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# Comparative floristic study of the Seman and Shkumbini River Valleys: Analyzing biodiversity and pollution impact

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#### Abstract

This study compares the Seman and Shkumbin River Valleys, focusing on their floristic, biodiversity, economic, and scientific aspects. Our research focuses on the unique regions of Fier and Elbasan in Albania, where anthropogenic impacts have had a significant impact on the environment, habitats, and human health. These two areas, noted for their high plant diversity, which we present through the construction of floristic spectra for life forms, floristic elements, and the diversity of plant families, are sure to pique your interest.

The floristic diversity of these areas stands out for its numerous economic and scientific values, and as citizens, we must protect it. In general terms, we have addressed the problem of pollution and its sources. Still, it is essential to understand the cause-and-effect relationship between the damage caused over the years and the decline in plant diversity. This understanding should motivate us to take action.

The study material is accompanied by three graphs and five tables reflecting biodiversity in the studied areas.

Keywords: Seman River Valley, Shkumbin River Valley, floristic diversity, Patos-Marinëz plain, environmental hotspot, flora, biodiversity

# 1. INTRODUCTION

The Seman Basin is Albania's largest river basin by surface area. It flows through Central Albania and is formed by the confluence of the Devoll and Osum Rivers near Kozara (Berat). This important geographical feature extends across the country's central, southern, and southeastern regions.

The Seman River's watershed covers  $5,949 \text{ km}^2$ , with an average elevation of 863 m. The river stretches for 281 kilometers, and its hydrographic network density is 1.9 kilometers per square kilometer. Rainfall mainly feeds the Seman River and its tributaries, with the catchment area receiving an average of 1,030 mm of precipitation annually. The river's average annual flow is approximately 101 m<sup>3</sup>/sec, with a maximum recorded flow of 1,800 m<sup>3</sup>/sec (Kabo, M., 1998).

Due to steep slopes and a geological structure that promotes erosion, rainwater quickly reaches the riverbed, carrying a substantial amount of solid material. Consequently, the Seman River is recognized as the most turbid river in Albania.

According to Albania's climatic regionalization, the Seman Valley is notable for its rich biodiversity from its water sources to the sea. This region encompasses several climatic subzones:

- Southeastern Subzone of the Mountainous Mediterranean Zone,
- Southern Subzone of the Foothill Mediterranean Zone,
- Southeastern Subzone of the Hilly Mediterranean Zone,
- Central Subzone of the Plain Mediterranean Zone (which predominantly covers most of this area).

The Seman River, recognized for its erosive power, displays significant variability in turbidity levels. Specific measurements include:

- Mbrostar: 4,390 g/m<sup>3</sup>
- Devolli at Kozarë: 5,500 g/m<sup>3</sup>
- Osumi near the Vajgurore Bridge: 3,510 g/m<sup>3</sup>

The waters of the Seman River have an average mineralization ranging from 200 to 500 mg/l, classified as bicarbonate type. Notably, the lowest mineralization values in March are 33 mg/l, while the highest in August can reach 440 mg/l. In the upper sections of the Osumi and Devolli rivers, average water mineralization tends to be lower, around 300 mg/l. Water temperatures fluctuate seasonally, ranging from 2-7°C in January to 16-25°C in August (Kabo, M., 1998).

Forestation in the Seman Basin, which once covered approximately 45% of the surface area, has been in a state of decline since the 1990s. This decline has led to a direct increase in the flow coefficient value, indicating a significant change in the ecosystem. The once diverse vegetation composition, with Mediterranean shrubs and beech forests, has been dominated by oaks. This shift underscores the crucial need for conservation and restoration initiatives, highlighting the important role of the audience in this process.

#### The Oil Field of the Fier Area

The oil field in the Fier area is one of the largest in Europe, and it is based on reserves located within the continent. Spanning approximately 160 km<sup>2</sup>, this field was first discovered in 1928 and has since been continuously exploited using various technologies and extraction rates. As it nears its 80th year of operation, the field has generated significant economic benefits but has also resulted in serious environmental challenges. The growing social awareness and the establishment of Albanian environmental institutions highlight the urgency of addressing historical environmental issues. These challenges are in stark contrast to the environmental standards and aspirations of a country striving for integration into European frameworks. Albania's environmental resources hold significant promise for its economic revitalization, potentially catalyzing growth in sectors like tourism, particularly along its coasts, which are rich in historical and archaeological sites (Lezzi, C.S., 2001; Métois, M., 2020).

In support of the Albanian government's commitment to an integrated approach to the environmental rehabilitation of the Patos-Marinëz oil field, the European Commission funded aproject that concluded in 2008 (Integrated Environmental Rehabilitation of the Patos-Marinëz Oil Field). This initiative focused on two key objectives:

- 1. Assessing the environmental and health conditions in the area,
- 2. Developing a comprehensive environmental and health action plan for the region.

Sadly, the area is a significant source of air, soil, and water pollution. The emission of sulfuric gas and hydrocarbons significantly contributes to this environmental crisis. Contaminants from oil wells, pumps, pipelines, and processing equipment have led to the pollution of groundwater, placing local families at high risk.

Health evaluations indicate that around 6,000 residents living near the springs have elevated levels of toxins, particularly carbon, in their blood. These individuals face a range of chronic health issues, including:Respiratory diseases, bronchitis, asthma, lung cancer, anemia, ischemia, cardiovascular diseases, and hypertension. The impact on their health is a pressing concern that underscores the urgent need for remedial action.

# Geomonuments in the Municipality of Fier

In the Municipality of Fier, numerous geomonuments are recognized as natural areas of special interest due to their unique formation, rarity, historical and cultural significance, or their role as points of attraction. Geomonuments are classified by their importance as follows:

- Geomonuments with international value
- Geomonuments with national value
- Geomonuments with regional value

### Geomonuments with Regional Value

The protected areas feature a buffer zone 50 meters from their borders, which regulates development. According to the International Union for Conservation of Nature-Protected Areas, category III, the following are natural monuments (Dollma *et al.*, 2008).

- Seman Dunes
- Black pines (*Pinus nigra*) along the coast of Poros,
- The crown of the old Seman River (Libofsha Adriatic),
- The plane trees along the Fier-Vlora road and the plane tree at Cakran Bazaar (Çaire).

### Air Pollution Challenges in Elbasan

The city of Elbasan faces critical air pollution issues that require urgent attention:

- Vehicle Emissions: Over the last two decades, the number of vehicles has dramatically increased, posing a significant threat to air quality. These vehicles release substantial amounts of carbon monoxide (CO) into the atmosphere. The extent of this pollution is influenced by the car's age, condition, and fuel quality. Poor fuel quality can lead to inefficient combustion, further increasing the emission of harmful gases.
- *Industrial Pollution*: Major industrial operators located on the outskirts of Elbasan, such as KURUM Steel, are significant contributors to air pollution. These facilities emitconsiderable dust and gases, which become primary

pollutants affecting the city when combined with certain atmospheric conditions.

• Urban Waste: Urban waste is another notable source of air pollution in Elbasan Municipality. The industrial sector, especially the steel production company Kurum, is among the leading contributors to particulate matter (PM10) pollution.

The objectives of this study are:

- Assessment of the environmental situation and efforts to improve the economic, social, natural, and human health aspects of the Seman and Shkumbin River valley areas, with the potential to bring about positive changes;
- Compilation of plant lists and specification of plant associations in these areas;
- Determination of the biological and medical life forms of the areas under study comprehensively.

# 2. MATERIALS AND METHODS

## 2.1. Methods of floristic studies

We used two methods to study plant cover: physiognomic and floristic.

The physiognomic method classifies plants based on the growth bud distance from the soil into:

- Ph Phanerophytes
- Ch Chamaephytes
- H Hemicryptophytes
- K Cryptophytes
- T Therophytes

The floristic method is vital for identifying plant species in various phytocenoses, involving:

- 1. Field surveys,
- 2. Assessment of species quantity and cover,
- 3. Species identification.

Identification follows local literature (Demiri, M., 1983) and is structured into three phases:

- a) Preparatory
- b) Fieldwork
- c) Laboratory (data processing) (Xhulaj, M., 2005).

Using the methods above, we identified and compiled a list of plants from both studied areas, showcasing the region's biodiversity. In the Xibraka area of the Shkumbini Valley, we recorded 90 species. In the Seman River Valley, we identified 119 species, highlighting the area's rich plant diversity (APPENDIX I, APPENDIX II). It is understood that many other species are found in these two areas; however, during the organized field expeditions, we have identified and herbarium a limited number of species.

The identification process in the laboratory involved consulting relevant literature sources, such as the "Flora of Albania" volumes 1-4, published by the Academy of Sciences between 1988 and 2000. We have used Barina *et al.* (2017) and the

Euro+MedPlantBase database (http://ww2.bgbm.org/EuroPlusMed) to determine the scientific names of the identified species.

The species found in these two areas belong to various plant families. Specifically, the Seman River Valley species belong to approximately 59 families, while those in the Shkumbin River Valley belong to about 38 families. The two prepared lists indicate the species name, the family to which it belongs, chorology, phenology (flowering period), and biological form.

#### 3. RESULTS AND DISCUSSION

#### Pollution in the Municipality of Fier

In recent years, the rivers in Albania, especially in the Municipality of Fier, have been used as receiving sources for wastewater, causing a severe impact on the environment. The riverbeds and banks have been used as dumping sites for solid waste, further exacerbating the situation. A stark example is the Seman and Gjanica rivers, which have been polluted by the discharge of untreated wastewater.

In addition to sewage, the Gjanica and Seman rivers have been constantly influenced by the oil industry and other industries along their banks. For example, many oil wells have been drilled at a minimal distance from the river. As a result, the quality of the river waters has deteriorated over the years. The rivers have been polluted with oil products, sewage, agricultural products, etc.

Fier is known for the diversity and breadth of agricultural and forested areas. Among the positive values of the Fier region's resources are the coastline, beaches, reserves with remarkable biological diversity, and the high fertility of the arable land. Poor environmental treatment of wastewater and sewage, industrial pollution, deforestation, urban solid waste and unplanned urban development, the anthropological factor, the high content above the annual average allowed and recommended by the World Health Organization (World Bank/FAO, 2002) of SO<sub>2</sub>, NOx, Ozone, CO and heavy metals are some of the negative aspects that have led to environmental degradation and the destruction of biodiversity.

Areas requiring special attention include the Marinza and Patos oil fields, the former Ballsh oil refinery, and the former nitrogen fertilizer plant. An environmental assessment conducted by UNEP identified these as environmental "hot spots". (https://shtetiweb.org/wp-content/uploads/2013/04/MDGR-Fier-2003-Albanian.pdf).

#### **Pollution and Environmental Hotspots in Elbasan**

We have several environmental hot spots in Elbasan, which are the Ferrochrome Smelting Plant and the Industry-Mining Supply Company. Elbasan also has the Explosives Plant in Mjekës, although it is not listed as a hot spot, as its impact on the population, tourism, and biodiversity does not pose a high risk. The former Elbasan Metallurgical Plant has been designated as one of our country's 35 environmental hot spots because it carries a large amount of hazardous industrial waste.

Many studies have been conducted to determine the type of pollution and the geographical extent of this plant's environmental impact. These studies have concluded that the Metallurgical Plant's soil inside and around the plant is contaminated with heavy metals such as Cd, Zn, Cu, etc. The soil is also contaminated with Cr, Zn, and Fe, while the environment is contaminated through the air with Fe, Mn, Zn, Cr, Ni, and Pb (Osmani *et al.*, 2015; Osmani *et al.*, 2019; Devolli *et al.*, 2024).

The former Metallurgical Complex, built 4 km as the crow flies from the city of Elbasan, is a real source of air pollution with gases and dust. Currently, there are a number of private activities related to chemical production lines (such as the SO<sub>2</sub> production line and a polystyrene production line), as well as other storage or processing lines (collection-sale of liquefied gas or mechanical processing lines). The development of these activities results in air pollution with chemical compounds such as SO<sub>2</sub>, CO, NOx, respirable dust, dust loads in the air, etc. Sulfur gas, in the presence of moisture, turns into hydrogen sulfide (H<sub>2</sub>S), an acid that affects surface and groundwater, significantly affecting the area's biodiversity. The same phenomenon occurs with the dissolution of N<sub>2</sub> and NOx. Urban waste is another source of air pollution, and in the Municipality of Elbasan, there are many unsanitary disposal sites, while the constructed landfill is often not functional. (https://elbasani.gov.al/wp-content/uploads/2021/05/Strategjia-e-Zhvillimit-per-Territorin-e-Bashkise-Elbasan-1.pdf).

These factors negatively impact the environment, including the flora and fauna of these two areas.

The distribution of plant species is influenced by various factors, including climate (temperature, precipitation, and sensitivity to climatic conditions play a crucial role in determining which species can thrive in a given area); soil (soil type, structure, and pH affect the availability of nutrients and the ability to support plant growth); environment (factors such as water availability, light exposure, and competition among plants significantly impact species distribution); human activity (urbanization, agriculture, and environmental pollution can alter natural habitats and affect species distribution); ecosystems and biodiversity (the interactions between species and other ecosystems determine how species develop and spread); historical factors (evolutionary history and past migrations of species also play a role in their current distribution) (Treshow, M., 1980; Prabhat Kumar Rai, 2016; Sposito *et al.*, 2017).

These factors create complex dynamics that influence how plant species are distributed across different regions.

Graph 1, a key component of this study, provides crucial comparative data on the number of species by family in the two studied areas. This graph visualizes the distribution of plant families and species diversity in each region, a significant aspect of our research, and vividly illustrates the rich and diverse tapestry of plant families in the two river valleys. With its 11 recorded species, Leguminosae stands out as the dominant family in the Seman River valley. It is closely followed by the Labiatae family, with 10 species, and the Compositae family, with eight species, among others. The Shkumbin River valley, on the other hand, is characterized by the dominance of the Poaceae family, with 12 recorded herbarium species. The representation of the Leguminosae, Labiatae, and Compositae families, each with seven species, further highlights the richness and complexity of these ecosystems.



Graph 1. Diversity of botanical families: A comparative analysis of species numbers in studied areas

From a floristic perspective, a significant diversity of biological forms is observed in both studied areas. This indicates a diverse range of plant life forms, highlighting the ecological richness and complexity of the region.

The Seman River valley has a rich and diverse flora in terms of biological forms, as reflected in Graph 2.



Graph 2. Plant distribution by biological forms in the Seman River Valley

The data in this graph clearly show that the Seman River valley is characterized by a diversity of biological forms. The majority of them are dominated by Phanerophyta forms, with 40 species. They are followed by Hemicryptophyta, Therophyta, Chamephyta, and Geophyta, with 32, 22, 9, and 8 species, respectively. The life forms with the fewest species are Terophyta/Chamephyta and Nano/Phanerophyta, specifically with 0 and 1 species, respectively. This indicates a significant lack of diversity in these categories within the studied areas, highlighting potential ecological limitations or specific environmental conditions affecting their distribution.

In the Shkumbini River Valley, our data reveals a significant dominance of Hemicryptophyta, a life form, over other forms. The graph illustrates this, with Hemicryptophyta leading the pack, followed by Terophyta, Phanerophyta, and Geophyta, with 22, 15, and 8 species, respectively. This distribution underscores the ecological characteristics and adaptations of plant species in this region.



Graph 3: Distribution of plant biological forms in the Shkumbini River Valley

A study has been conducted on species distribution based on their floristic elements for the floristic diversity of the studied areas. The collected data have been organized in the table below.

Table 1. Chorological types of species recorded in two areas							
No.	Floristic element	Semani	Shkumbini				
		River Valley	River Valley				
1.	Euro-Mediterranean	15	9				
2.	Euro-Asian	12	17				
3.	Steno-Mediterranean	18	2				
4.	Paleo-temperate	11	14				
5.	Mediterranean	8	3				
6.	Cosmopolitan	6	2				
7.	Cirkumboreal	3	4				
8.	Subcosmopolitan	8	0				
9.	Eurosiberian	1	6				
10.	American	6	4				
11.	SubMediterranean	1	2				
12.	Other	30	27				

The data from Table 1 indicate that in the Semani River Valley, Sten Mediterranean forms dominate, followed by Euro-Mediterranean forms. This dominance is linked to the region's geographical position, and its influence is reflected in the thriving diversity of species present.

The Mediterranean climate is characterized by hot, dry summers and mild, wet winters. In several key aspects, the environment of the Seman River Valley is in stark contrast to that of the Shkumbin River Valley. The Seman Valley, nestled in its geographical position and close to the coast, basks in higher summer temperatures. In contrast, the Shkumbin Valley, with its slightly more moderate temperatures, especially at higher elevations, offers a different climate experience.

The Seman Valley receives more rainfall, particularly during winter, due to its influence by the Adriatic Sea climate. The Shkumbin Valley, on the other hand, experiences less precipitation, which is more concentrated during specific periods. Spring in the Seman Valley is a warm embrace, and winter a gentle caress, while the Shkumbin Valley experiences a colder winter.

A significant number of species are at risk of extinction in the Seman River Valley area for various reasons. The table below shows the names of the endangered species and the reasons why this danger is occurring.

No.	The name of the species	Reason		
1.	Efedra dystachia	Anthropogenic activity		
2,	Hypericum perforatum	Overgrazing		
3,	Juniperus oxycedrus	Unconditional exploitation		
4,	Panctratium maritimum	Anthropogenic activity		
5,	Sambucus nigra	Collection as a medicinal plant		
6,	Saturea montana	Root damage during uprooting		
7,	Panctratium maritimum	Anthropogenic activity		
8,	Baldellia ranunculoides	High sensitivity to climate		
9,	Nuphar lutea	High sensitivity to climate		
10.	Centaurea pindicola	Very rare individuals		
11.	Conium maculatum	Very rare individuals		
12.	Orchis albanica	Rare individuals		
13.	Sinapis pubescens	Rare individuals		
14.	Gladiolus palustris	Habitat destruction		

Table 2. The highest endangered species in the Seman River Valley

The Shkumbin River Valley is a haven for medicinal plants, each with a wide range of uses, from traditional medicine to modern pharmaceuticals. It's reassuring to note that

their widespread use, as confirmed by Naqellari, P. (1999), is not only beneficial for health but also completely safe, with no side effects.

In the table below, we present a selection of these plants, each accompanied by its scientific name and family.

No.	Name of species	Family
1.	Abelmoschus esculentus	Malvaceae
2.	Acer platanoides	Aceraceae
3.	Achillea millefolium	Asteraceae
4.	Aesculus hippocastanum	Hippocastanaceae
5.	Alnus glutinosa	Betulaceae
6.	Anagallis arvensis	Primulaceae
7.	Anchusa officinalis	Boraginaceae
8.	Artemisia vulgaris	Asteraceae
9.	Atropa bella-donna	Solanaceae
10.	Brassica oleracea	Brassicaceae
11.	Campanula patula	Campanulaceae
12.	Capsella bursa-pastoris	Brassicaceae
13.	Citrulus lanatus	Cucurbitaceae
14.	Cornus sanguinea	Cornaceae
15.	Cynoglossum officinale	Boraginaceae
16.	Ficus carica	Moraceae
17.	Fragaria vesca	Rosaceae
18.	Hedera helix	Araliaceae
19.	Helleborus odorus	Ranunculaceae
20.	Linaria vulgaris	Scrophulariaceae
21.	Malva sylvestris	Malvaceae
22.	Melilotus officinalis	Fabaceae
23.	Mentha aquatica	Lamiaceae
24.	Mercurialis annua	Euphorbiaceae
25.	Morus alba	Moraceae
26.	Origanum vulgare	Labiatae
27.	Papaver rhoeas	Papaveraceae
28.	Parietaria officinalis	Urticaceae
29.	Plantago major	Plantaginaceae
30.	Populus alba	Salicaceae
31.	Prunela vulgaris	Lamiaceae
32.	Rosa canina	Rosaceae
33.	Rubus ulmifolius	Rosaceae

Table 3. List of the main medicinal plants in the Shkumbini River Valley

#### CONCLUSIONS

The main contributors to pollution in the Seman River Valley and the Shkumbin River Valley are causing significant and urgent harm to the environment. They are:

These sources, including urban wastewater, solid waste landfills, and industrial waters, are significantly contributing to the pollution in the Seman River Valley. Similarly, the Shkumbin River Valley is facing its challenges, with discharges and infiltrations from the agricultural sector, using river beds for inert materials, and industrial waste containing heavy metals like chromium (Cr), mercury (Hg), and lead (Pb), all of which are specific and concerning types of pollution.

The plant diversity in both valleys is high. The working group's meticulous collection of the plant's herbarium has resulted in a comprehensive understanding of the Seman River Valley. The Leguminosae family, with its 11 species, is a significant part of this diversity. In contrast, the Shkumbin River Valley is home to the dominant Poaceae family, which boasts 12 species.

The Seman River Valley is notably dominated by Phanerophyta, with a staggering 40 species, followed by Hemicriptophyta forms with 32 species.

In the Shkumbin River Valley, Hemicriptophyta forms take the lead with 35 species, followed by Therophyta ones with 22.

In the Seman River Valley, Sten Mediterranean forms dominate, followed by Euro-Mediterranean ones, while in the Shkumbin River Valley, Euro-Asian types dominate, followed by paleo-temperate ones.

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AFF	ENDIX I: Flora of the S	eman kiver valle	y		
No.	The name of the species	Blooming	Family	Biological form	Floristic element
1.	Acanthus spinosus	Qershor-Gusht	Acanthaceae	Н	Steno-Medit.
2.	Aegilops triuncialis	May-July	Poaceae	Т	Euro-Medit.
3.	Agrimonia eupatoria	May-July	Rosaceae	Н	Subcosmopolitan
4.	Alkanna tinctoria	March-May	Boraginaceae	Н	Steno-Medit.
5.	Alnus glutinosa	February-March	Betulaceae	Ph	Paleo-temperate
6.	Althaea officinalis	May-June	Malvaceae	н	Euro-Siberian
7.	Abelmoscus esculentus	May-July	Malvaceae	Т	Afrotropical
8.	Amaranthus lividus	June-October	Amaranthaceae	Т	Cosmopolitan
9.	Ammi visnaga	May-September	Apiaceae	Т	Euro-Medit.
10.	Amorpha fruticosa	June-July	Leguminosae	Ph	Nano-American
11.	Anthemis arvensis	May-October	Compositae	Т	Sub-Medit.
12.	Anthyllis hermanniae	May-July	Leguminosae	Ch	Steno-Medit.
13.	Artemisia caerulescens	July-September	Compositae	Ch	Euro-Medit.
15.	Brachypodium distachyon	April-July	Poaceae	Т	Steno-Medit
					Turanian
16.	Cardus py cnocephalus	April-July	Compositae	T/H	MeditTuranian
17.	Carex extensa	May-June	Cyperaceae	Н	MeditAtlantic
18.	Centaurium erythraea	May-August	Gentianaceae	Т	Paleo-temperate
19.	Cercis siliquastrum	March-May	Leguminosae	Ph	Sub-europ-pontico
20.	Chenopodium album	July-October	Chenopodiaceae	Т	Subcosmopolitan
21.	Convolvulus arvensis	April-October	Convolvulaceae	G	Paleo-temperate
22.	Cichorium intybus	May-September	Compositae	Н	Cosmopolitan
23.	Dittrichia viscosa	July-October	Compositae	Н	Euro-Medit.
24.	Echinops ritro	July-September	Compositae	Н	Steno-Medit.
25.	Cornus sanguinea	May-June	Cornaceae	Ph	Euro-Asian
26.	Corylus avellana	February-March	Corylaceae	Ph	European-
					Caucasian
27.	Cucumis melo	June-July	Cucurbitaceae	Т	Paleo-temperate
28.	Cucurbita pepo	May-September	Cucurbitaceae	Т	American
29.	Cydonia oblonga	March-April	Rosaceae	Ph	Asian
30.	Echinophora spinosa	June-September	Umbelliferae	Н	Euro-Medit.
31.	Equisetum palustre	May-August	Equisetaceae	G	Cirkumboreal
32.	Erica arborea	March-May	Ericaceae	Ph	Steno-Medit.
33.	Erica manipuliflora	June-October	Ericaceae	Ch/NP	Steno-Medit.
34.	Eryngium maritimum	June-September	Umbelliferae	G	Mediterranean
35.	Eucalyptus globulus	April-June	Myrtaceae	Ph	Australian
36.	Euphorbia brittingeri	May-July	Euphorbiaceae	Н	South European
37.	Ficus carica	May-August	Moraceae	Ph	Asian-Oriental
38.	Foeniculumvulgare	June-August	Umbelliferae	Н	Steno-Medit.
39.	Galium verum	June-September	Rubiaceae	Н	Euro-Asian
40.	Hypericum perforatum	May-August	Guttiferae	Н	Paleo-temperate
42.	Juglans regia	April-May	Juglandacaeae	Ph	Euro-Asian
43.	Juncus acutus	May-July	Juncaecae	H	Euro-Medit.
44.	Juniperusoxycedrussubsp.	April-May	Cupressaceae	Ph	Euro-Medit.
17	oxycedrus	T A I	D.	m	<u>ри</u> :
45.	Knautia orientalis	June-August	Dipsacaceae	T	Balkanian
46.	Lalium parganicum	April August	Labiatae	п	Fure Agian
47.	Lotua corriculatua	May August	Leguminosae	н	Palao tomporato
40.	Lotus connedutus Lythrum valicaria	Juno-Sontomber	Lythracoao	н	Subcosmonolitan
	Marrubium vulgare	May-August	Labiatae	H	Euro-Medit
51	Mentha aquatica	June-October	Labiatae	н	Paleo-temperate
52	Medicasomarina	March-August	Leguminosao	н	Euro-Medi
52.	Malusdomestica	April-May	Rosacoac	Ph	Mediterrangen
54	Micromeria graeca	May-June	Labiatae	Ch	Steno-Medit
55	Myrtus communis	June-July	Myrtaceae	Ph	Steno-Medit
56.	Oenothera biennis	June-August	Onagraceae	T/H	Nano-American
57.	Olea europaea	May-June	Oleaceae	Ph	Mediterranean
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APPENDIX I: Flora of the Seman River Valley

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58.	Onon is spinos a	May-September	Leguminosae	Ch	Euro-Medit.
59.	Paliurusspina-christi	May-June	Rhamnaceae	Ph	Southeastern
					European
60.	Phillyrea angustifolia	March-May	Oleaceae	Ph	Steno-Medit.
61.	Phlomis fruticosa	March-May	Labiatae	Ch	Steno-Medit.
62.	Phaseolus vulgaris	August-September	Leguminosae	Т	Nano-American
63.	Phoenix canariensis	May-June	Palmaceae	Ph	Canary Islands
64.	Physalis alkekengi	May-July	Solanaceae	Н	Euro-Asian
65.	Pinus pinaster	April-May	Pinaceae	Ph	Steno-Medit.
66.	Pistacia lentiscus	April-June	Anacardiaceae	Ph	Steno-Medit.
67.	Phragmites australis	June-October	Poaceae	G	Subcosmopolitan
68.	Plantagomedia	May-July	Plantaginaceae	Н	Euro-Asian
69.	Platanus orientalis	April-May	Platanaceae	Ph	Balkanian
70.	Polygonumpersicaria	May-October	Polygonaceae	Т	Subcosmopolitan
71.	Populus alba	February-April	Salicaceae	Ph	Paleo-temperate
72.	Populus nigra	March-April	Salicaceae	Ph	Paleo-temperate
73.	Potamogeton gramineus	June-August	Salicaceae	Hidro	Circumboreal
74.	Prunella vulgaris	April-October	Labiatae	Н	Circumboreal
75.	Prunus cocomilla	April-May	Rosaceae	Ph	Mediterranean
76.	Pteridium aquilinum		Hypolepidiaceae	G	Subcosmopolitan
77.	Quercus coccifera	April-May	Fagaceae	Ph	Mediterranean
78.	Quercusfrainetto	April-May	Fagaceae	Ph	Southeastern
	<b>.</b> ,,	1			European
79.	Quercus cerris	April-May	Fagaceae	Ph	Euro-Medit.
80.	Quercus pubescens	April-May	Fagaceae	Ph	Southeastern
	4	p	- ngurrar		European
81.	Punica granatum	May-July	Punicaeae	Ph	Asian Medit.
82.	Ranunculus velutinus	April-June	Ranunculaceae	Н	Nano-Medit.
83	Rhamnus alaternus	March-April	Rhamnaceae	Ph	Steno-Medit
84	Rapistrum rugosum	April-June	Cruciferae	T	Euro-Medit
85	Ruhia peregrina	April-June	Rubiaceae	Ph	Steno-Medit
86	Rubus ulmifolius	Max-July	Rosaceae	N/Ph	Euro-Medit
87	Rumex pulcher	May-August	Polygonaceae	Н	Euro-Medit
88	Rumer maritimus	July-September	Polygonaceae	T/H	Euro-Asian
89	Scirpus lacustris	May-August	Cyperaceae	G	Subcosmonolitan
90	Scripus racustris	July Databas	Chenonodiaceae	т	Bubeosinopointain
00.	Salicornia euronaea	- IIIIV-UCTODOP			Ellropean
91	Salicornia europaea Salix alba	March-April	Salicaceae	Ph	European Paleo-temperate
91. 92	Salicornia europaea Salix alba Salir incana	March-April	Salicaceae	Ph Ph	Paleo-temperate
91. 92.	Salicornia europaea Salix alba Salix incana Salix purpura	March-April April-May	Salicaceae Salicaceae Salicaceae	Ph Ph Ph	European Paleo-temperate Subeuropean
91. 92. 93.	Salicornia europaea Salix alba Salix incana Salix purpurea Saluia officinalie	March-April April-May March-April March-April	Salicaceae Salicaceae Salicaceae	Ph Ph Ph Ch	European Paleo-temperate Subeuropean Euro-Asian StopoMedit /N
91. 92. 93. 94.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis	March-April April-May March-April March-June	Salicaceae Salicaceae Salicaceae Labiatae	Ph Ph Ph Ch	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit
91. 92. 93. 94.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca	March-April April-May March-April March-June	Salicaceae Salicaceae Labiatae	Ph Ph Ph Ch	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Medit.eatlantic
91. 92. 93. 94. 95.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca	March-April April-May March-April March-June January- December	Salicaceae Salicaceae Salicaceae Labiatae Labiatae	Ph Ph Ph Ch H	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic
91. 92. 93. 94. 95.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca	March-April April-May March-April March-June January- December July-Sentember	Salicaceae Salicaceae Salicaceae Labiatae Labiatae	Ph Ph Ph Ch H	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit Meditatlantic Mediterranean
91. 92. 93. 94. 95. 96. 97	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salureja montana Solanumnierum	March-April April-May March-April March-June January- December July-September March-November	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae	Ph Ph Ph Ch H Ch	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit Meditatlantic Mediterranean Cosmonolitan
91. 92. 93. 94. 95. 96. 97. 98	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salureja montana Solanumnigrum Sorahumbalenense	March-April April-May March-April March-June January- December July-September March-November July-Octobor	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Pogeeae	Ph Ph Ph Ch H Ch T	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan
91. 92. 93. 94. 95. 96. 97. 98. 99.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Soarganium erectum	March-April April-May March-April March-June January- December July-September March-November July-October June-July	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Solanaceae Poaceae Snarganiaceae	Ph Ph Ph Ch H Ch T G Hidto	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Euro-Asian Euro-Asian
91. 92. 93. 94. 95. 96. 97. 98. 99.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarii parvifloor	March-April April-May March-April March-April January- December July-September March-November July-October July-October June-July April-May	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae	Ph Ph Ph Ch H Ch T G Hidro Ph	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriganal
91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Satureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica	July-October March-April April-May March-April March-June January- December July-September March-November July-October June-July April-May Max-Junc	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae	Ph Ph Ph Ch H Ch T G Hidro Ph	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Euro-Asian Medit-Oriental Medit-Oriental
91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica	March-April April-May March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatac	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Stano.Medit.
91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salureja montana Solanumigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifoliumanaccificilium	July-October March-April April-May March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June April-Luly	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Labiatae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit.
91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 102.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifolium guberco	July-October         March-April         April-May         March-April         March-June         January-         December         July-September         March-November         July-October         June-July         April-May         May-June         May-June         April-July	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Labiatae Labiatae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T T	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Control Furge age
91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salvia verbenaca Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifoliumangustifolium Trifolium rubens	March-April April-May March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June April-July May-August	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Tamaricaceae Labiatae Leguminosae Leguminosae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T H H	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro
91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salureja montana Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifolium rubens Trifolium rubens Trifolium repens	March-April April-May March-April March-April March-June January- December July-September March-November July-October July-October July-October July-October July-October July-Outober May-July May-June May-June April-July May-August May-August	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T H H H H	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro-Asian
91. 92. 93. 94. 95. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifolium rubens Trifolium rubens Trifolium repens Typha latifolium	March-April April-May March-April March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June April-July May-August May-August June-July	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae Leguminosae Julymaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ch T H H H G G Ph	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro-Asian Cosmopolite Madit_Oriental
91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia officinalis Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifoliumangustifolium Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens	March-April April-May March-April March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June May-June May-June May-August June-July May-August June-July February-March	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Labiatae Leguminosae Leguminosae Leguminosae Typhaceae Ulimaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T H H G Ch T H H H G Ph	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro-Asian Cosmopolite MeditOriental
91.           92.           93.           94.           95.           96.           97.           98.           99.           100.           101.           102.           103.           104.           105.           106.           107.           108.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salvia verbenaca Salvia verbenaca Salvia verbenaca Solanumigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifoliumagustifolium Trifolium rubens Trifoliumrepens Typha latifolia Ulmus canescens Ulmus minor	July-October         March-April         April-May         March-April         March-June         January-         December         July-September         March-November         July-October         June-July         April-May         May-June         May-June         May-June         May-August         June-July         February-March         February-March	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae Ulmaceae Ulmaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T H H H G Ph Ph Ph	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro-Asian Cosmopolite MeditOriental European Courseine
91.           92.           93.           94.           95.           96.           97.           98.           99.           100.           101.           102.           103.           104.           105.           106.           107.           108.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifolium rubens Trifolium rubens Trifolium rubens Trifolium repens Trifolium repens Typha latifolia Ulmus canescens Ulmus minor	July-October         March-April         April-May         March-April         March-June         January-         December         July-September         March-November         July-October         June-July         April-May         May-June         May-June         May-June         May-August         June-July         February-March         February-March	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae Typhaceae Ulmaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T T H H H G Ph Ph	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro-Asian Cosmopolite MeditOriental European Caucasian Caucasian Caucasian Caucasian Caucasian Caucasian
91.           92.           93.           94.           95.           96.           97.           98.           99.           100.           101.           102.           103.           104.           105.           106.           107.           108.           109.	Salicornia europaea Salix alba Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salvia verbenaca Salvia verbenaca Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Ulmus canescens Ulmus canescens	July-October         March-April         April-May         March-April         March-April         March-June         January-         December         July-September         March-November         July-October         June-July         April-May         May-June         May-June         May-August         June-July         February-March         February-March         May-September	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae Leguminosae Ulmaceae Ulmaceae Ulmaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ph Ch T H H H H G G Ph Ph	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro-Asian Cosmopolite MeditOriental European Euro-Asian Cosmopolite MeditOriental European Caucasian Subcosmopolitan
91.           92.           93.           94.           95.           96.           97.           98.           99.           100.           101.           102.           103.           104.           105.           106.           107.           108.           109.           110.	Salicornia europaea Salix alba Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salvia verbenaca Sorghumhalepense Sporganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifoliumagustifolium Trifolium rubens Trifolium rubens Trifolium repens Typha latifolia Ulmus canescens Ulmus minor Urtica dioica Verbenaofficinalis	July-October March-April April-May March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June April-July May-August June-July February-March February-March May-September May-September	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae Leguminosae Uphaceae Ulmaceae Ulmaceae Urticaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T H H H G Ph Ph Ph H H H H	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Steno-Medit. Central European Euro-Asian Cosmopolite MeditOriental European Caucasian Subcosmopolitan Paleo-temperate Rese Marin
91.           92.           93.           94.           95.           96.           97.           98.           99.           100.           101.           102.           103.           104.           105.           106.           107.           108.           109.           110.           111.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia officinalis Salvia verbenaca Salureja montana Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifolium rubens Trifoliumngustifolium Trifoliumnepens Trifoliumrepens Typha latifolia Ulmus canescens Ulmus minor Urtica dioica Verbenaofficinalis Viala adorata	March-April April-May March-April March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June May-June May-August June-July February-March February-March February-March May-September May-September May-September March-June	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae Ulmaceae Ulmaceae Ulmaceae Verbenaceae Violaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ch T H H H H H H H H H H	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Central European Euro-Asian Cosmopolite MeditOriental European Caucasian Subcosmopolitan Paleo-temperate Euro-Medit.
91.         92.         93.         94.         95.         96.         97.         98.         99.         100.         101.         102.         103.         104.         105.         106.         107.         108.         109.         110.         111.         112.	Salicornia europaea Salix alba Salix incana Salix purpurea Salvia officinalis Salvia verbenaca Salvia verbenaca Salvia verbenaca Salvia verbenaca Solanumnigrum Sorghumhalepense Sparganium erectum Tamarix parviflora Tamarix dalmatica Thymus capitatus Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Trifolium rubens Ulmus canescens Ulmus minor Urtica dioica Verbenaofficinalis Viola adorata Viscum album	March-April April-May March-April March-April March-June January- December July-September March-November July-October June-July April-May May-June May-June May-June May-August June-July February-March February-March February-March May-September March-June March-June March-June	Salicaceae Salicaceae Salicaceae Labiatae Labiatae Labiatae Solanaceae Poaceae Sparganiaceae Tamaricaceae Labiatae Leguminosae Leguminosae Leguminosae Leguminosae Ulmaceae Ulmaceae Ulmaceae Verbenaceae Violaceae	Ph Ph Ph Ch H Ch T G Hidro Ph Ph Ch T Ch T Ch T H H H H H H H H H H Ph Ch	European Paleo-temperate Subeuropean Euro-Asian StenoMedit./N- Medit. Meditatlantic Mediterranean Cosmopolitan Cosmopolitan Euro-Asian MeditOriental MeditOriental Steno-Medit. Central European Euro-Asian Cosmopolite MeditOriental European Caucasian Subcosmopolitan Paleo-temperate Euro-Medit. Euro-Asian

114.	Vitis labrusca	May-June	Vitaceae	Liane	Nano-American
115.	Vitis vinifera	May-June	Vitaceae	Liane	South european
116.	Xanthium spinosum	July-October	Compositae	Т	Latin American
117.	Xanthiumstrumarium	July-October	Compositae	Т	Cosmopolitan
118.	Zea mays	August-October	Poaceae	Т	Neotropical
119.	Zizyphus jujuba	April-June	Rhamnaceae	Ph	Euro-Asian

#### APPENDIX II: Flora of the Shkumbini River Valley

No.	The name of the	Gender	Family	Biological	Floristic element
	species			form	
1.	Abelmoschus esculentus	Abelmoschus	Malvaceae	Т	Tropical Africanian
2.	Acer campestre	Acer L.	Aceraceae	Ph	South.EurWest.
					Asian
3.	Acer platanoides	Acer L.	Aceraceae	Ph	European-Caucasian
4.	Achillea millefolium	Achillea L.	Asteraceae	Н	Euro-Siberian
5.	Anthemis arvensis	Anthemis L.	Asteraceae	Т	Submediterranean
6.	Artemisia scoparis	Artemisia L.	Asteraceae	Н	Europeo-Orientale
7.	Chamomilla recutica	Chamomilla L.	Asteraceae	Т	Asian-Oriental
8.	Taraxacum officinalis	Taraxacum L.	Asteraceae	Н	Cirkumboreal
9.	Tussilago farfaro	Tussilago L.	Asteraceae	G	Paleo-temperate
10.	Cichorium intybus	Cichorium L.	Asteraceae	Н	Cosmopolitan
11.	Briza maxima	Briza L.	Poaceae	Н	Paleo-subtropical
12.	Bromus sterilis	Bromus L.	Poaceae	H/T	Paleo-temperate
13.	Agrostis canina	Agrostis L.	Poaceae	Н	Euro-Siberian
14.	Alopecurus gerardii	Alopecurus Vill.	Poaceae	Н	Mediterranean
15.	Alopecurus pratensis	Alopecurus L.	Poaceae	Н	Euro-Siberian
16.	Avena fatua	Avena L.	Poaceae	Т	Euro-Asian
17.	Avena sativa	Avena L.	Poaceae	Т	Euro-Asian
18.	Brachypodium	Brachypodium	Poaceae	Н	European-Caucasian
	pinnatum	L.			
19.	Hordeum murinum	Hordeum L.	Poaceae	G	Paleo-temperate
20.	Lolium perenne	Lolium L.	Poaceae	Н	Euro-Asian
21.	Poa bulbosa	Poa L.	Poaceae	Н	Paleo-temperate
22.	Zea mays	Zea L.	Poaceae	Т	Neotropical
23.	Acinos arvensis	Acinos L.	Labiatae	Т	Euro-Medit.
24.	Ajuga reptans	Ajuga L.	Labiatae	Н	Euro-Asian
25.	Calamintha alpina	Calamintha L.	Labiatae	Ch	South European
26.	Mentha aquatica	Mentha L.	Labiatae	Н	Paleo-temperate
27.	Origanum vulgare	Origanum L.	Labiatae	Н	Euro-Asian
28.	Prunela vulgaris	Prunela L.	Labiatae	Н	Cirkumboreal
29.	Salvia viridis	Salvia L.	Labiata	Т	Steno-Medit.
30.	Alyssum alyssoides	Alyssum L.	Brassicaceae	Т	Euro-Medit.
31.	Brassica oleracea	Brassica L.	Brassicaceae	H/T	European
32.	Capsella	Capsella L.	Brassicaceae	Т	Cosmopolitan
	bursa-pastoris				
33.	Rapistrum rugosum	Rapistrum L.	Brassicaceae	Т	Euro-Medit.
34.	Alyssum bertolonni	Alyssum Desv.	Brassicaceae	Ch	Balkanian
35.	Amorpha fruticose	Amorpha L.	Leguminosae	Ph	North Americanian
36.	Dorycnium	Dorycnium scop.	Leguminosae	Ch	Central European
	pentaphyllum				
37.	Medicago sativa	Medicago L.	Leguminosae	Н	Persian
38.	Melilotus officinalis	Melilotus L.	Leguminosae	Н	Euro-Asian
39.	Spartium junceum	Spartium L.	Leguminosae	Ph	Euro-Medit.
40.	Trifolium alpestre	Trifolium L.	Leguminosae	G	European Caucasian
41.	Vicia cracca	Vicia L.	Leguminosae	Н	Euro-Asian
42.	Aruncus dioicus	Aruncus L.	Rosaceae	Н	Cirkumboreal
43.	Fragaria vesca	Fragaria L.	Rosaceae	Н	Euro-Siberian
44.	Filipendula vulgaris	Filipendula L.	Rosaceae	Н	Euro-Asian
45.	Rosa canina	Rosa L.	Rosaceae	N/Ph	Euro-Asian
46.	Rubus ulmifolius	Rubus Schott.	Rosaceae	Ph	Euro-Medit.
47.	Verbascum blattaria	Verbascum L.	Scrophulariaceae	H/T	Paleo-temperate

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48.	Verbascum longifolium	Verbascum L.	Scrophulariaceae	Н	Southeast European
49.	Linaria vulgaris	Linaria L.	Scrophulariaceae	Н	Euro-Asian
50.	Digitalis lanata	Digitalis Ehrh.	Scrophulariaceae	Н	Sub-Balkan
51.	Anchusa officinalis	Anchusa L.	Boraginaceae	Н	Pontic
52.	Cynoglossum officinale	Cynoglossum L.	Boraginaceae	Т	European
53.	Malva sylvestris	Malva L.	Malvaceae	Н	Euro-Siberian
54.	Convolvulus cantabrica	Convolvulus L.	Convolvulaceae	Н	Euro-Medit.
55.	Alnus glutinosa	Alnus L.	Betulaceae	Ph	Paleo-temperate
56.	Betula pendula	Betula Roth.	Betulaceae	Ph	Euro-Siberian
57.	Amaranthus hybridus	Amaranthus L.	Amaranthaceae	Т	Tropical
					Americanian
58.	Amaranthus retroflexus	Amaranthus L.	Amaranthaceae	Т	North Americanian
59.	Amaranthus albus	Amaranthus L.	Amaranthaceae	Т	North Americanian
60.	Calystegia sepium	Calystegia L.	Convolvulaceae	Н	Paleo-temperate
61.	Anagallis arvensis	Anagallis L.	Primulaceae	Т	Euro-Medit.
62.	Anagallis foemina	Anagallis L.	Primulaceae	Т	Steno-Medit.
63.	Helleborus odorus	Helleborus L.	Ranunculaceae	G	Paleo-temperate
64.	Ranunculus sardous	Ranunculus L.	Ranunculaceae	Т	Euro-Medit.
65.	Morus alba	Morus L.	Moraceae	Ph	Asian-Oriental
66.	Ficus carica	Ficus L.	Moraceae	Ph	Asian-Oriental
67.	Ligustrum vulgare	Ligustrum L.	Oleaceae	Ph	Asian-Oriental
68.	Lonicera caprifolium	Lonicera L.	Caprifoliaceae	Ph	South. European
69.	Hedera helix	Hedera L.	Araliaceae	Liane	Sub-Medit.
70.	Mercurialis annua	Mercurialis L.	Euphorbiaceae	Т	Paleo-temperate
71.	Ricinus communis	Ricinus L.	Euphorbiaceae	T/Ch	Paleo-temperate
72.	Orchis laxiflora	Orchis L.	Orchidaceae	G	Euro-Medit.
73.	Orchis mascula	Orchis L.	Orchidaceae	G	Paleo-temperate
74.	Plantago media	Plantago L.	Plantaginaceae	Н	Euro-Asian
75.	Plantago major	Plantago L.	Plantaginaceae	Н	Euro-Asian
76.	Populus alba	Populus L.	Salicaceae	Ph	Paleo-temperate
77.	Silene alba	Silene L.	Caryophyllaceae	Н	Paleo-temperate
78.	Vitis vinifera	Vitis L.	Vitaceae	Liane	Sub-European
79.	Parietaria officinalis	Parietaria L.	Urticaceae	Н	Euro-Asian
80.	Papaver rhoeas	Papaver L.	Papaveraceae	Т	MeditOrientalis
81.	Iris sintenissii	Iris Janka.	Iridaceae	G	Southeast European
82.	Galium album	Galium L.	Rubiaceae	Н	Euro-Asian
83.	Cornus sanguinea	Cornus L.	Cornaceae	Ph	Euro-Asian
84.	Asparagus acutifolius	Asparagus L.	Liliaceae	G	Mediterranean
85.	Atropa bella-donna	Atropa L.	Solanaceae	Н	Mediterranean
86.	Citrulus lanatus	Citrulus L.	Cucurbitaceae	Т	South-African
87.	Campanula patula	Campanula L.	Campanulaceae	Н	Euro-Asian
88.	Aesculus	Aesculus L.	Hippocastanaceae	Ph	Balkanian
	hippocastanum		-		
89.	Platanus orientalis	Platanus L.	Platanaceae	Ph	Euro-Asian
90.	Atriplex hastata	Atriplex L.	Chenopodiaceae	Т	Circumboreal