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EVERY ECOSYSTEM NEEDS SOME DISTURBANCE REGIME

Ecosystem Restoration on Marginal Lands

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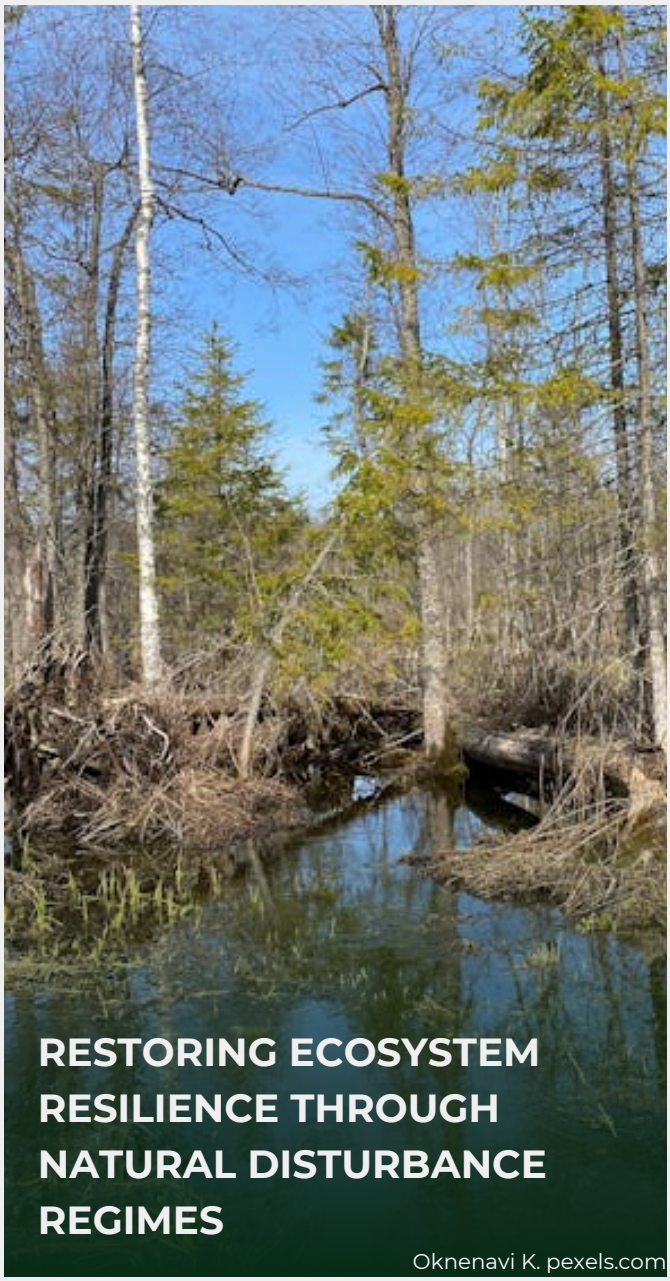
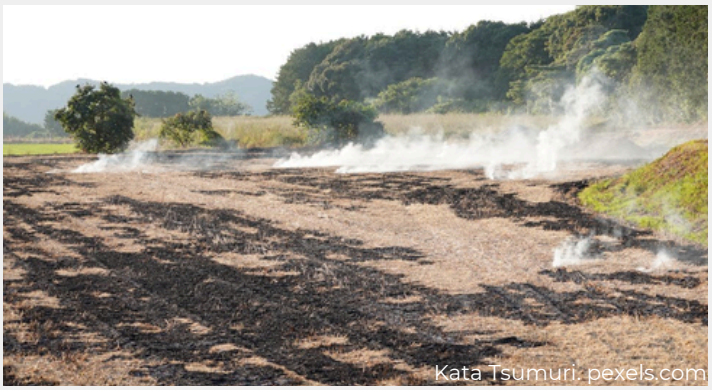
Disturbances like wildfires, floods, avalanches, and pest outbreaks are commonly viewed as disruptive forces, but in reality, they are vital to maintaining healthy ecosystems. These events promote biodiversity, facilitate nutrient cycling, and enhance ecosystem resilience. Anthropogenic activities have substantially modified natural disturbance regimes—either by intensifying them, particularly in agricultural landscapes, or by suppressing them through various land-use practices. However, such approaches often undermine resilience. A properly functioning disturbance regime strengthens ecosystems. Ecosystems deprived of natural disturbances become more vulnerable to larger disruptions, with detrimental consequences for biodiversity and human communities.

KEY RECOMMENDATIONS

- **Allow natural disturbances:** Designate non-intervention zones where natural processes like fires or floods occur unimpeded.
- **Mimic disturbances when needed**: Reintroduce fire regimes, restore rivers, and enhance wetland connectivity.
- **Education and awareness:** Actively engage local communities by addressing their concerns and raising awareness to shift public perception of natural disturbances as essential ecological processes rather than threats.
- **Monitor and involve the public:** Use existing mechanisms for reporting and involve citizens in review processes.
- **Set clear restoration targets:** Define habitat-specific goals and outcomes in national restoration plans.
- **Ensure funding and collaboration:** Leverage EU funds (LIFE, CAP, ERDF) and build partnerships across sectors.



European ecosystems—including forests, grasslands, and wetlands—rely on periodic disturbances for renewal and species diversity. Suppressing these natural processes has repeatedly led to biodiversity loss, increased vulnerability to extreme events, and overall ecosystem degradation.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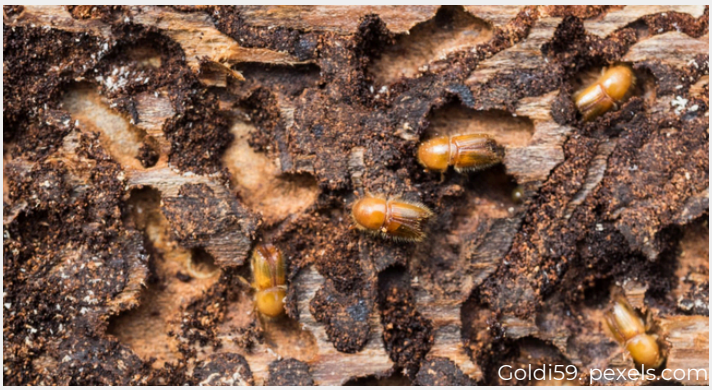
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RESEARCH AND RESULTS

In the Białowieża Forest, efforts to suppress bark beetle outbreaks and prevent tree falls disrupted natural ecological cycles, ultimately weakening forest resilience. More recent approaches that allow such disturbances to occur naturally have contributed to improved ecosystem health and adaptability (Samojlik et al., 2016).

In southern Europe, prescribed burning (PB) and strategic grazing have been reintroduced to reduce wildfire risk and restore fire-adapted landscapes. PB is particularly effective at reducing surface fire intensity for up to a decade, although its ability to mitigate crown fires under extreme weather conditions is limited (Fernandes et al., 2013). Nonetheless, PB plays an important role in maintaining habitat heterogeneity and supporting species of conservation concern in abandoned farmlands and regenerating forests (Brotons et al., 2008); (Moretti et al., 2008). In heathland ecosystems, PB has been shown to reduce shrub height by 62% and fuel loading by 44%, resulting in a 78% decrease in fire intensity under similar weather conditions (Vega et al., 2010).

The Danube Delta illustrates the ecological and socio-economic benefits of controlled flooding and rewilding. These efforts have restored aquatic biodiversity and key bird habitats previously degraded by dam construction.

Additionally, sustainable practices such as wildlife watching and regulated harvesting of fish and wild meat provide important income sources for local communities (Rewilding Europe, n.d.).

A similar approach in the Upper Rhine Valley, Germany, combined controlled flooding with the application of Bacillus thuringiensis israelensis (Bti) for effective floodwater mosquito control. Flooding stimulates larval hatching, while Bti treatments achieve over 90% mortality within one week (Gerstle et al., 2024).

The Isar-Plan in Munich demonstrates the multifunctional benefits of combining water retention with river renaturation. This initiative significantly enhanced flood protection, water quality, biodiversity, and recreational use along the Isar River. Critical to its success was the active involvement of stakeholders and conflict mediation processes (European Environment Agency, n.d.).

Research from the Făgăraș Mountains highlights the ecological value of infrequent but severe natural disturbances. Forest management practices that mimic these patterns have proven effective in restoring biodiversity and enhancing ecosystem resilience (Silva et al., 2010).

In Sweden, national parks provide further evidence of the long-term benefits of natural disturbances such as storms and wildfires. Historical disturbances were cited as influential factors in the designation of 37% of the country's 30 national parks, creating "delayed windows" of opportunity for conservation. However, a paradox remains: while past disturbances are retrospectively valued for their ecological benefits, future disturbances are often viewed negatively unless tightly controlled (Davidsson, 2023).

Natural disturbances are not simply disasters, but vital processes that sustain healthy, resilient ecosystems. With informed planning and adaptive management, we can reduce risks and support biodiversity. Engaging and educating communities is key to turning disruption into renewal.

MANAGING RISK, RECOVERY, AND PUBLIC TRUST IN DISTURBANCE-BASED MANAGEMENT

Managing Concerns About Allowing Natural Disturbances

Concerns about allowing or mimicking natural disturbances are valid, but they can be addressed through careful planning and risk management. Successful examples—such as prescribed burns in southern Europe, controlled flooding in the Danube Delta, and the restoration of fire regimes in Sweden's national parks—demonstrate that well-designed interventions can deliver ecological benefits while minimizing risk. When tailored to specific ecological and socio-economic contexts, these actions allow natural processes to strengthen ecosystem resilience without placing communities or landscapes in harm's way.

Long-Term Resilience vs. Immediate Impacts

Although disturbances like wildfires or floods may appear destructive in the short term, ecosystems are highly resilient and often recover with greater biodiversity and functionality. Research shows that biodiversity can exceed pre-disturbance levels within a decade of major wildfires. This underscores the importance of shifting focus from immediate impacts to long-term ecological recovery. Embracing the regenerative potential of disturbances reframes them as opportunities for renewal, not simply losses to be avoided.

Monitoring and Community Engagement

Implementing disturbance-based management requires robust monitoring and active public engagement. Potential side effects—such as health concerns from increased mosquito populations after flooding—must be anticipated and mitigated. Just as crucial is the social dimension: local communities need to understand, accept, and participate in these processes. Education, transparent communication, and inclusive decision-making help build trust and support. By highlighting the long-term benefits and ecological necessity of disturbances, authorities can promote public stewardship and ensure the success of restoration strategies.

A POLICY ON RESTORING ECOSYSTEM RESILIENCE THROUGH NATURAL DISTURBANCE REGIMES

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CONCLUSION

Integrating close to nature based disturbance management into EU conservation and land-use policies is not only ecologically sound but also **essential for adapting to climate change and reducing long-term environmental risks**. By reintroducing natural dynamics and mimicking them where necessary, we can **restore degraded ecosystems, bolster climate resilience, and secure biodiversity for future generations.**

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