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Editorial: Assessment of anthropogenic pollution as a cause of forest disturbance

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Editorial on the Research Topic
Assessment of anthropogenic pollution as a cause of forest disturbance

Since the industrial revolution, the global economy has developed rapidly, while at the same time, the global population has also grown rapidly. The phenomenon of soil desertification and sudden forest pollution has shifted from being dominated by natural environment to being dominated by human activities. Urbanization and industrialization are continuing to damage forest ecosystems, leading to a reduction in forest land, which will seriously affect the global carbon and nitrogen cycle and pose a huge threat to terrestrial ecosystems (Gurung et al., 2024). The types of anthropogenic pollution are complex, including substances that damage the functions of organisms, such as heavy metals and polycyclic aromatic hydrocarbons, as well as material phenomena that affect soil function and microbial community structure, such as abnormal carbon and nitrogen cycling in soil (Lorenz and Granke, 2009; Xie et al., 2020; Łyszczarz et al., 2021; Elrys et al., 2023). According to statistics, the global per capita forest area has decreased by more than 60% in the past 60 years, affecting 1.6 billion people worldwide, especially in all forest dependent developing countries. Both natural and human factors can affect the sustainable development of forests (Flores et al., 2024). Among them, the pollution caused by human interference to forests is long-term and difficult to self-repair (Gong et al., 2021; Łyszczarz et al., 2021).

Vegetation, as an important component of terrestrial ecosystems, is influenced by both natural environment and human activities. Clarifying the driving mechanisms of vegetation change is of great significance for surface ecological protection and achieving sustainable development goals. Xu et al. used net primary productivity (NPP) to analyze the spatiotemporal variability of vegetation dynamics in East Africa over the past 20 years and its correlation with climate factors. In addition, they combined the use of partial derivative analysis models to analyze different scenarios to distinguish the relative contributions of climate and human factors to NPP changes. Precipitation is the most positively contributing factor among all climate factors, while temperature has a significant negative contribution. In addition, human activities contribute more to the increase of NPP than climate change, and climate change has a greater impact on the decrease of NPP than human activities.

Studying carbon sources/sinks in desert ecosystems is of great significance for improving ecological degradation in desert regions. NPP and net ecosystem productivity (NEP) are important indicators for evaluating carbon storage in ecosystems, which can reflect the response of terrestrial ecosystems to climate change. Feng et al. used vegetation data, meteorological data, and improved CASA models to estimate the NPP and NEP in the Yulin region (a typical desertification reversal area in Maowusu sandy land) over the past 20 years. This study identified the spatiotemporal characteristics of NPP and NEP and their relationship with temperature and precipitation.

Agricultural protective forests play a positive role in ensuring food production and agricultural ecological security. The absence or degradation of protective forest structures may lead to a weakening of their protective effects. The maintenance and management system of protective forests has addressed these potential deficiencies. Deng et al. used the random forest algorithm to classify land cover in ZY-3 images, and validated the results using nine uniformly distributed training sample regions in the entire region. This method achieved a correct recognition rate of 94.9% within the training area.

Vegetation phenology can reflect vegetation climate interactions and carbon sink changes in ecosystems, which is crucial for understanding the temporal and spatial variability of vegetation phenotypes and driving climate determinants. Dang et al. analyzed the spatiotemporal changes of photosynthetic phenotypes extracted based on solar induced chlorophyll fluorescence (SIF) and green phenotypes extracted based on enhancement vegetation index (EVI). The results indicate that photosynthetic phenols and green phenols are influenced by the same main factors. The greenness and photosynthetic phenology in spring are highly consistent with pre-season temperature and soil texture, while the greenness and photosynthetic phenology in autumn are slightly different from pre-season temperature and soil texture. This study will help to better understand the differences between vegetation greenness and changes in photosynthetic phenology, as well as their responses to climate factors.

This Research Topic emphasizes the specific impact of human activities on forest ecosystem functions, highlighting the enhancement of forest ecosystem functions through improving carbon sources and sinks and protecting forest systems. This helps to improve the interference of human activities on forest ecosystems and provides important scientific evidence for preventing forest environmental degradation and mitigating climate change.

Author contributions

YLi: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. KL: Investigation, Writing – review & editing. ZJ: Investigation, Supervision, Writing – review & editing. YLiu: Investigation, Writing – review & editing. MF: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Elrys, A. S., Uwiragiye, Y., Zhang, Y., Abdel-Fattah, M. K., Chen, Z. X., Zhang, H. M., et al. (2023). Expanding agroforestry can increase nitrate retention and mitigate the global impact of a leaky nitrogen cycle in croplands. *Nat. Food* 4, 109–121. doi: 10.1038/s43016-022-00657-x

Flores, B. M., Montoya, E., Sakschewski, B., Nascimento, N., Staal, A., Betts, R. A., et al. (2024). Critical transitions in the Amazon forest system. *Nature* 626, 555–564. doi: 10.1038/s41586-023-06970-0

Gong, P., Xu, H., Wang, C., Chen, Y., Guo, L., and Wang, X. (2021). Persistent organic pollutant cycling in forests. *Nat. Rev. Earth Environ.* 2, 182–197. doi: 10.1038/s43017-020-00137-5

Gurung, K., Field, K. J., Batterman, S. A., Poulton, S. W., and Mills, B. J. W. (2024). Geographic range of plants drives long-term climate change. *Nat. Commun.* 15:1805. doi: 10.1038/s41467-024-46105-1

Lorenz, M., and Granke, O. (2009). Deposition measurements and critical loads calculations, monitoring data, results and perspective. *iForest-Biogeosci. For.* 2:11. doi: 10.3832/ifor0478-002

Łyszczarz, S., Lasota, J., Szuszkiewicz, M. M., and Błońska, E. (2021). Soil texture as a key driver of polycyclic aromatic hydrocarbons (PAHs) distribution in forest topsoils. *Sci. Rep.* 11:14708. doi: 10.1038/s41598-021-94299-x

Xie, Z., Yang, J., Huang, Q., and Yang, Y. (2020). Occurrence of heavy metals and polycyclic aromatic hydrocarbons in typical used mineral oil from China, implications for risk management. *Environ. Sci. Pollut. Res.* 27, 33065–33074. doi: 10.1007/s11356-020-09515-4