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# СЕКЦІЯ 1. ТЕЗИ З ПРОБЛЕМАТИКИ ТИПОЛОГІЇ, ЕКОЛОГІЇ ЛІСІВ ТА НАБЛИЖЕНОГО ДО ПРИРОДИ ЛІСІВНИЦТВА

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## UKRAINIAN FORESTS AND CLIMATE CHANGE: NATURE-BASED SOLUTIONS FOR INCREASING THE RESILIENCE TO DROUGHT AND WILDFIRE

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The consequences of regional climate change on the future of Ukrainian Forests is uncertain. The uncertainty refers to the impact of climate variability on the natural potential vegetation (including forest) types to evolve, the species composition of forests and their resilience to biotic and abiotic stress factors, such as pests and disease, extreme wind events and wildfires.

Under these circumstances, testing nature-based solutions aimed at enhancing wildfire resilience of natural and planted Scotch pine (*Pinus sylvestris* L.) forests are important. In addition, the conservation and restoration of non-forest (open land) ecosystems of high conservation value, which are threatened by invasion / encroachment of tree cover need additional attention as well. We consider following methodologies could be tested in near future.

**Wildfire risk reduction of pine forest by enrichment with broadleaved species:** Pine forest plantations established in Central Europe during the 19<sup>th</sup> and 20<sup>th</sup> centuries have resulted in the formation of stands that are highly susceptible to fire, i.e. characterized by high wildfire hazard (due to high fuel loads / high loads of easily combustible materials), characteristics of microclimate (rapid desiccation / fuel moisture reduction in periods of precipitation deficits / drought). Experience in Germany reveals that underplanting (under canopy) / enrichment of pure pine stands with

broadleaved species such as beech (*Fagus sylvatica* L.) results in an understory microclimate of higher humidity and a shaded understory characterized by a litter and humus layer of reduced flammability. The experiences gained in Germany could be evaluated and experimental stands in Ukraine established.

**Wildfire risk reduction of pine forest by applying nature-based integration of prescribed burning:** In Ukraine extended areas of lands have been afforested by Scotch pine (*Pinus sylvestris* L.). These stands are located within the natural range of this species (stretching from Scotland in Western Europe to the Far East of the Russian Federation). Similar to Central Europe these forest plantations have been established with up to 30,000 to 40,000 seedlings / ha historically, more recently between 7,000 and 8,000 seedlings / ha, and subsequent silvicultural treatment aiming at producing limbless high-quality lumber. Consequently, these stands are characterized by high fuel loads including ladder-fuels, allowing the development of surface fires and crowning fires of high intensities, especially in the young and middle age classes. In addition to the high wildfire risk these stands are prone to windthrow and windbreak due to the crown shape in higher age classes.

In the natural range of *Pinus sylvestris* in Central Asia (Siberia and adjoining regions of Mongolia, Kazakhstan and Northern China), natural pine forest ecosystem of the “light taiga” have been shaped by recurrent natural (lightning-caused) wildfires. Dendrochronology and stand analyses have revealed that these fires have significantly shaped the formation of open, park-like stands, characterized by solitaire-type of tree stands with low fuel loads and crown shapes. Reduced numbers of individual trees per ha also result in reduced water competition. These features make these open pine stands resilient to wildfires, extreme wind events and drought, especially under continental climate conditions and poor sites.

**Safeguarding biodiversity of open land ecosystems of high-conservation value against invasion of trees and development of forest:** While the protection and securing of forests of Ukraine in a changing climate era will receive high attention, the role of open-land ecosystems, such as grasslands that are providing resting and breeding ground for bird populations,

or dwarf shrub ecosystems like heathlands (e.g., *Calluna vulgaris*) that bear floristic and faunistic habitats of high conservation value. These ecosystems have been created by centuries of intensive land use such as grazing, mowing, biofuel utilization and fire application – practices that have been abandoned in Central Europe, notably in Germany, prescribed fire is increasingly applied to maintain and restore open-land habitats, which are not cultivated any longer, and where prescribed fire is used as a substitution tool for maintaining these valuable open ecosystems. In Germany it has also been proposed and demonstrated that belts of these conservation areas could serve as fuel breaks between forest stands of high wildfire risk. These fuel breaks would avoid to construct and maintain ploughed firebreaks that will expose the mineral soil and thus becoming subject to wind and water erosion.

**Strategic treatment of fuel breaks between forests, agricultural lands and settlements:** The concept of creating open, park-like stands that are intensively treated for fuel reduction (wildfire hazard reduction) would have highest priority at the interface with agricultural lands. Agricultural burnings are a major source of forest fires. The concept of creating open, park-like stands should be concentrated strategically as belts along the agricultural interface and along forest roads used by the public. On these belts specific attention could be given to fuel reduction and intensive thinning / selective cutting by mechanical means and the use of prescribed fire.

An additional option could be tested by creating a silvo-pastoral concept in which these belt would be used as pastures for animal husbandry. In Central and Eastern Europe this concept has been abandoned completely and is generally not accepted by foresters. However, agrosilvo-pastoral land-use concepts are increasingly debated and used in the Mediterranean region (including Southern Europe) and in Western North America. Targeted grazing by livestock (cattle, sheep, goats) would allow a combined land use under canopy shade. Such open forest belt would also be strategically planned around settlements that are located inside forests, such as weekend / datcha and small farm estates. Here the open forest belts would also serve as protection of the settlements because wildfires would be less intense and could be controlled easier as compared to dense stands.