

HEALTH STATUS OF TREE VEGETATION IN FIELD PROTECTION FOREST BELTS IN NORTHEASTERN BULGARIA, AND MEASURES FOR IMPROVEMENT

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(Summary)

The health status of tree species within the system of field protective forest belts (FPFBs) in Southern Dobrudzha was studied in the territories of the State Hunting Enterprise (SHE) Balchik, the State Forestry Enterprise (SFE) Dobrich, and the SFE General Toshevo, where 72% (7668.2 ha) of all field shelterbelts in Bulgaria are situated. The study used a methodological approach that included a representative sample of 190 FPFBs, which largely reflects the species composition, origins, ages, and health conditions of the tree species.

Between 2023 and 2025, a significant decline in the health of the FPFBs was observed. A trend of decline was noted in the belts of *Ulmus minor*, *Acer pseudoplatanus*, *Juglans regia*, *Fraxinus* spp., and *Quercus* spp. The relative share of dead *U. minor* trees increased from 61.6% to 100%, which is associated with a development of tracheomycosis caused by *Ophiostoma ulmi*.

During the study period, trees in *Acer pseudoplatanus* forest belts completely died as a result of a severe disease development caused by *Cryptostroma corticale*. The disease was also found in *A. platanoides* and *A. campestre* belts, where it caused the complete death of the trees. On the dead trees, together with *C. corticale*, the parasitic fungi *Stegonsporium pyriforme* and *Massaria macra* were found for the first time in Bulgaria.

The health condition of *F. angustifolia* is the worst (27.5–80.8% dead and 14.2–40.0% dying trees), followed by *F. americana* (6.5–66.9% dead and 23.5–26.5% dying trees) and *F. excelsior* (11.7–58.4% dead and 24.6–32.2% dying trees). Significant damage was caused by xylophagous insects that damage the stems and branches of the trees: *Hylesinus fraxini*, *Hylesinus crenatus*, *Zeuzera pyrina*, *Cossus cossus*. In recent years, severe damage has also been caused by five species of singing cicadas (Hemiptera: Cicadidae): *Cicada orni*, *Tibicina haematodes*, *Oligoglana tibialis*, *Pagiphora annulata* and *Dimissalna dimissa*. Damage from egg laying by *C. orni*, *T. haematodes* and *D. dimissa* causes the shoots of the attacked trees to dry out, and from egg laying by *O. tibialis* and *P. annulata* – drying out and falling of the leaves. Feeding of the larvae with juices from the roots leads to additional weakening of the ash trees. The high population density of singing cicadas is not only a prerequisite for accelerated weakening and drying of aging trees, but also a serious threat to young saplings during shoot regeneration and reconstruction of degraded field protection forest belts in Northeastern Bulgaria.

The health status of *Q. rubra* is deteriorated by the aggressive development of the fungal pathogen *Biscogniauxia mediteranea*. The relative share of dying and dead trees for the three years of observation increased from 50.8% to 90.8%. Deterioration of the health status under the infection of *B. mediteranea* was also reported in *Q. robur* and *Q. frainetto*. In 2024–2025, a strong deterioration in the health of *Tilia tomentosa* in the field-protective forest belts was recorded as a result of the aggressive development of the fungal pathogen *Biscogniauxia cinereolilacina*.

Twelve species and subspecies of xylophagous insects from four coleopteran families were found in the field protection forest belts: *Gasterocercus depressirostris depressirostris* (Coleoptera: Curculionidae), *Chrysobothris affinis affinis*, *Agrilus graminis graminis*, *A. hastulifer*, *A. laticornis* (Coleoptera: Buprestidae), *Melasis buprestoides* (Coleoptera: Eucnemidae), *Lichenophanes varius* (Coleoptera: Bostrichidae), *Plagionotus detritus detritus*, *Xylotrechus antilope antilope*, *Exocentrus adspersus*, *E. lusitanus* and *Mesosa nebulosa nebulosa* (Coleoptera: Cerambycidae). The predominant part of them is associated with *Quercus* spp. and to a lesser extent with *T. tomentosa* and *J. regia*.

Among the main tree species in the FPFBs, the best health condition was recorded for *Q. cerris* and *G. triacanthos*, although drying and degradation processes were also observed in them. *R. pseudoacacia* is unsuitable as a main tree species due to its low height up to 40 years of age, the short vitality of the seed plantations, and the large number of shoot rotations made; *G. triacanthos* is not managed according to its condition but is legally cut down after 50 years of age and regenerated by shoot, despite its good health and lack of decay even after 60-70 years of age.

New methodological approaches were employed to swiftly gather field data through a mobile application and to thoroughly evaluate the health status of the FPFBs in Southern Dobrudzha. The use of these methodologies provides essential information on the belts' ability to fully perform their protective functions.

PlanetScope data are suitable for monitoring and assessing the health of woody vegetation in forest shelterbelts. The values of the normalised differential vegetation index (NDVI) indicate a higher risk of mortality and decline in trees within *F. angustifolia* belts (NDVI<0.399) due to cicada attacks, while in *Q. cerris* and *G. triacanthos*, trees with physiological weakness are more common (NDVI in the range of 0.400-0.699).