

SOIL ACIDITY AND VEGETATION CHANGES FOLLOWING STRIKE UAV IMPACTS

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All ecosystems on Earth are subject to anthropogenic pressure, making it crucial to assess its impact on natural dynamics. The concept of hemeroby has evolved into the evaluation of anthropogenic influence through the degree of anthropotolerance, which enabled the development of an improved 18-point scale. Given the complexity of directly measuring the energetic parameters of ecosystems, the use of synphytoindication methods based on species distribution patterns along tolerance gradients is considered a promising approach. This is especially relevant in the context of the armed conflict in Ukraine, which, in addition to human and economic losses, has caused large-scale environmental degradation, destruction of natural ecosystems, and a reduction in their ecosystem services. Military activities involve a combination of anthropogenic factors – shelling, landmines, and the movement of heavy machinery – each of which affects specific habitat components in different ways, requiring scientific analysis, impact assessment, and the development of effective restoration strategies.

This study explores the projected dynamics of vegetation self-regeneration in areas where UAV explosions have altered soil acidity. In such sites, active soil pH ranges from 6.62 to 7.41 (mean 7.14), and exchangeable pH from 6.68 to 7.28 (mean 7.02), likely due to carbonate bedrock exposure in craters. These conditions support early autogenic succession dominated by herbaceous, ruderal, and segetal vegetation. According to the Brown-Blanke system (EcoDBase 5g), these communities span 8 classes, 9 orders, 10 alliances, and 11 associations, with high levels of synanthropization and the dominance of anthropotolerant species.

Stellarietea mediae vegetation occurs where the humus layer is partly preserved, while *Poo compressae–Tussilaginetum farfarae* (*Artemisietea vulgaris*) develops in deep craters. The most widespread is *Agropyretum repentis*, forming on disturbed soils in various post-agricultural or military-impacted environments. Once established, vegetation dynamics are driven more by biotic and abiotic interactions than by the initial explosion. However, thermobaric munitions can destroy soil seed banks, necessitating human-assisted reintroduction of native flora. Elevated nitrogen compounds may also shift succession toward nitrophilous communities. Though self-regeneration is effective, explosion-induced soil changes promote invasive species, potentially destabilizing ecosystems. Therefore, controlling invasives is vital for restoring war-impacted natural landscapes.

Elevated nitrate and ammonium levels may drive vegetation toward nitrophilous phytocoenoses. Although self-regeneration is an efficient restoration strategy, altered soil conditions and niche destruction post-explosion facilitate invasive species colonization. Their establishment can destabilize ecosystems and lead to a catastrophic climax.

Hence, managing invasive species during post-disturbance regeneration is a key priority for the ecological rehabilitation of war-affected landscapes.

Keywords: anthropogenic pressure, synphytoindication, soil pH, vegetation succession, ecosystem restoration