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Research Article

Life Near Water: The Importance of Riparian Woody Plants

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Abstract: Woody plants growing along streambanks play a critical role in maintaining ecosystem health and biodiversity. This article focuses on the ecological functions, environmental contributions, and conservation importance of woody plants found near water bodies and within streambeds. Additionally, recommendations are provided for the conservation of riparian zones based on case studies from Turkey and findings from international literature. In this study, five active streambeds located in rural areas of Bingöl Province were examined over a 12-month period to identify plant species. The elevation of these streambeds ranged from 1087 to 1813 meters. While Salix species were found in all of the streambeds, the presence of other species varied. The identified taxa included: Alnus sp., Crataegus sp., Pyrus sp., Prunus sp., Cerasus sp., Malus sp., Tamarix sp., Morus sp., Rosa sp., Rubus sp., and Platanus sp.

Keywords: Bingöl, Riparian ecosystem, Riverside vegetation, Woody plants

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1. INTRODUCTION

Riparian areas are transitional zones between terrestrial and aquatic ecosystems, characterized by high biodiversity and significant ecological functionality. The woody plants that grow in these areas not only serve as aesthetic landscape elements but also play key roles in preserving natural water regimes, preventing erosion, and supporting habitat diversity. However, increasing urban expansion, agricultural pressures, and climate change threaten the integrity of these sensitive ecosystems. Therefore, identifying the structural and functional roles of riparian woody plants is crucial from both scientific and applied ecological perspectives.

Riparian zones, as intersection points of land and water ecosystems, are ecologically vital transition areas (Naiman et al., 2005). The woody vegetation in these zones provides various ecosystem services such as habitat formation, soil stabilization, water filtration, and microclimate regulation (Gregory et al., 1991; Tabacchi et al., 2000).

Studies conducted in Turkey have shown that woody and aquatic plants in riparian zones contribute not only to local flora but also play a significant role in conserving regional biodiversity. Floristic surveys by Taş (2021, 2023) in the Kacalı and Akçaova streams of Ordu Province revealed rich macrophyte diversity in riparian zones, with hydrological variables being decisive in species distribution.

Zencirkıran and Seyidoğlu Akdeniz (2017) classified woody species used in Bursa city parks based on their ecological tolerance and noted that these species possess both aesthetic and functional value. This assessment aligns with Richardson et al. (2005), who emphasized that riparian plant communities should be managed not only from a biological but also from a landscape perspective.

Similarly, Sarı (2021) examined the pollination capacity of woody ornamental plants and demonstrated their strategic importance for sustainable ecosystem services in urban green spaces. Naiman and Décamps (2005) also noted that riparian vegetation provides crucial habitats for insect fauna, supporting Sarı's findings.

The effects of environmental factors such as climate, topography, and soil structure on the distribution of woody vegetation have also been investigated. In a study conducted in Bilecik Province, Menteşe and Koca (2021) evaluated the relationship between climate and vegetation, highlighting the sensitivity of riparian zones to local climatic variables. This is consistent with findings by Tabacchi et al. (2000), who emphasized the strong interaction between riparian zones and hydrological processes in European rivers.

In the context of cultural ecosystem services, Seyidoğlu Akdeniz and Yener (2024) drew attention to the ethnobotanical significance of woody species used in urban parks, noting that traditional usage patterns can contribute to sustainable landscape design. This approach supports the socio-ecological integration recommended by Naiman et al. (2005) for riparian area management.

Field-based studies by Yılmaz and Yılmaz (2009) and Tarım (2000) evaluated the functional diversity of woody species in natural and semi-natural areas such as highway slopes and forest ecosystems, analyzing their resilience to biotic and abiotic stress factors.

In conclusion, both national and international literature strongly support the ecological functions of woody plants growing along streambanks. However, the localized nature of most studies in Turkey indicates a need for more comprehensive and multidisciplinary research on this subject.

2. MATERIAL AND METHOD

The province of Bingöl is located in the Upper Euphrates section of the Eastern Anatolia Region of Turkey. It is bordered by Muş to the east, Erzurum and Erzincan to the north, Tunceli and Elazığ to the west, and Diyarbakır to the south. Geographically, Bingöl lies between 41º20' and 39º56' east longitudes and 39º31' and 36º28' north latitudes. In addition to the provincial capital, Bingöl comprises seven districts: Adaklı, Genç, Karlıova, Kığı, Solhan, Yayladere, and Yedisu.

The city center is located at an elevation of 1,151 meters above sea level, on a plain overlooking a tributary of the Göynük Stream, which eventually joins the Murat River near the district of Genç. Initially established within the valley, the city of Bingöl expanded rapidly after the 1950s and relocated onto the surrounding plains along the Elazığ–Tatvan highway.

The terrain within the province is generally rugged and mountainous, with vast hilly areas. Bingöl is surrounded by mountains on all sides. The prominent mountains in the region include Bingöl Mountain (3,250 m), Genç Mountain (2,940 m), Şeytan Mountain (2,906 m), and Şerafettin Mountain (2,544 m). Hydrologically, Bingöl is rich in freshwater resources, with significant rivers such as the Peri Stream, Murat River, and Göynük Stream flowing through its boundaries. Additionally, the province contains numerous small glacial lakes known as cirques, including Gölbahri, Kerkis Lake, Sar Lake, Harem Lake, and Karlı Lake.

Bingöl is one of the provinces in Eastern Anatolia with the richest forest areas, where oak forests (Quercus spp.) are dominant. These forests typically extend up to elevations of 1,900 meters. However, due to long-term anthropogenic degradation, large forest areas have been replaced by steppe vegetation (Caf & Yılmaz, 2024).

2.1 Field Study and Data Collection

This study was conducted in five active streambeds located within the borders of Bingöl Province(Figure 1 and Figure 2). The elevations of these streambeds range between a minimum of 1,087 meters and a maximum of 1,813 meters. The focus of the study was on woody plants rooted in or immediately adjacent to the watercourse, including species with roots directly immersed in the water.

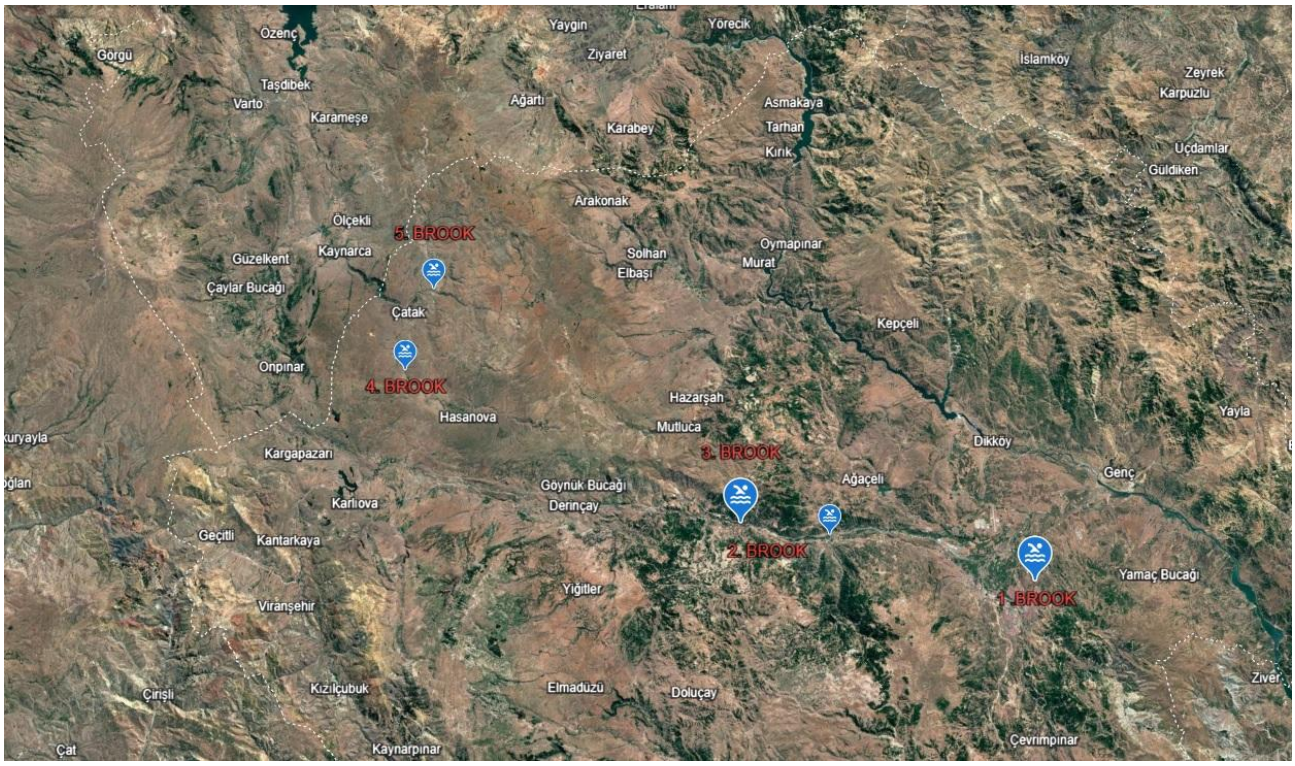

Figure 1. The five brook were sampled.

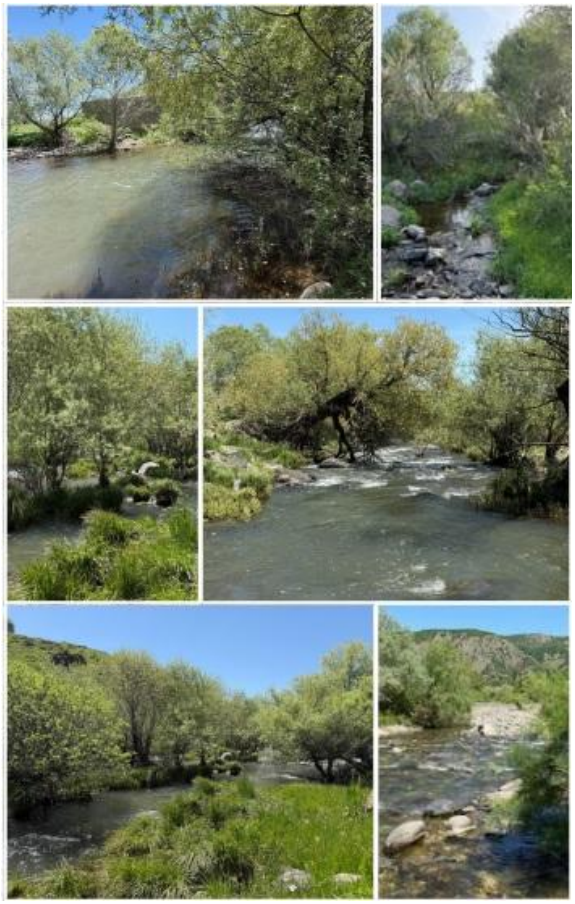

Figure 2. Brook views from work areas

Plant species identification was conducted using Mamıkoğlu (2007) and the Turkish Plant Data Service (Türkiye Bitkileri Veri Servisi). For the taxonomic diagnosis of the woody plants, volumes of Flora of Turkey and the East Aegean Islands (Davis et al., 1965–1985; Davis et al., 1988; Güner et al., 2000) were utilized. The Latin and Turkish nomenclature of the identified species was standardized according to the Checklist of Vascular Plants of Turkey (Türkiye Bitkileri Listesi – Damarlı Bitkiler) (Güner et al., 2012).

3. RESULTS

The integration of native and resilient plant species plays a vital role in sustainable landscape design and ecological restoration, particularly in semi-arid and riparian zones. Alnus glutinosa (Black Alder), with its nitrogen-fixing capability, enriches riparian soils and supports aquatic ecosystems (Bühlmann et al., 2017; Gulis et al., 2006). Cerasus mahaleb (Mahaleb Cherry) is drought-tolerant and enhances rural landscapes with its fragrant spring blossoms (Güner et al., 2014; Özyurt et al., 2012). Crataegus orientalis (Oriental Hawthorn) provides shelter and food for birds through its thorny branches and fruit (Yaltırık, 1988; Yanar et al., 2011). Malus sp. (Wild Apple) contributes to biodiversity conservation by offering genetic diversity and a vital food source in natural ecosystems (Okcu et al., 2015; Koruyucu Tarım Derneği, 2019). Morus alba (White Mulberry), known for its rapid growth and dense foliage, is favored in urban landscapes

for shade (Gündüz et al; 2009; Hakan et al., 2011). But Since its fruits are sweet and juicy, it is not recommended for use in urban areas, especially on walking paths.

Platanus orientalis (Oriental Plane) is a long-lived, broad-leaved species ideal for urban shading and carbon sequestration (Durukaya et al; 2009). Pyrus elaeagnifolia (Oleaster-leaved Pear) is well adapted to rocky and dry soils, effectively used in erosion control (Ercisli, 2004; Kızılgöz et al., 2021). Rosa canina (Dog Rose) functions as a soil stabilizer and a habitat source for wildlife (Koçhan, 2014), while Rubus sp. (Blackberry) provides both ground cover and fruit for wild fauna (Poyraz et al., 2019).

Tamarix tetrandra (Tamarisk) thrives in saline and arid soils and is employed for coastal stabilization (Kurt et al., 2023). Salix excelsa and S. alba (White Willows) grow rapidly in riparian zones and are essential for erosion control and habitat structure (Bita-Nicolae, 2023). Salix fragilis (Crack Willow) spreads naturally via brittle branches and suits wetland habitats (Kuzovkina & Volk, 2009). Salix viminalis (Basket Willow) is commonly used in basketry, live fencing, and biomass production (Karp & Shield, 2008). Finally, Salix cinerea (Grey Willow) establishes naturally in wetlands and offers critical shelter for avian and insect species (Calder, 1998). Photographs of some identified plant species are given in figure 3 and figure 4.

Table 1. Plant species and using area

Scientific Name	Common Name	Usage Area	Plant Type
Alnus glutinosa	Black Alder	Riparian afforestation	Deciduous Tree
Cerasus mahalep	Mahaleb Cherry	Rural landscape, fragrant flowers	Small Tree
Crataegus orientalis	Oriental Hawthorn	Wildlife habitat, fruit production	Shrub/Small Tree
Malus sp.	Wild Apple	Natural orchards	Tree
Morus alba	White Mulberry	Shade tree, fast growth	Deciduous Tree
Platanus orientalis	Oriental Plane	Urban shading tree	Large Deciduous Tree
Prunus sp.	Wild Cherry/Plum	Spring blossoms for aesthetics	Tree/Shrub
Pyrus elaeagnifolia	Oleaster-leaved Pear	Drought-resistant for arid areas	Small Tree
Rosa canina	Dog Rose	Hedge plant, bird habitat	Shrub
Rubus sp.	Blackberry	Ground cover, fruit production	Shrub
Tamarix tetrandra	Tamarisk	Saline soils, erosion control	Shrub/Small Tree
Salix alba	White Willow	Riparian zones, stream stabilization	Large Deciduous Tree
Salix excelsa	White Willow	Riparian zones, stream stabilization	Tree
Salix fragilis	Crack Willow	Fast-growing in wet areas	Tree
Salix viminalis	Basket Willow	Basketry, living fences	Shrub/Small Tree
Salix caprea	Grey Willow	Natural cover in wetlands	Shrub/Small Tree

Figure 3. *Tamarix sp. Crateagus sp. Planatus sp. Malus sp. Morus sp. Prunus Sp. Cerasus sp.*

Figure 4. *Rosa sp. Pyrus sp. Rubus sp. Salix sp.*

4. DISCUSSION AND CONCLUSION

The integration of these species into landscape design provides not only aesthetic value but also substantial ecological services including erosion control, habitat provision, and climate resilience. Their varied growth habits and tolerances to different abiotic stresses make them versatile components in sustainable urban and rural greening projects. These species fulfill various ecological roles across different habitats. Salix and Alnus species contribute to flood control and water filtration. Shrubby species such as Rosa canina and Rubus sp. provide essential shelter and food sources for wildlife. Alnus glutinosa, with its nitrogen-fixing ability, plays a significant role in enriching the soil.

In terms of landscape use, broad-leaved species like Platanus orientalis are ideal for urban areas due to their shading capacity and microclimate regulation. Native small trees such as Cerasus mahalep and Pyrus elaeagnifolia can be utilized in rural landscape design to enhance visual diversity and reflect local identity. Tamarix tetrandra stands out for its high tolerance to saline soils.

Among the identified species, Pyrus, Prunus, and Malus were observed only occasionally along the streambeds. Platanus orientalis, found in only one streambed, is not considered native to the region. Its presence is likely due to the dispersal of seeds from nearby planted specimens in urban parks.

REFERENCES

Bita-Nicolae, C. (2023). Distribution of the Riparian Salix Communities in and around Romanian Carpathians. Diversity, 15(3), 397. https://doi.org/10.3390/d15030397

Bühlmann, T., Caprez, R., Hiltbrunner, E., Körner, C. and Niklaus, P.A. (2017), Nitrogen fixation by Alnus species boosts soil nitrous oxide emissions. Eur J Soil Sci, 68: 740-748. https://doi.org/10.1111/ejss.12457

Calder, I. R. (1998). Water use by forests, limits and controls. Tree Physiology, 18(8–9), 625–631. https://doi.org/10.1093/treephys/18.8-9.625

Davis, P. H. (1965-1985). Flora of Turkey and the East Aegean Islands. Vol 1-9. Edinburgh University Press, Edinburgh.

Davis, P. H., Mill, R. R. and Tan, K. (1988). Flora of Turkey and the East Aegean Islands. Vol.10. Edinburgh University Press, Edinburgh.

Durkaya, A., Durkaya, B., & Uludağ, M. (2009). Volume Functions for Oriental Plane (Platanus orientalis L.) Stands in Kastamonu-Akçay Region. Kastamonu University Journal of Forestry Faculty, 9(1), 19-24.

Ercisli, S. (2004). A short review of the fruit germplasm resources of Turkey. Genetic Resources and Crop Evolution, 51(4), 419–435.

Gregory, S. V., Swanson, F. J., McKee, W. A., & Cummins, K. W. (1991). An ecosystem perspective of riparian zones. BioScience, 41(8), 540–551.

Gündüz, G., Yıldırım, N., Şirin, G., Murat Onat, S. (2009). Ak Dut Agacının Anatomik, Kimyasal, Fiziksel ve Mekanik Özellikleri. Düzce Üniversitesi Orman Fakültesi Ormancılık Dergisi, 5(1), 131-149.

Güner, A., Aslan, S., Ekim, T., Vural, M., ve Babaç, M.T. (2012). Türkiye bitkileri Listesi (Damarlı Bitkiler). Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırmaları Derneği yayını, İstanbul.

Güner, A., Özhatay, N., Ekim, T. and Başer, K.H.C. (2000). Flora of Turkey and the east aegean islands, Vol. 11, Edinburgh Univ. Press, Edinburgh.

Güner, A., Özkan, A. M. G., Akyıldırım, B.,Çıngay, B., Tuğ, G. N., Alkayış, M. F., Kanoğlu, S. S. (2014). Editöre Mektup; Orhan Sevgi ve Ünal Akkemik'in ""Türkiye Bitkileri Listesi (Damarlı Bitkiler)" Adlı Eserin Bilgi Kaynağı ve Terim Yaklaşımı Üzerine Bir Değerlendirme"(Avrasya Terim Dergisi 2 (1): 50-67, 2014) Adlı Makalesi Üzerine. Avrasya Terim Dergisi, 2(2), 1-5.

Şevik, H., Çetin, M., Yiğit, N., Türkyılmaz, A., Canbulat, S., Belkayalı, N., Kravkaz Kuşcu, İ. S. (2017). Morus alba'da bazı yaprak mikromorfolojik karakterlerinin trafik yoğunluğuna bağlı değişimi. The Journal of Academic Social Science, 5(40), 25–36.

Karp, A., & Shield, I. (2008). Bioenergy from Salix species: new opportunities with improved varieties. Annals of Applied Biology, 152(3), 321–333.

Koçhan, N. (2014). Peyzaj Planlama Ve Tasarım Çalışmalarında Kuşburnu (Rosa canina L.) Bitkisinin Değerlendirilmesi. Harran Tarım Ve Gıda Bilimleri Dergisi, 14(4), 33-37.

Kurt, C. H., Tunçtürk, M., & Tunçtürk, R. (2023). Tuzluluk stresi koşullarında yetiştirilen soya (Glycine max L.) bitkisinde bazı fizyolojik ve biyokimyasal değişimler üzerine salisilik asit uygulamalarının etkileri. Journal of Agriculture Faculty of Ege University, 60(1), 91-101. https://doi.org/10.20289/zfdergi.1053742

Kuzovkina, Y. A., Volk, T. A. (2009). The characterization of willow (Salix) varieties for use in ecological engineering applications: Co-ordination of structure and function. Biomass and Bioenergy, 33(9), 1486–1492.

Menteşe, S., Koca, S. (2021). İklim, bitki örtüsü ilişkisi ve odunsu bitki örtüsünün dağılımı: Bilecik örneği.

Naiman, R. J., Décamps, H., McClain, M. E. (2005). Riparia: Ecology, Conservation, and Management of Streamside Communities. Elsevier Academic Press.

Okcu, M., Kalkisim, O., Okcu, Z., Karabulut, B., Yildirim, N., Ağar, G., (2015). Determination of Genetic Diversity Among Wild Grown Apples From Eastern Black Sea Region in Turkey Using ISSR and RAPDs Markers. Erwerbs-Obstbau, vol.57, 171-177.

Özyurt, İ. K., Akça, Y., Demirsoy, H. (2012). Bazı Mahlep (Prunus mahaleb L.) Genogenotiplerinin ve SL64 Anacının Çelikle Çoğaltılabilme Özellikleri. Gaziosmanpaşa Bilimsel Araştırma Dergisi(1), 90-96.

Poyraz Engin, S., Boz, Y. (2019). Ülkemiz Üzümsü Meyve Yetiştiriciliğinde Son Gelişmeler.

Uluslararası Anadolu Ziraat Mühendisliği Bilimleri Dergisi, 1(5), 108-115.

Richardson, J. S., Naiman, R. J., Swanson, F. J., Hibbs, D. E. (2005). Riparian communities associated with Pacific Northwest headwater streams: Assemblages, processes, and uniqueness. Journal of the American Water Resources Association, 41(4), 935–947.

Sarı, D. (2021). Kent parklarında kullanılan bazı odunsu süs bitkilerinin polinasyon değerleri bakımından irdelenmesi.

Seyidoğlu Akdeniz, N., Yener, Ş. D. (2024). Kent parklarında kullanılan odunsu peyzaj bitkileri üzerine etnobotanik bir araştırma.

Tabacchi, E., Lambs, L., Guilloy, H., Planty-Tabacchi, A. M., Muller, E., Décamps, H. (2000). Impacts of riparian vegetation on hydrological processes. Hydrological Processes, 14(16–17), 2959–2976.

Tarım, S. (2000). Eskişehir Kalabak Ormanları Odunsu Bitkileri ve Bunların Kullanım Değerleri [Yüksek lisans tezi, Anadolu Üniversitesi.

Taş, B. (2021). Kacalı Deresi (Ordu) riparian alanının makrofit florası.

Taş, B. (2023). Akçaova Deresi (Ordu) riparian zonunun makrofit florası.

Yanar, M., Ercisli, S., Yilmaz, K. U., Sahiner, H., Taskin, T., Zengin, Y., ... Akgul, I.(2011). Morphological and chemical diversity among hawthorn (Crataegus spp.) genotypes from Turkey. Scıentıfıc Research And Essays , vol.6, no.1, 35-38.

Yılmaz, H., Yılmaz, H. (2009). Karayolu şevlerinde doğal olarak yetişen odunsu bitkilerin kullanım alanlarının irdelenmesi: Erzurum Uzun Dere örneği.

Zencirkıran, M., Seyidoğlu Akdeniz, N. (2017). Bursa kent parkları odunsu bitki taksonlarının ekolojik tolerans kriterleri açısından değerlendirilmesi.