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Alien invasive plant species pressures on ecological reconstruction process: concept and methods

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INTRODUCTION. Performance of ecological reconstruction process in early stages and the actual pressures made by alien invasive plant species, based on their dispersion and vitality characteristics was assessed. Including a biodiversity monitoring plan for each stage of project development preconstruction, construction and postconstruction and also ecological reconstruction process with zero net loss on biodiversity, current European development projects have a major improvement. Our analysis reflects the importance to correct use of concept and methods to control invasive species. Space and time variability on seasonality, geomorphological parameters (slope and exposition), soils and geological substrate and also target reconstruction habitat impose the specific optimum time and extent to be applied species method to control invasive plant species.

Keywords. Alien invasive plant, ecological reconstruction, biodiversity, Romania

METHODOLOGY. Implementation of environmental management plan (EMP) for infrastructure projects is under eco-management and audit schema (EMAS) regulation at European level. In this respect we have applied the EMAS for infrastructure project and assess the invasive species and control soil erosion environmental assets. We have evaluate more than five European Nature Information system (EUNIS – https://eunis.eea.Europe.eu/index.jsp) habitats and presence of invasive species on ecological reconstruction sites. In table 1 you can see the plot randomly established for comparative analysis on invasive species colonization of ecological reconstruction plots with size of 25mx25m.
Conceptual model approach presented in Figure 3 was applied and test for 25 plots with different condition and will be monitored for 3 years, every month.

Table 1. Plots for optimum time for in site control of invasive species

Plot	Target habitats	Invasive species	Life cycle			Species cover	Inclination	Impact on erosion	Time for control measures
			Life form	Longevity	Flowering time				
P1	E5.4	*Ambrosia artemisiifolia*	T	A	Jul-Aug	10%	< 10%		Jul
P2	E5.4	*Coniza canadensis*	T	A	Jun-Sept	15%	< 10%		Jun
P3	E5.4	*Reynoutria japonica*	G	P	Aug-Sept	20%	< 10%		Jun-Jul
P4	G1.6	*Ambrosia artemisiifolia*	T	A	Jul-Aug	10%	> 30%		Jul
P5	G1.6	*Coniza canadensis*	T	A	Jun-Sept	20%	> 30%		Jun
P6	G1.6	*Reynoutria japonica*	G	P	Aug-Sept	10%	> 20%		Jun-Jul
P7	G1.6	*Erigeron annuus*	T	A/B/P	Jun-Aug	30%	> 30%		Jun
P8	G1.21	*Ambrosia artemisiifolia*	T	A	Jul-Aug	15%	< 10%		Jul
P9	G1.21	*Coniza canadensis*	T	A	Jun-Sept	10%	< 10%		Jun
P10	G1.21	*Reynoutria japonica*	G	P	Aug-Sept	10%	< 10%		Jun-Jul
P11	G1.21	*Impatiens glanduligera*	T	A	Jul-Sept	5%	< 10%		Jul
P12	G1.21	*Erigeron annuus*	T	A/B/P	Jun-Aug	10%	< 10%		Jun
P13	G1.6	*Pteridium aquilinum*	G	P	Jul-Sept	20%	> 30%		Jul
P14	G1.A	*Coniza canadensis*	T	A	Jun-Sept	5%	> 20%		Jun
P15	G1.A	*Reynoutria japonica*	G	P	Aug-Sept	3%	> 20%		Jun-Jul
P16	G1.A	*Pteridium aquilinum*	G	P	Jul-Sept	30%	> 20%		Jul
P17	G1.61	*Erigeron annuus*	T	A/B/P	Jun-Aug	15%	> 20%		Jun
P18	G1.61	*Phytolacca americana*	H	P	Jun-Sept	10%	> 20%		Jun
P19	G1.61	*Pteridium aquilinum*	G	P	Jul-Sept	50%	> 20%		Jul
P20	G1.1	*Ambrosia artemisiifolia*	T	A	Jul-Aug	15%	< 10%		Jul
P21	G1.1	*Phragmites australis*	G(HH.)	P	Jul-Sept	20%	< 10%		Jul
P22	G1.1	*Phytolacca americana*	H	P	Jun-Sept	5%	< 10%		Jun
P23	G1.7	*Ambrosia artemisiifolia*	T	A	Jul-Aug	20%	< 5%		Jul
P24	E2.1	*Ambrosia artemisiifolia*	T	A	Jul-Aug	20%	< 5%		Jul
P25	E2.1	*Erigeron annuus*	T	A/B/P	Jun-Aug	15%	< 5%		Jun
P26	G1.1	*Amorpha fruticosa*	Ph	P	May-Jul	20%	< 10%		May
P27	G1.1	*Robinia pseudoacacia*	Ph	P	May-Jun	20%	< 10%		May
P28	G1.1	*Erigeron annuus*	T	A/B/P	Jun-Aug	30%	< 10%		Jun
P29	G1.1	*Phragmites australis*	G(HH.)	P	Jul-Sept	15%	< 10%		Jul
P30	G1.1	*Helianthus tuberosus*	G	P	Aug-Sept	15%	< 10%		Jun
P31	C2.2	*Asclepias syriaca*	H	P	Jun-Aug	80%	< 10%		Jun
P32	C2.3	*Amorpha fruticosa*	Ph	P	May-Jul	20%	< 10%		May
P33	C2.3	*Robinia pseudoacacia*	Ph	P	May-Jun	15%	< 10%		May

EUNIS Habitat code: C2.2 Surface running water; C2.3 Permanent non-tidal, smooth flowing watercourses; E2.1 Permanent mesotrophic pasturesand aftermath-grazed meadows; E5.4 Moist or wet tall herb and fern fringes and meadows; G1.A Meso- and eutrophic *Quercus, Carpinus, Fraxinus, Acer, Tilia, Ulmus* and related woodland; G1.21 Riverine *Fraxinus-Alnus* woodland, wet at high but not at low water; G1.6 Fagus woodland; G1.61 Medio-European acidophilous *Fagus* forests; G1.1 Riparian and gallery woodland with dominant *Alnus, Betula, Populus* or *Salix*; G1.7 Thermophilous decidous woodland;
Life form: T(Therophyte); G(Geophyte); H(Hemichryptophyte); Longevity: A(Annual); B(Biannual); P(Perennial)
Impact on erosion: the traffic light method, where green means high impact, orange - medium and red – low.
Control measures: Mechanical extraction of AIS before the flowering period together with sowing in the winter season with native species characteristic of the habitat (May-July)

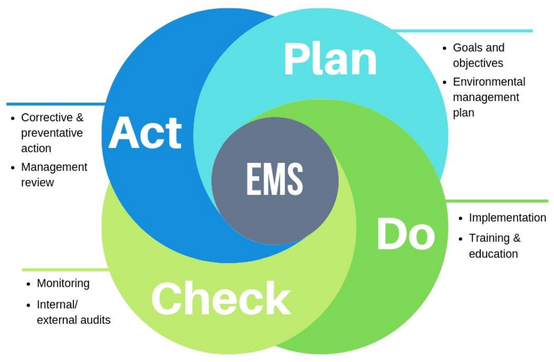

Figure 1. Environmental management systems conceptual framework (https://ec.Europa.eu/environment/emas/index_en.htm)

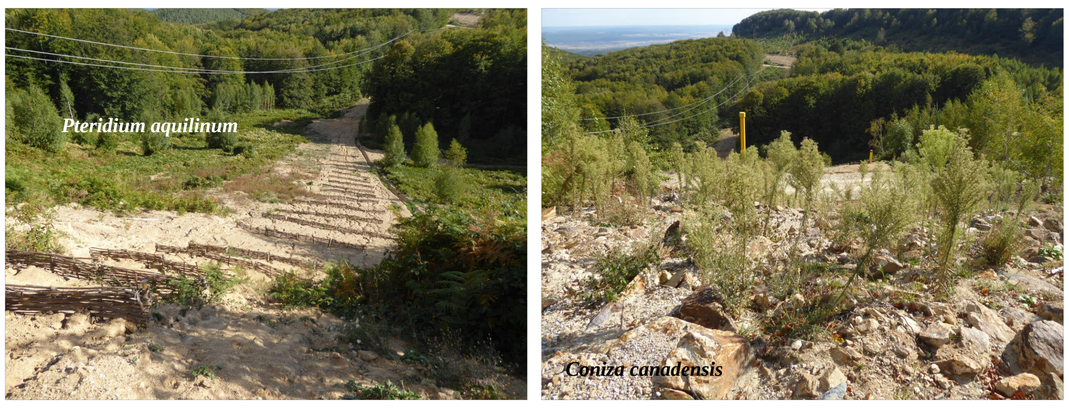

Figure 2. AIS colonisation after ecological reconstruction (I)

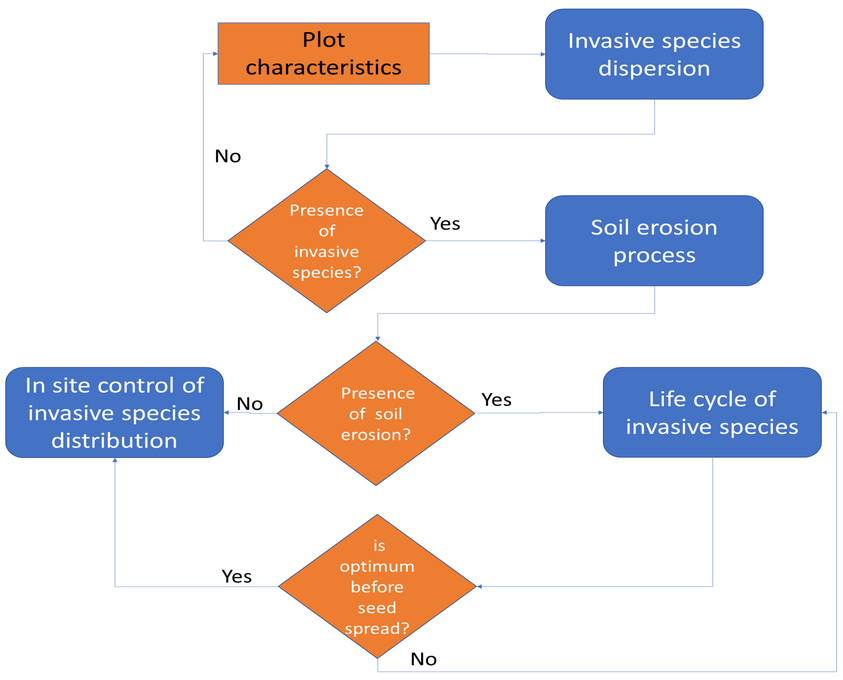

Figure 3. Conceptual model approach for identify optimum time for in site control measure of invasive species

Figure 4. AIS colonisation after ecological reconstruction (II)

CONCLUSIONS. Ecological reconstruction applied for achieving the common species of plants for target habitat can benefit from invasive species dispersion and vitality on short time. The optimum time for intervention and methods applied for in site control of invasive species will increase the success of a ecological reconstruction process.
The conceptual model approach to connect two or more environmental assets can be improved and also need more experimental testing and validation.