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O 36. THE FLOOD CONTROL WITH OUTDOOR PLANTS IN LANDSCAPE RENOVATION

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ABSTRACT: Flooding could occur almost anywhere in the world, including the driest (desert) and most humid (tropical) areas. Floods are defined in many different ways and a great majority of floods actually occur as a result of events that occur within the self-protection mechanism of nature. As long as the flood does not harm the living and non-living environment, it is accepted as a normal "hydrometeological" event. Landscape restoration are also applied in order to respond to problematic areas such as floods. Necessary studies are carried out by considering the principles determined as the basis for all landscapes that have been intervened in the landscape restoration process. Planting is also important in flood control studies. The root structure of the plants, the water requirement of the plant, the attachment of the plant to the soil and survival status is important when flood occurs. In this study information was given about plants which have an important place in flood control.

Keywords: *Landscape repair, Hydrological Planting, Disaster, Outdoor Plants*

INTRODUCTION

Landscape (Nature) restoration is the work that includes restoration (restoration, biorestoration), rehabilitation, or reclamation works applied in natural areas whose structure and function properties have changed as a result of degradation or intervention (Avcı and Sunkar, 2015; Dewan et al., 2006; Gülgün et al., 2014a; Yazici et al., 2018; Yazici, 2019;). Floods and submergence are also disasters that occur with the deterioration of natural areas. In terms of the losses they suffered, floods are natural disasters that cause the most damage in Turkey after earthquakes. Between 1975 and 2009, 695 floods occurred in the country, causing 634 deaths and approximately $ 100 million in economic damage each year. The EU's Flood Risk Analysis and Management Directive aims to reduce the negative effects of floods. However, in order to fulfill the requirements of this directive fully, the laws and approach in Turkey should be developed (Delegation of the European Union to Turkey).

Figure 1. Flood (excerpt: website of the EU Delegation to Turkey)

Plants adapt to their ever-changing environment in many ways, leading to a wealth of growth forms of varying complexity. Certain habitats demand exceptional adaptations, especially when one or more essential resources is scarce or absent. The conditions prevailing in wetlands are an example of such an extreme environment since the highly water-saturated soils exclude oxygen, one of the fundamental requirements for plant life **(**Visser et al. 2003; Bodur, 2018; Ceylan et al., 2015; Gülgün et al., 2014b; Ankaya et al., 2018; Gülgün et al., 2017)**.** The definition of flood and submergence can be made as follows;

Flood is the phenomenon of rising or coming from elsewhere, covering surfaces that are usually dry. Floods are classified as slow-growing, fast-growing and sudden floods, depending on their rate of occurrence. Floods that usually occur within a week or more are called slow floods, floods that occur within a day or two are called rapid floods, and floods occurring within an hour are called sudden floods. In terms of the place of occurrence, floods are called coastal floods, city floods, dry stream floods, dam / pond floods and streams (stream and river) floods (Annotated Disaster Management Terms Dictionary, 2014).

Submergence, on the other hand, is an event where a stream overflows from its bed for various reasons, damaging the surrounding lands, settlements, infrastructure facilities and living creatures, causing a flow size that interrupts normal socioeconomic life in the impact zone (Annotated Disaster Management Terms Dictionary, 2014).

In order to be prepared for floods and submergence, it is necessary to do the following;

General Precautions To Be Taken Against Floods

- For all types of meteorological disasters, early warning units working with radar systems and satellite data, which are used very effectively in determining precipitation areas and precipitation intensities, should be established.
- Rescue units should be established in provinces and districts that will work in coordination with this warning unit.
- Regional radios should inform the public in case of any danger and warn them about the methods to be implemented.
- Local administrations should take care not to settle in stream beds and prevent settlement there.
- The blockages that may occur over time in the stream beds and drainage channels passing through the settlements, as well as in the canals at the points where streams and rivers meet the sea, should be cleaned regularly and it should be ensured that they are always open.
- Stream beds passing through the settlements should be rehabilitated.
- Erosion and floods should be prevented by protecting and increasing the surrounding green areas.
- Terracing and afforestation should be done on slopes with flood risk.
- Since there is a high risk of flooding in the basement floors of the buildings in hollow areas, a basement should not be built in such places and the basement level should be kept high.
- There should be enough rainwater channels in cities and these should be maintained continuously.
- Flood warning signs and warning systems should be learned in our settlements.
- Houses should be insured against flood as in other disasters (Afad)

In this study, information is given about plants that are partially or completely resistant to water in areas where floods and floods occur. It should not be ignored that increasing green areas is another factor that prevents floods and overflows, as green areas need to be protected. Planting studies should be carried out in problematic areas, taking into account the functional characteristics of the plants instead of their aesthetic features. In this study, water resistant trees with roots are emphasized.

MATERIAL and METHOD

In this study, landscape restoration technique, literature research has been done within the scope of disasters. There is not enough data on plants resistant to floods and submergence. In this study, using the study of Güngör et al. (2006), a list of plants that can withstand floods, submergence and stagnant water for 1-2 months was created. Its use in disasters and areas with floods (partially-fully resistant) is rated.

RESULTS

Thanks to the planting design, we can make the most of the environment we live in, because with the help of a well-made planting design, it is possible to create landscapes for versatile use and benefit,

instead of very limited utilization and utilization. In addition, planting design helps to restore the balance between man and natüre (Yazici and Gülgün, 2017; Yazici and Ünsal, 2019; Yazici and A.Sağlamer, 2019). A very well and successfully planting design is the most appropriate expression of the function and usage needs.

Table 1. The flood resistant plants 1

	
Latin Name	*Ailanthusalttisima*
Turkish Name	Kokarağaç
General Characteristics	Ailanthusaltissima is a foul-smelling tree species of the Simaroubaceae family that blooms with greenish yellow flowers between May and June. Its homeland is the Far East. From here it spread to Europe and Anatolia.
FloodResistance	Durable
Usedlinks	Url,1; Url,2; Url 3; Güngör ve ark., 2006.

Good design is the design that usually performs the functions of planting by keeping the interventions to the natural development process to a minimum. Water-resistant plants are important in disasters such as floods. The functional performance and ecological compatibility of planting can be evaluated with more objective criteria than its aesthetic value.

Table 2. The flood resistant plants 2

	
Latin Name	*Alnusglutinosa*
Turkish Name	Sakalllı kızılağaç
General Characteristics	Alnusglutinosa is a species of birch (Betulaceae) familythat can reach 20-30 m withbrown bark andsparselybranched. It is quitesoft, but durablewhensubmerged, so it is usedforunderwaterstructuresandsmallerboats.
FloodResistance	Durable
Usedlinks	Url,1; Url,4; Url 5; Güngör ve ark., 2006.

Table 3. Thefloodresistantplants 3

	
Latin Name	*Ecalyptuscamaldulensis*
Turkish Name	Okaliptus
General Characteristics	Itshomeland is Australia. Mersingillers (myrtaceae) family. It can reach 45 meters in lengthand 3 meters in diameter in itshomeland. It can livefor an average of 500 years.
FloodResistance	Durable
Usedlinks	Url,6; Url,7; Url 8; Güngör ve ark., 2006.

Table 4. Thefloodresistantplants 4

	
Latin Name	*Fraxsinusanguustifolia*
Turkish Name	Sivri Meyveli Dışbudak
General Characteristics	Thepointed-fruitedash (Fraxinusangustifolia) is fromtheoleaceae (Oleaceae) familywhosehomeland is Southern Europe, North AfricaandSouthwestAsia. it can withstandstagnantwaterfor 1-1.5 months
FloodResistance	medium-low
Usedlinks	Url,9; Url,10; Güngör ve ark., 2006.

Table 5. Thefloodresistantplants 5

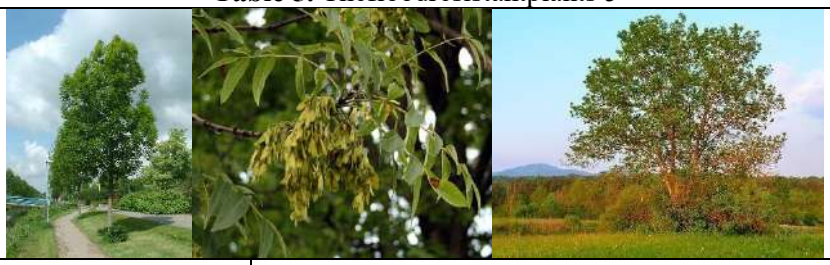	
Latin Name	*Fraxsinusexelsior*
Turkish Name	Adi dişbudak
General Characteristics	Fraxinusexcelsior is a type of ashfromtheoleaceae (Oleaceae) family, nativeto Europe andTurkey. Itgrowsupto 40 m. The body shell is paleyellow in color. Budsareblack, hairyleaves, 7-11 leaflets.
FloodResistance	Durable
Usedlinks	Url1; Url 4Güngör ve ark., 2006.

Table 6. Thefloodresistantplants 6

	
Latin Name	*Populustremula*
Turkish Name	Titrek kavak
General Characteristics	Populustremula is a type poplar fromSalicaceaefamilythat can be sizedupto 25 m, with a cylindricalstem, dense branchingand a wideconical top. It is mildlydemandingandrequiresbare, preferablywetsoils, devoid of vegetationcompetingfornaturalregeneration
FloodResistance	Durable
Usedlinks	Url,4; Url,11; Güngör ve ark., 2006.

Table 7. Thefloodresistantplants 7

	
Latin Name	*Salixalba*
Turkish Name	Ak Söğüt
General Characteristics	Salixalba, fromtheSalicaceaefamily, 25–30 m. It is a willowspecies in size. It is seen in creeks, meadowsandwetlands.
FloodResistance	partially
Usedlinks	Url,12 Url,13; Url 14; Güngör ve ark., 2006.

Table 8. Thefloodresistantplants 8

	
Latin Name	*Salixfragilis*
Turkish Name	Gevrek Söğüt
General Characteristics	Salixfragilis is a SalixspeciesfromSalicaceaefamilythat is nativeto Europe, AsiaandTurkey.It is an importantplantformarshrehabilitation. It can be used in floodedareas
FloodResistance	Durable
Usedlinks	Url 3; Güngör ve ark., 2006.Url 1

Table 9. Thefloodresistantplants 9

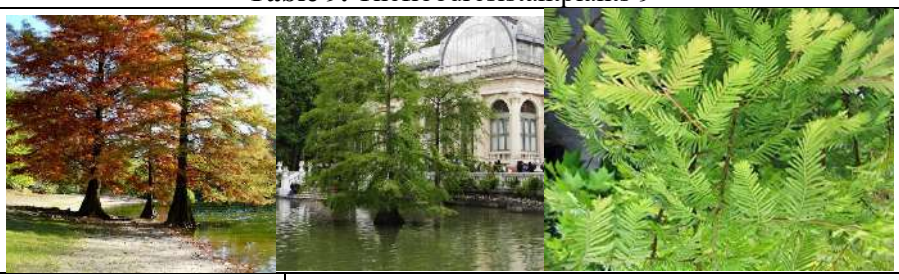	
Latin Name	*Taxodiumdistichum*
Turkish Name	Bataklık Servisi
General Characteristics	Itshomeland is North AmericaandMexico. Swamp is in thefamily of Taxodiaceae. It can grow in floodedareas, wetlands.
FloodResistance	Durable
Usedlinks	Url 3; Güngör ve ark., 2006.Url 1; Url 15

Table 10. Thefloodresistantplants 10

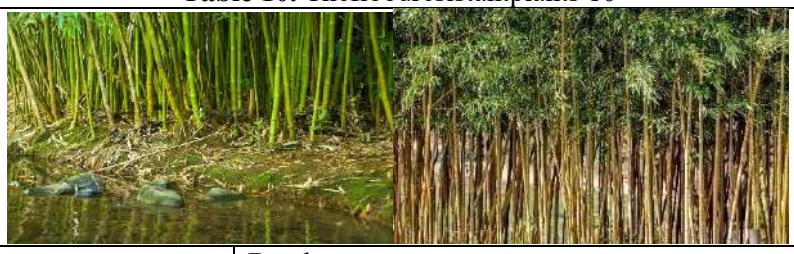	
Latin Name	Bambusaaurea
Turkish Name	Sarı Bambu
General Characteristics	Bamboo (Bambusoideae) is a member of thePoaceaefamilyand a subfamily of upto 1,200 plantspeciesthatsometimeslookverydifferentfromeachother. Bamboospeciesarefound in Asia, South and North America, andAfrica.
FloodResistance	Durable
Usedlinks	Url 16; Güngör ve ark., 2006.Url 17

Table 11. Thefloodresistantplants11

	
Latin Name	*Tamarixparviflora*
Turkish Name	llgın
General Characteristics	*Tamarixparviflora* is a plantspecies of theTamaricaceaefamilyseen in saltysoils. Themembers of thewildgenus, whichhavearound 90 speciesgrowingalloverEurasia, bloomwhiteorpinkflowers. Variousspeciesaregrown as hedgeplantsor as ornamentalplants in gardens.It is resistanttofloodsandinjuries
FloodResistance	Durable
Usedlinks	Url 18; Güngör ve ark., 2006.Url 19

CONCLUSION

With this study, it is aimed to restore these areas to nature by giving examples of plants resistant to extreme conditions such as floods, submergence and stagnant water. Urban floods will continue in the future, as they do today. However, measures can be taken to reduce their harms. Geographers and different disciplines can come together to produce solutions, and engineering sciences can put them into practice. In this sense, there is a need for Urban Risk Management Units, including landscape architects and agricultural engineers. In addition to the dissemination of units such as AKOM (Disaster Coordination Center) in Istanbul, these occupational disciplines play an important role in taking measures such as the improvement of the area by planting the areas that are not opened to housing, and where the priority is to open and where not to be opened during urban development.

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