TAFER T1 – Modèles de croissance

Trackside plant growth model: architectural traits involved in the success of different plant biological types on railway embankments

ABSTRACT

The TAFER project aimed to study different aspects of the temporal dynamics of vegetation along linear land transport infrastructures in the Mediterranean region in order to feed realistic and dynamic visualization models and tools over time.
The vegetation surveys on the railway embankments showed that the species that spontaneously colonize the embankments are dominant in the early years following the construction of the infrastructure. Their dominance is further reinforced after a decade, both in terms of number of species and in terms of representation in the vegetation cover. It has also been shown that:
- hydro-seeding with a mixture of seeds of commercial and local species allows to obtain a temporal dynamics of the vegetation in harmony with the natural dynamics;
- after 30 years, the vegetation cover of the mowed part decreases and the bare soil appears whereas a stratification of the unmowed vegetation is observed with the presence of local tree species;
- mowed vegetation flowers earlier and more simultaneously;
- reasoned mowing increases diversity at local level but tends to homogenize vegetation on a wider scale;
The architectural analyzes carried out to define the taxonomic characteristics and the growth forms of species present on the sites, seeded and / or resulting from spontaneous colonization of the embankments, revealed that:
- on road embankments, successive community replacements result in a closing in of the vegetation and is accompanied by differences in the architecture of the dominant species in these communities;
- at the beginning of the succession: the architectural organization tends towards a rapid exploitation of the environment, the axes are little differentiated and little hierarchized, the architectural unit is simple, without regeneration structure, without lateral exploration strategy;
- at the end of the succession, the architectural organization favors vertical exploration, structures of regeneration, a hierarchy of structure, a distribution of the vital functions of plants within the whole architecture and lateral exploration structures.
On the other hand, regarding the underground parts and during the ecological succession, a decrease in the root length per unit of root mass, an increase in the root diameter and a greater morphological diversity were noted. These variations indicate the presence of very fine roots at the beginning of the succession, which are particularly efficient for rapidly exploring and acquiring soil nutrients. On the contrary, the vegetation of the older slopes presents absorption roots with larger diameters, with a lower root-to-root ratio, indicating that roots grow slower but persist longer (resource conservation strategy). There are also more nutrient transport roots.
Finally, the integration of architectural and spatial dynamics vegetation data in the visualization tools used by SYSTRA allowed obtaining realistic 3D renderings of the slopes studied.

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