



Research Article

Status of Threatened Woody Perennial Species and their Conservation through Participatory Approaches in Maidan Valley (Dir Lower)

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Abstract | Trees conservation plays a significant role in climate change and biodiversity maintenance. The research study was conducted to find out the current status and conserve the threatened woody perennial species through participatory approaches in Maidan valley (Dir Lower). Regular study trips were undertaken in summer and winter season during 2023–2024. The main attention was given to the woody perennial species in this research work. During the research work exotic plants, ornamental plants and fruits trees were not taken into consideration. The main focus was given to the indigenous threatened woody perennial species. Through personal observations, and population survey 20 tree species were assessed and examined keeping in view the threatened plants criteria. Out of them 06 species were distinguished as threatened in the study area, 02 species were endangered, 04 species were highly threatened, 03 species as dominant while 02 species as rare and remaining 03 were found abundant in nature. The area was put into data deficient group of local red list. It is recommended that immediate conservation strategies be implemented for the identified threatened woody perennial species in Maidan Valley through active community participation and awareness programs.

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Keywords | Threatened species, Woody perennial, Conservation, Participatory approaches, Maidan valley, Indigenous plants, Red list



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Introduction

Plants are considered the lungs of the environment. Plants have been categorized into trees, shrubs and herbs (Aakif and Khan, 2015). Similarly on the basis of life cycle completion plants have been divided into annual, biennial and perennial. On the other hand, plants on the basis of habitats have been classified into hydrophytes, mesophytes and xerophytes (Whittaker, 2012). While keeping in view the existence they have been classified into threatened, endangered, rare, and

extinct (Wang *et al.*, 2015).

Unfortunately, only 4.8 % of Pakistan's land mass is under forest cover (Ali *et al.*, 2023). Developed countries having higher percentage of covered forest area, because of their good management and utilization practices (Laaksonen-Craig, 2004). Moreover, the masses of developed countries are well aware of the negative impact of ruthless cutting of trees (Piltan and Sowlati, 2014). Developed countries like Japan, China, Russia and America etc invest more

in the forest conservation and wildlife protection (Huettmann, 2014). European nations have increased the forest covered area of about 9 % between 1990 to 2023 (Siry *et al.*, 2005).

Maidan Valley is located in the Dir Lower district of Khyber Pakhtunkhwa (Pakistan). Maidan valley is from 34°37' to 35°07' North latitude and 71°31' to 72°14' from East longitude and about 180 km towards the North of Peshawar. Its area is 300 sq.Km. the elevation of Maidan valley is from 1575 to 2300 meter. In North the valley is surrounded by Tehsil Barawal, in West surrounded by Tehsil Munda, in East by Tehsil Wari, and Tehsil Balambat lies towards the South. The valley is bounded at all sides by the lofty Hindu Raj Mountains (Ullah *et al.*, 2015). The mountains have steep slopes on all sides topped by three notable conical peaks that form a horse shoe shaped valley with a single outlet at extreme south west. It has beautiful sub valley, hilly tracts, famous for its healthy water. The Climate of Maidan valley is mild moderate and warm to hot summers mostly warm during May to July but the northern parts of the valley, are mostly cooler due to excessive humidity, due to low temperature from the December to march .The Average annual rainfall of Maidan valley is 700 mm to 1200 mm. Generally, 55% of the rainfall takes place from December to April. Average maximum temperature is 38°C while average minimum temperature falls to 0°C and sometime below zero up to freezing point (Khan *et al.*, 2010).

Maidan valley is a home for a rich variety of woody perennial plant species (Din, 2006). These plants play an important role in maintaining biodiversity ecological balance, and resources for the sustenance of local communities. However, numerous factors such as overgrazing, deforestation, inappropriate harvesting and climate change have resulted the decline of various valuable shrub and tree species (Sajjad *et al.*, 2018). Woody perennials species loss in the Maidan Valley is not only a menace for natural environment but also disturbs the livelihoods of residents and local people who solely depend on them for timber, fuel wood, fodder and medicine (Waris, 2020).

Materials and Methods

This study employed a combination of primary

and secondary data collecting methods to examine the factors contributing to the threatened status of specific plant species and to identify the underlying causes of their endangerment.

Primary data collection

Fieldwork was conducted extensively across the Maidan Valley to gather firsthand information. Data collection happened through structured questionnaires to local residents, personal interviews, both with individual and groups of the community. The study focused on approximately 40 main villages in the region, including Hayaseri, Shako, Masarkhani, Fazalabad, Lal Qilla, Manyal, Zimdara, Sarlara, and Lajbook. During field visits, photographs of significant features and objects were captured to document and support the research findings (Andelman *et al.*, 2004).

Secondary data collection

To enhance the depth of the analysis, secondary data was obtained from a range of national and international sources like, the published research articles and the use of online databases (Khan *et al.*, 2023). Local and regional information was further supplemented through visits to the Forest Department and other relevant institutions, ensuring that all critical aspects of the study were addressed comprehensively (Zeeshan *et al.*, 2023).

By integrating both primary and secondary data, this methodology provided a well-rounded understanding of the threats to the plant species under study and the factors driving their endangered status.

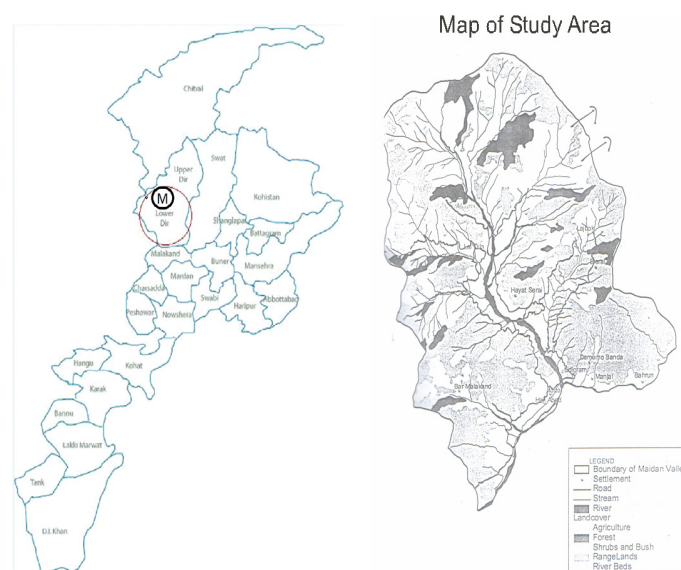


Figure 1: Study area map.

Results and Discussion

Current status of woody perennial species in Maidan valley

The Maidan Valley, a region with a rich diversity of woody perennial vegetation, is witnessing a decline in its flora due to unsustainable resource management and environmental pressures. During the survey, 20 species were analyzed, among which six species were identified as threatened, *Juglans regia* and *Platanus orientalis* were classified as endangered. Additionally, four species *Alnus nitida*, *Punica granatum*, *Pyrus pashia*, and *Zizyphus sativa* were considered highly threatened. Some species, such as *Ailanthus altissima*, *Ficus carica*, and *Melia azedarach*, were found to be dominant, while *Celtis* spp. and *Morus* spp. appeared to be rare.

Patterns of species threat

Table 1 highlights the proportions of species in each threat category. Endangered species constitute a significant concern, with *Juglans regia* and *Platanus orientalis* facing severe risks from felling and water scarcity.

Table 1: Status of woody perennial species in Maidan Valley.

Species name	Dom- inant (%)	Rare (%)	Threat- ened (%)	Total responses
<i>Acacia modesta</i> Wall.	0	18	82	17
<i>Ailanthus altissima</i> Miller	94	5	1	79
<i>Alnus nitida</i> (Spach) Endle.	0	20	80	55
<i>Broussonetia papyrifera</i> Linnaeus	55	45	0	9
<i>Celtis australis</i> L.	0	100	0	24
<i>Eucalyptus camaldulensis</i> Dehn.	20	80	0	10
<i>Ficus carica</i> Linnaeus	87	10	3	79
<i>Juglans regia</i>	3	11	86	79
<i>Melia azedarach</i>	72	28	0	47
<i>Morus alba</i>	11	79	10	61
<i>Olea ferruginea</i>	77	17	6	48
<i>Pinus roxburghii</i>	75	25	0	32
<i>Platanus orientalis</i>	4	9	87	79
<i>Punica granatum</i>	0	15	85	74
<i>Populus nigra</i>	64	36	0	25
<i>Pyrus pashia</i>	0	4	96	74
<i>Quercus</i> spp.	47	16	37	19
<i>Robinia pseudoacacia</i>	14	50	36	14
<i>Salix</i> spp.	15	35	50	26
<i>Zizyphus sativa</i>	0	8	92	75

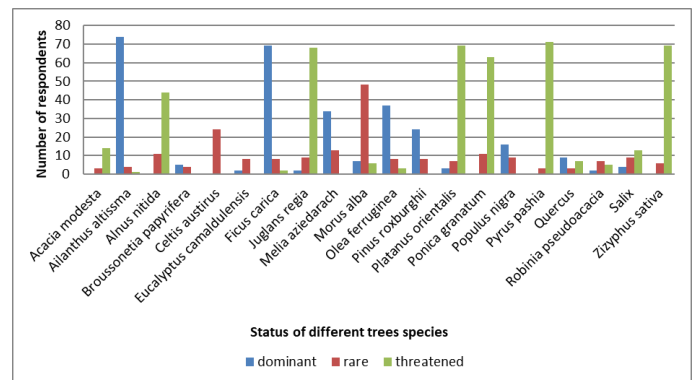


Figure 1: Graphical representation of Table 1.

The Table 2, shows species wise percentage responses to decline in populations, the intensity of threatening process, vulnerability of species with respect to time, and underscores the urgency of conservation measures.

Table 2: Accelerated threatened process.

Age classes	Name					
	<i>Alnus nitida</i>	<i>Juglans regia</i>	<i>Platanus orientalis</i>	<i>Punica granatum</i>	<i>Pyrus pashia</i>	<i>Zizyphus sativa</i>
5-10	21	49	34	19	42	21
11-15	17	11	19	35	23	35
16-20	5	7	9	6	6	13
21-25	---	1	4	3	---	---
26-30	1	---	4	---	---	---

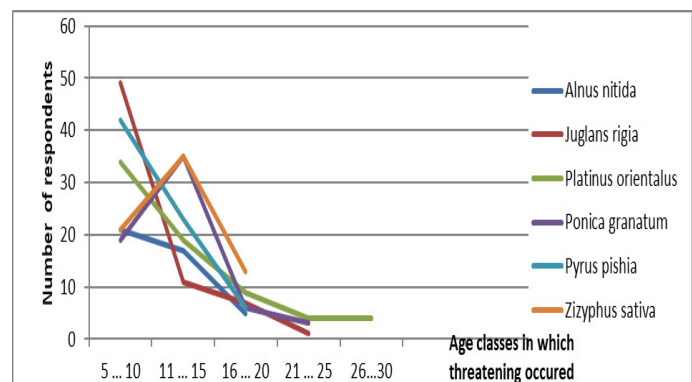


Figure 2: Graphical representation of Table 2.

Table 3 shows the responses in percent, about the factors causing and accelerating the threatening process of woody perennial species in Maidan valley.

Factors contributing to threats

The decline of woody perennials in Maidan Valley is attributable to multiple factors:

- Anthropogenic pressures: Illegal logging, population growth, and expanding agriculture have intensified habitat loss.
- Environmental challenges: Drought and

water scarcity exacerbate species vulnerability, particularly in *Platanus orientalis* and *Zizyphus sativa*.

- Lack of conservation practices: Limited replantation initiatives and inadequate awareness campaigns have hindered recovery efforts.

Table 3: Description of threatened species.

Name	Dis- ease	Water scarcity	Felling	Flooding
<i>Acacia modesta</i>	5	---	9	---
<i>Alnus nitida</i>	---	10	34	---
<i>Ficus carica</i>	---	---	2	---
<i>Juglans regia</i>	26	12	30	---
<i>Morus alba</i>	1	---	5	---
<i>Platanus orientalis</i>	4	23	42	---
<i>Punica granatum</i>	27	5	31	---
<i>Pyrus pashia</i>	13	15	43	---
<i>Quercus</i>	---	---	2	---
<i>Robinia pseudoacacia</i>	2	2	1	---
<i>Salix</i>	2	7		4
<i>Zizyphus sativa</i>	23	12	34	---

Anthropogenic activities like illegal logging, agriculture expansion, and overgrazing are key drivers of woody species decline in Pakistan (Khan *et al.*, 2006). Climate change, particularly drought and irregular rainfall, severely impacts species like “*Platanus orientalis*” and “*Zizyphus sativa*” (IPCC, 2021). Poor reforestation efforts and limited public awareness further hinder conservation (Malik *et al.*, 2015). Community involvement has proven effective in biodiversity protection (Pretty and Smith, 2004). In northern Pakistan, weak forest governance and low environmental literacy persist (Shah *et al.*, 2024). These challenges collectively threaten the survival of native woody perennial species.

Conclusion

The study in Maidan Valley, Dir Lower, KPK, found that many tree species, such as *Alnus nitida*, *Juglans regia*, *Platanus orientalis*, *Punica granatum*, *Pyrus pashia*, and *Zizyphus sativa*, are declining. The main causes include deforestation, illegal cutting, smuggling, population growth, lack of fuel resources, increasing demand for furniture and construction, and environmental issues like floods and diseases. Due to these threats, the valley may lose these valuable trees, leading to scarcity of fuel and construction wood.

Army checkpoints restrict imports, forcing residents to cut slow-growing trees like *Juglans regia* for survival. Deforestation continues at an alarming rate, while conservation efforts are almost nonexistent. If urgent action is not taken, these species may become locally extinct, causing severe environmental and economic crises.

Recommendations

The study recommends the following measures for mitigating threats to the woody perennial species of Maidan Valley:

- Encouraging community participation in replantation programs for threatened species.
- Educating local communities on the ecological importance of preserving native flora.
- Introducing alternative sources of fuel and construction materials to reduce pressure on forests.
- Strengthening enforcement against illegal logging and promoting forest conservation policies.
- The study underscores the importance of a participatory approach involving local communities, government bodies, and non-governmental organizations to ensure the protection of Maidan Valley’s biodiversity.

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Novelty Statement

This study presents a novel assessment of threatened woody perennial species in the ecologically significant Maidan Valley (Dir Lower), highlighting species at risk due to anthropogenic pressures. It uniquely integrates participatory conservation approaches by engaging local communities in data collection and protection strategies.

Author's Contribution

Sajid Ali: Conducted and surveyed the research project. Collected all the data carefully. Also acted as a corresponding author.

Mansoor Ali Khan: Contributed in woody perennial species data collection and manuscript writing.

Nowsherawan Zarif: Contributed in tabulating the data and in literature review.

Dr. Anwar Ali: Evaluated the basic statistical data analysis of the manuscript

Basheer Ahmad: Helped in the proper identification of various woody perennial species.

Muhammad Umair Khan: Contributed in proof reading and removal of grammatical mistakes. Also helped in basic statistical data determination.

Generative AI and AI-assisted technology statement

For the manuscript entitled "Status of Threatened Woody Perennial Species and Their Conservation through Participatory Approaches in Maidan Valley (Dir Lower)," no generative AI tools were used in the conception, design, data collection, analysis, or interpretation of the research. The study is based entirely on field surveys, participatory approaches, and manual data analysis conducted by the authors. Only AI has been used for minor grammatical and spellings mistakes correction.

Conflict of interest

The authors have declared no conflict of interest.

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