tree regeneration should be favoured over artificial regeneration due to the mostly high densities and the effective growth of pioneer trees. Where possible, dead trees should be left on site due to their positive impact on the microclimate, nutrient supply and biodiversity.

SESSION 4 · POSTFIRE MANAGEMENT AND FOREST REGENERATION

ORAL PRESENTATION · 22 OCTOBER 2026, 14:30

DOLOMITES OPEN-AIR FIRELAB: FIRST YEAR RESULTS FROM A TEST ON ASSISTED MIGRATION, BIOLOGICAL LEGACIES, AND PROPAGULE TYPES

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Forest fires in the Alps were historically limited by intensive land use, but with the current socio-economic conditions, and accelerating climate warming, new fire regimes are appearing, raising questions about the ecological trajectories of Alpine forests. Forest restoration techniques are being evaluated to keep the provision of ecosystem services stable in burnt areas, but their implementation is still guided by limited quantitative evidence. Following a previous study (Taccaliti et al., 2026), we tested the use of several restoration ecology approaches in a case study in the Dolomites, in order to support local administrations and practitioners in preparing for future post-fire restoration. Assisted migration (McLachlan et al., 2007) of *Quercus pubescens* Mill., the use of biological legacies as nursery sites (Franklin et al., 2000), and two alternative types of propagation (seeds, transplants from nursery) have been applied in one of the largest burnt areas on record in the Dolomites (Pale di San Lucano fire in 2018). Survival and height growth of propagules have been monitored at the end of every season for one year; in addition, sensors for air temperature and illuminance have been deployed together with the propagules, to check the micro-environmental conditions around them. The first results show an increase in both height growth and survival for propagules near biological legacies, mirrored by a buffering of the environmental conditions. The results provide direct, transferable knowledge to local land managers, and aim at reducing the impact of business-as-usual practices on a fragile ecosystem such as a burnt forest.

REFERENCES

Franklin, J.F., Lindenmayer, D., MacMahon, J.A., McKee, A., Magnuson, J., Perry, D.A., Waide, R. and Foster, D. (2000). Threads of continuity. Conservation biology in practice, 1(1), pp.8-16.

McLachlan, J.S., Hellmann, J.J. and Schwartz, M.W. (2007). A framework for debate of assisted migration in an era of climate change. Conservation biology, 21(2), pp.297-302.

Taccaliti, F., Vitali, A., Marzano, R., Garbarino, M., Urbinati, C. and Lingua, E. (2026). Biological legacies facilitate post-fire active management by improving the micro-sites. *Forest Ecology and Management*, *600*, p.123297.

KEYWORDS forest restoration, artificial regeneration, *Quercus pubescens*, microclimate

SESSION 4 · POSTFIRE MANAGEMENT AND FOREST REGENERATION

ORAL PRESENTATION · 22 OCTOBER 2026, 14:45

POST-FIRE FOREST ECOSYSTEM RESTORATION IN ITALY: INSIGHTS FROM A NATIONAL SURVEY AND THE MONTE PISANO CASE STUDY

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Wildfires are one of the most critical drivers of degradation in Mediterranean and mountain forests in Europe, causing loss of soil stability and biodiversity, and demanding effective, long-term restoration strategies. This study shows the results from a survey on forest restoration in Italy, focusing on post-fire interventions, complemented by a case study from Monte Pisano (Calci municipality, Tuscany region). Of 56 restoration projects surveyed, ten targeted wildfire-affected ecosystems ranging from coastal to mountain sites up to 1,100 m. Data collected were timeframes, ownership, forest habitat, degradation causes, objectives, treatments, and monitoring indicators. Fire-affected ecosystems were mainly Mediterranean pine forests (70% of projects), oak-dominant forests, and sweet chestnut stands, with interventions oriented towards ecosystem recovery, biodiversity enhancement and fuel load reduction through thinning, deadwood management and the encouragement of native broadleaves. The Monte Pisano case study targeted a severely compromised, fire-degraded mosaic of Mediterranean pine forest, holm oak forest, and maquis. Completed in 2020–2021 with regional funding, the restoration interventions combined intensive thinning of maritime pine and shrub vegetation, retention of organic material, and planting of native broadleaves (holm oak, downy oak, sessile oak, manna ash, cork oak, viburnum; buckthorn and strawberry tree) from specialized nurseries. A semiannual monitoring plan tracks uneven-aged structure, native-species dominance, and tree species diversity, with the strongest expected benefits for structural diversity, lying deadwood, and C-stock. Findings indicate a shift towards active restoration aimed at converting fire-vulnerable pine monocultures into species-rich mixed broadleaf forests, with direct relevance for restoration planning in Alpine and other mountain regions.

KEYWORDS Biodiversity conservation; Active restoration; Broadleaf conversion; Ecological resilience; Long-term monitoring

SESSION 4 · POSTFIRE MANAGEMENT AND FOREST REGENERATION

ORAL PRESENTATION · 22 OCTOBER 2026, 15:00

BEYOND SPECIES RICHNESS: DIVERGENT PATTERNS OF TAXONOMIC AND FUNCTIONAL DIVERSITY IN LONG-TERM POST-FIRE SUCCESSION

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Plant taxonomic and functional dimensions often recover asynchronously following major ecological disturbances. These decoupled trajectories can drive functional redundancy or prolonged ecological lags. Yet, how such multidimensional recovery patterns manifest across distinct vegetation layers over decadal timescales remains a knowledge gap (Purschke et al., 2013). We evaluated long-term post-fire recovery across overstory and understory to uncover the mechanisms driving community recovery toward mature reference states. We investigated a 50-year post-fire chronosequence comprising 25 low-severity burned stands and 5 unburned controls within temperate-Mediterranean in italian Karst transition forests (Friuli Venezia Giulia, NE Italy). We quantified trajectories of alpha diversity, functional identity, basal area and beta-diversity components (turnover vs. nestedness). Post-fire recovery was strongly layer-decoupled. Low-severity fire preserved overstory tree survival, maintaining taxonomic and functional identity via resprouting persistence, with tree recovery manifesting primarily through basal area increase. Conversely, the understory followed a directional trajectory: species and functional richness declined over time, while evenness increased alongside a functional shift from resource-acquisitive to resource-conservative strategies. Beta-diversity decomposition revealed that temporal community reorganization was driven by species and trait turnover rather than nestedness. Functional dissimilarity to reference stands was consistently lower than taxonomic dissimilarity, suggesting successional functional redundancy. Post-fire recovery is inherently multidimensional and layer-decoupled. At low severity, the overstory rapidly stabilizes its taxonomic composition, acting as a structural filter that shapes understory trait distribution and species assembly. Notably, ecosystem functions recover ahead of full taxonomic re-assembly (successional functional redundancy). Evaluating post-fire recovery requires an integrated assessment of taxonomic, functional and compositional dynamics rather than species richness alone (Mori et al., 2018).

REFERENCES

Mori, A. S., Isbell, F., & Seidl, R. (2018). β-Diversity, Community Assembly, and Ecosystem Functioning. *Trends in Ecology & Evolution*, *33*(7), 549–564. https://doi.org/10.1016/j.tree.2018.04.012

Purschke, O., Schmid, B. C., Sykes, M. T., Poschlod, P., Michalski, S. G., Durka, W., Kühn, I., Winter, M., & Prentice, H. C. (2013). Contrasting changes in taxonomic, phylogenetic and functional diversity during a long-term succession: Insights into assembly processes. *Journal of Ecology*, *101*(4), 857–866. https://doi.org/10.1111/1365-2745.12098

KEYWORDS community assembly; beta diversity; vegetation-layer decoupling

SESSION 4 · POSTFIRE MANAGEMENT AND FOREST REGENERATION

ORAL PRESENTATION · 22 OCTOBER 2026, 15:15

MICROCLIMATE AND SOIL MOISTURE DYNAMICS ALONG A FIRE SEVERITY GRADIENT IN AN ALPINE FOREST ECOSYSTEM

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Climate-driven changes in heat and drought are intensifying wildfire frequency and severity, threatening alpine forest ecosystems. Whilst post-fire degradation is widely recognized, studies integrating microclimate and soil properties along a severity gradient remain scarce. Because mountain environments feature pronounced topography and a mosaic of microclimates, understanding how these variables shift together is critical for evidence-based management of post-fire alpine forest stands.

This study investigated microclimatic conditions across intact, moderately damaged and severely burned forest in St. Martin im Kofel, Italy (fire date: 06.03.2025, extension approximately 100 ha). Soil temperature and moisture were measured in situ, across the severity gradient using TOMST TMS-4 sensors. Additionally, soil properties were characterized through laboratory analysis of collected soil samples.

Preliminary results revealed that fire severity significantly altered post fire microclimate, water dynamics and soil conditions. Mean soil temperature at 8 cm depth was 5.2 °C higher in burned than intact forest ($p < 0.001$), while soil moisture content differed significantly ($p < 0.001$).

After rainfall, burned soils also wetted and dried faster than intact soils, indicating a reduced hydrological buffering capacity. Laboratory analyses further indicated a distinct decline in organic carbon and nitrogen content, alongside an increase in soil pH and electrical conductivity. Together, by integrating microclimatic shifts, water dynamics, and soil properties, these preliminary findings illustrate how fire severity reshapes local environmental conditions, providing a step towards better understanding how such dynamics alter the habitat requirements for alpine forest recovery.

KEYWORDS European Alps, Post disturbance recovery, substrate parameters, woodland ecosystems

SESSION 4 · POSTFIRE MANAGEMENT AND FOREST REGENERATION

ORAL PRESENTATION · 22 OCTOBER 2026, 15:30

ASSESSING LANDSCAPE HETEROGENEITY AROUND BURNED FOREST AREAS USING LIDAR IN KARLOVAC COUNTY, CROATIA

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Forest fires are an emerging threat in Karlovac County, Croatia, a historically fire-marginal region where 177 forest fire events were recorded between 2016 and 2026. Understanding how forest structure and landscape composition relate to fire occurrence is essential for prevention and restoration planning, yet fine-scale structural data are rarely linked to fire records. This study outlines an ongoing initiative connecting national airborne LiDAR data (acquired in 2022/2023) with forthcoming UAV-based LiDAR surveys developed within the INVESUM project (Karlovac University of Applied Sciences), which compares classical field inventory, optical, multispectral and LiDAR methods for monitoring forest habitats. As a first step, 250 m buffers were generated around selected fire points and intersected with a national LiDAR-derived forest density classification (open, moderate, dense canopy). Preliminary results show dense forest cover dominating most fire buffers (mean 39%, up to 92% of buffer area), while open and moderate classes remain comparatively marginal, pointing to canopy structure as a factor worth investigating further. From point cloud data from the 2022/2023 campaign, detailed land-use classes (forest, shrub, grassland, buildings, roads, water) around selected forest fire points will be derived. Then landscape heterogeneity around burned areas will be analyzed. The analysis is expected to show whether surroundings of forest fires are structurally more homogeneous or more fragmented and to identify landscape configurations associated with fire occurrence. This will provide a national-LiDAR-based basis for prioritizing preventive forest management in similarly structured stands.

KEYWORDS remote sensing, fire risk assessment, spatial buffer analysis, INVESUM

SESSION 5 · FIRE BEHAVIOUR AND POST-FIRE EFFECTS

KEYNOTE PRESENTATION · 22 OCTOBER 2026, 15:45

POST-FIRE EFFECTS ON TREE HYDRAULICS OF EUROPEAN FOREST SPECIES

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Global change causes increased frequencies and intensities of forest fires worldwide. Trees surviving fires provide important ecosystem services, but fire-induced damage can increase the risk of dieback, even years after the fire event. The talk examines the long-term effects of fire on the hydraulic system of trees, focusing on both non-structural and structural damages caused by fire and heat. Atmospheric conditions during fires can trigger the immediate formation of xylem embolism in some species, particularly under drought stress. Heat can also alter xylem structures, potentially reducing hydraulic safety and/or hydraulic efficiency. In the field, electric resistivity tomography enables assessment of post-fire stem damage, which corresponds well to bark thickness and thermal properties. A better knowledge of fire effects and fire resistances with respect to tree hydraulics will improve our understanding of fire injuries and post-fire survival of trees under current and future conditions.

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