

Chapter 2

Status of Natural Resources in the Uplands of the Swat Valley Pakistan

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2.1 Introduction

Swat is the focal point of the Hindu Kush Himalayan region of Pakistan and enjoys a central position in the trans-Hindu Kush Himalayan socioeconomic development activities. It is known for its natural beauty and some of the world's concerned biodiversity resources. It spreads over 8220 km² of land within 34°30'–3°55' lat N and 71°45'–72°50' E. The area can broadly be divided into three physical units, i.e., land, water, and biodiversity. A valley basin, largest among the valleys of the Hindu Kush, represents land of Swat. It is an eolian formation of the Cenozoic era and has highly interrupted the alluvial activities of Swat River. A single watershed of Swat River physically represents the area. The valley has altitudinal variations ranging from 600 m in the south to more than 6000 m in the northern high peaks, and the highest peak being that of Falaksair (6261 m). The area is mainly mountainous and rugged with a wide range of altitudinal variations, ranging from mild relief in the southern parts to very steep relief and high altitudes in the north (Jan and Mian 1971). The ridges are predominantly oriented in the north-south direction. Phyto-geographically, most of the area of the valley comes under the Sino-Japanese region (Ali and Qaisar 1986; Ahmad and Sirajuddin 1996) with monsoon rains concentrated mostly in summer (Table 2.1), whereas toward the north (Swat Kohistan), the Irano-Turanian region dominates, having very little or no summer monsoon rains.

The word Swat, unless specified, is synonymously used for the area included in the Swat River catchment. The book introduces Swat in historical perspectives of the natural resources with special emphasis on the land, water, and biodiversity.

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Table 2.1 Meteorological data obtained from Agriculture Research Institute North Mingora. (Source: Khan and Khan 1993)

S. No.	Month	Temperature (°C)		Relative humidity (%)	Total rainfall (mm)	Wind velocity (km/h)
		Max.	Min.			
1	July	31.64	20.96	77.84	143.0	4.28
2	August	31.67	20.90	82.58	87.4	2.76
3	September	29.67	15.97	74.77	112.4	2.25
4	October	27.27	10.12	70.51	94.3	2.32
5	November	21.98	6.23	67.80	20.5	1.40
6	December	17.40	4.11	76.80	20.5	0.99
7	January	13.35	1.32	81.12	40.8	1.21
8	February	18.80	4.76	71.32	43.8	1.80
9	March	16.329	5.35	72.45	25.5	2.37
10	April	26.21	11.76	63.76	90.2	3.14
11	May	31.35	16.25	54.41	26.9	4.47
12	June	32.71	18.9	58.50	54.2	1.84
Monthly averages		24.86	11.39	71.16	64.64	2.4

2.2 Administrative Boundaries

The southern extreme of the valley comes under the administrative control of Malakand Agency and Dir district on the left and right banks of the Swat River, respectively. More than 87% of the area of the valley comes under the administrative control of Swat district. The area is bounded at all sides by the lofty Hindu Raj Mountains and is drained by a single watershed, i.e., the meandering river of Swat originating in the high mountains to the north >6000 m.

2.3 Population

Historical reviews supported by archeological evidence show that the Swat valley was inhabited by men in the prehistoric era between 2400 and 2100 BC (Ali and Khan 1991; Stacule 1969). It remained under the powerful domains of a variety of civilizations, the most prominent among which is the Gandhara civilization reported by the well-known Chinese travelers Fa Hien, Song Yun, Hiuen Tsang, and Wiking in the fifth to eighth century AD (Shah 1940; Hussain 1962; McMahon and Ramsay 1901). Fa Hien, who visited Swat area in AD 403, gave its name “Won-Chang” in Chinese, and “park” in English (McMahon and Ramsay 1901). He wrote that the language of the Swat people was similar to that spoken by the people in central India (McMahon and Ramsay 1901). Swat remained for more than 1000 years under Buddhist and Brahmin whose engravings are still preserved on rocks in various parts of the district.

Swat district occupies more than 87% of the area included in the Swat valley. It has a population of more than 1.25 million individuals with a growth rate of 3.9% and in migration of 3.2%. Having been regarded as “an ideal place in summer for kings” (Khalil 1986), it is visited by thousands of tourists from the country and abroad. Its pleasing environment in the hot summer, the chilling water of river Swat, the scenic beauty of its landscape, and the widespread archeological sites provide much attraction to the tourists.

The district is inhabited by three ethnic groups (Barth 1956), i.e., Pathans, Gujars, and Kohistanis. Pathans, who are mainly Yousafzai by descent (McMahon and Ramsay 1901; Hussain 1962; Bellew 1994), depend mainly upon agriculture. They occupy plains, generally extending to a critical ecological threshold of supporting two crops per year. The climate of the valley is generally hot in summer. Vegetation in the area occupied by Pathans is highly degraded scrub.

Gujars, the Indian Aryans (Bowles 1977; Anonymous 1978), are the original inhabitants of the area (Bellew 1994). They generally use the foothills for agriculture and the highland meadows as grazing pastures. Though highly defused among Pathans, they exclusively occupy the mountain slopes and high-altitude areas. These areas comprise forests. The climate is cold, supporting monocrop agriculture at high altitudes of 1900 m and above.

Kohistanis are Dardic in origin (Barth 1956). They have been concentrated in the northern mountain gorges of Swat Kohistan. They mainly occupy areas beyond the reach of monsoon, generally of the subhumid to dry temperate zone. They practice both agriculture and livestock herding. Their area is cold and supports monocrop culture. Transhumance is observed in some of the highland Gujar and Kohistani tribes, whereas the tribal movements of Pathans (*garzenda wesh*) came to an end in 1932 (Barth 1995).

Both the Gujars and Kohistani are fluent in speaking Pukhto, the local Pathan language, besides their mother tongues, Gojri and Kohistani, respectively. Presently, the Swiss-sponsored “Kohistan Integrated Development Project” has greatly improved the Kohistani economy through the development of social organizations and the extension of improved agricultural technologies, especially the off-season vegetables culture. A sketch of the geographical boundaries of the valley is given in Fig. 2.1. Its geophysical and agroclimatic diversity supports the existence of wide variety of terrestrial and aquatic resources of wild and domesticated plants and animals. The area spreads over 8220 km² of land within 3430–3555°N and 7145–7250°E. Highly interrupted eolian deposits of Cenozoic origin mainly represent the basin of Swat valley. Its southern extremities come under the administrative control of Malakand Agency and District Dir on the left and right banks of the river Swat, respectively, whereas most of the area of the valley toward the north is included in the Swat district. The area is bound from all the sides by the lofty Hindu Raj Mountains and drained by a single watershed, i.e., the meandering river of Swat originating in the high mountains in the north. The flow of Swat River is mainly determined by the melting snow and ice from March to June and the incident monsoon rains in rest of the year, particularly in July and August. The valley has an altitudinal variation ranging from 600 m in the south to more than 6000 m

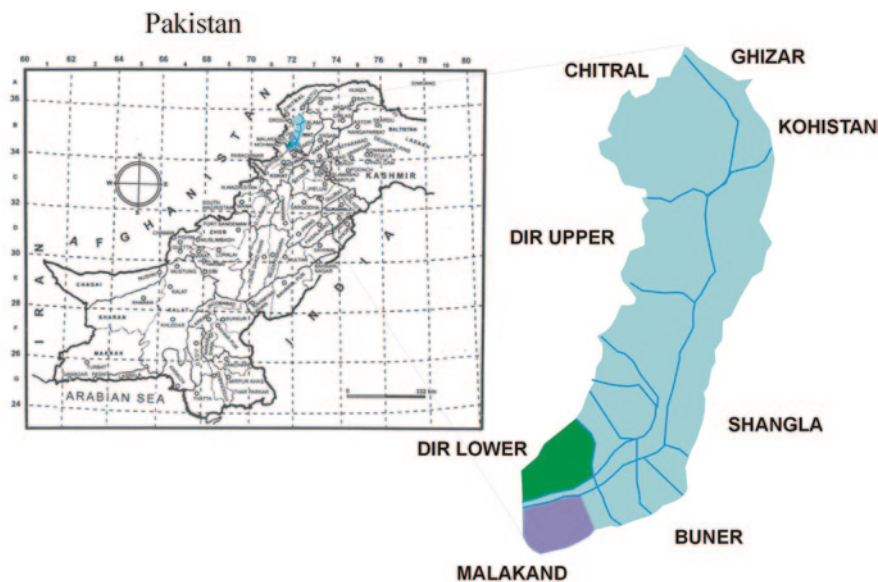


Fig. 2.1 Swat valley, location and administrative boundaries. (Ahmad and Ahmad 2003)

in the north. Mostly the area is rugged, with a wide range of altitudinal variation reaching upto 10,000 ft, within a small distance of 5 miles in the main ridges (Jan and Mian 1971). The ridges are predominantly oriented in the north-south direction. These highly varying topographic conditions affect the flow and thereby the lifestyle of the associated flora and fauna. Geoclimatologically, the Swat River falls under (1) monsoon excluding spating river ecology and (2) the monsoon prevailing sluggish river ecology. The former being restricted to the Kohistan region is represented by trout fish and can therefore be referred to as trout ecology. Whereas the latter that spreads over the entire river in the rest of the valley and is endemic to the *Schizothorax*-associated fish species and can be referred to as non-trout ecology.

Phytogeographically, most of the area of the valley comes under the Sino-Japanese region (Ali and Qaisar 1986; Ahmad and Sirajuddin 1996) with monsoon rains mostly in summer (Table 2.1), establishing a variety of biotic communities within the influence of various temperature and precipitation regimes.

For getting a broader overview of the impact and interaction among physical, chemical, and biological factors, secondary information are reviewed. Details regarding the secondary information is presented in “Reference” section of this chapter. Depending upon the variation in altitude, rainfall, and temperature regimes, the whole catchment is divided into:

- Lower Swat, starting just from Boosaq in the south and extends up to Nagova Spur in the north, prevailing generally over 600–900 m altitudinal ranges.
- Middle Swat, starting from Nagova Spur extending up to Shahgram in the north, generally having more than 900–1400 m altitude.
- Upper Swat, including areas with the altitudinal ranges generally exceeding 1200 m in the side valleys and 1400 m in the main valley of Swat.

- Swat Kohistan, having an altitudinal range of 1500–6000 m, within the prevailing subhumid to dry temperate type of climate.

Floristically, whole of the catchment is broadly divided into the artificial and natural type of forests. Further classification for each of these types is based upon the land-use system in the case of artificial forests and the evident climax vegetation in the case of natural forests. Climatically, the catchment was broadly divided into subtropical, temperate, alpine, and cold desert agroclimatic zones. The land-use system in each of these zones with regard to the cropping pattern, farming system, and the associated wildlife is discussed zone-wise. Direct field observations were made for recording floral and faunal diversity. Historical evidences with regard to the biodiversity situation were reviewed and the impacts of most important ecological factors on the biodiversity situation were elucidated. The direct and indirect role of a man, who is the highly skilled and most important among ecological factors, is also reported separately.

Ecologically, the Swat River was divided into “the torrent trout type” and “the sluggish non-trout type” of ecologies. Both the floral and faunal distribution in each ecological type is described separately. The role of Swat River as a resource base, for variety of socioeconomically productive systems of Khyber Pakhtunkhwa (KP), together with its role as a sink for absorbing and converting the household, agricultural, municipal, and industrial refuse into the precious bioproducts, is elucidated. For limnological aspects, the findings of Ahmad (1999) are reproduced as such.

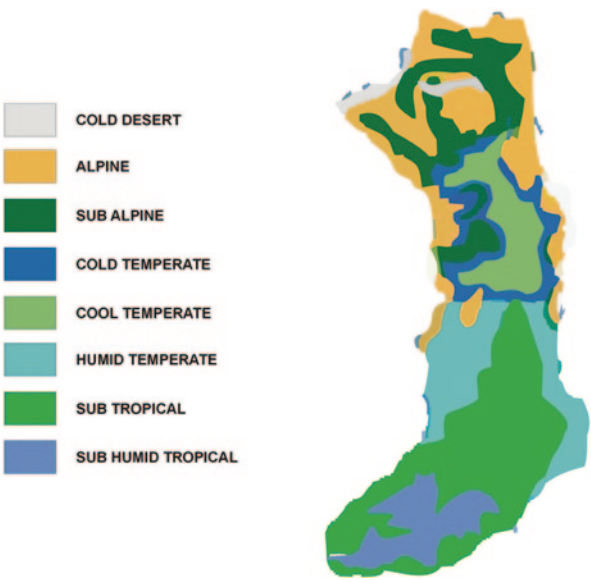
2.4 Population and Ethnoecology

Historical reviews supported by the archeological evidence show that the valley of Swat was inhabited by men during the protohistoric era of 2400–2100 BC and remained under the powerful domains of variety of civilizations, the most prominent among which is the Gandhara civilization reported by the well-known Chinese travelers Fa Hien, Song Yun, Hsien Tsang, and Wiking in the fifth to eighth century AD (Shah 1940; Hussain 1962; McMahon and Ramsay 1901; Wylly 1998). Fa Hien, who visited Swat area in AD 403, reported its name as “Won-Chang” in Chinese, synonymous to “park” in English and “Udyana” in Sanskrit (McMahon and Ramsay 1901). He also reported that the language of the people of Swat was similar to that spoken by the people in central India (McMahon and Ramsay 1901). Swat remained for more than 1000 years under Buddhist and Brahmin maharajas whose engravings are still preserved on rocks in various parts of the valley. Presently, the area is occupied by more than 1.7 million individuals (Table 2.2), separated into three distinct ethnic groups (Barth 1956), i.e., Pathans, Gujars, and Kohistanis, exploiting different ecological niches and sharing the resources symbiotically. Pathans mainly depend upon agriculture and exploit the deep soil of the alluvial plains generally with irrigation systems. The climate in the plains is rather hot in summer, and generally, two crops a year are harvested from their fields. Vegetation of the Pathans exploiting ecology is generally scrubby.

Table 2.2 Population of Swat valley according to 1998 census

S. No.	Administrative unit	Population	Percentage
1	District Swat	1,249,572	72.03
2	Batkhela Tehsil	247,441	14.16
3	Chakdara Tehsil	235,920	13.80
Total		1,734,933	99.99

Fig. 2.2 A sketch of the major climatic zones in Swat valley



Gujars, though highly defused among Pathans, exclusively occupy the foothills and high-altitude areas. They practice both agriculture and livestock herding. They mostly comprise forest-associated communities and generally occupy colder climate, mostly supporting the monocrop culture.

Kohistanis are concentrated in the northern mountain gorges of Swat Kohistan. They mainly occupy the monsoon-excluded ecology of the subhumid to dry temperate nature. They practice both agriculture and livestock herding. Their area is too cold, and one crop in a year is generally cultivated. Presently, the Swiss-sponsored “Kohistan Integrated Development Project” has greatly improved the Kohistanis economy through social organization and the extension of the improved agricultural technology, especially through the introduction of the off-season vegetables in the area.

2.5 Geomorphology

The water into Swat River makes its way across a variety of geophysical formations. These formations not only affect the quality of its water and the associated life-forms but also determine the flow and speed of the river generally. The detailed geological surveys regarding the Swat valley show that various forces during the geological history have resulted in the formation of mountains, plains, and outwash deposits. A brief description of these landforms with special reference to its impact on Swat River is the content of this section.

2.5.1 Mountains

Most of the area of the Swat River catchment is mountainous, categorized into plutonic, sedimentary, volcanic, and metamorphic rocks. The subdivision of rock types commonly met within the area is presented in Table 2.3. It has the extreme relief of more than 10,000 ft in a horizontal distance of only 5 miles (Jan and Mian 1971) in the north and comparatively very mild relief in the south of the valley. The surface of mountains is generally rugged. In the northern part, natural vegetation covers most of the mountains that recharge the flow of local streams and ultimately the Swat River. The extinct of erosion is less here and therefore the turbidity and total

Table 2.3 Petrography of open rocks found in Swat. (Source: Jan and Mian 1971)

S. No.	Formation	Rock types	Probable period of origin
1	Dewangar, Matiltan, Lower Swat, and Malakand	Propyritic granite, granite, at places gneisses	Early to middle Tertiary
2	The Gabral plutonites	Quartz diorites, granites, and minor granodiorites	Early to middle Tertiary
3	The Deshai diorites	Quartz diorides, amphibolite, biotite gneisses, granites, and metagabbros	Early Tertiary
4	The Utrere volcanic	Sillicic to intermediate lavas ignimbrites, tuffs, and agglomerates	Cretopleocene
5	The Kohistan basic complex	Norites, diorites, bands of pyroxenites/anorthosites, granites, and minor amphibolites	Late Cretaceous
6	The Kalam group	Micaceous quartzites, siliceous schist, phyllite, siltstone shale, and limestone	Carboniferous to Siluro-Devonian
7	The Lower Swat, Buner Shiston group	Green schists, phyllitic schists, marble calcareous, and siliceous schists	Middle Paleozoic

dissolved solids (TDS) are very low. The natural forests have good humus and excellent fertility. Whereas in the lower valley (southern part), most of the forests have been uprooted and the mountains have lost the water-retention capacity. Runoff in monsoon rain therefore causes accelerated erosion and landslides and results in severe floods in the plains. It also contributes a variety of rock material and organic matters to the running water and therefore affects the quality of water recurrently.

2.5.2 *The Outwash Deposits*

Three types of depositions, i.e., colluvial, glacial, and alluvial recognized in the Swat River catchment area are described below.

2.5.2.1 Colluvial Deposits

These deposits resulted from the erosion and disintegration of rock surface. The rock particles of various sizes can be observed in this type of soil. It is generally highly drained and is not preferred for cultivation.

2.5.2.2 Alluvial Deposits

Generally, the deposition of gravels and fine rock materials under the influence of water results in alluvial deposits. The soil of this landform is generally coarse gravely to sandy loam with shallow or moderate depth. Most of the streambeds and their floodplains in the lower and southern parts of the valley are alluvial deposits.

2.5.2.3 Glacial Deposits

These landforms are established under the influence of avalanches. The moving glacier have brought and deposited a variety of organic and inorganic materials, including trees and boulders. The soils thus formed are generally unstratified and can very frequently be observed in the Kohistan area.

2.5.3 *The Plains*

Wind and water are the major factors responsible for the formation of plains in Swat valley. Four types of plains can be recognized here.

2.5.3.1 The Glacio-Alluvial Plains

These are the plains of minor extent and can only be observed in Swat Kohistan. They are generally formed by the joint activities of avalanches and water flow.

2.5.3.2 The Eolian Plains

These landforms represent the wind-borne deposits, of probably Cenozoic in origin. Its soil is characteristically very deep, fine-grained in texture, yellowish brown in color, and fertile in nature. Locally, this type of soil is referred to as *mata khawra*. Usually, this type of soil is free of gravels. This landform is heavily disrupted by the natural forces like the flow of water, glacial activity, and agricultural activities of men everywhere in the valley. Its uninterrupted pieces can only be observed along the mountain spurs downstream the river in the valley. It is susceptible to erosion and causes increased alkalinity and is the main source of inorganic suspended solids in the river water.

2.5.3.3 The Alluvial Plains

Alluvial soil is waterborne in origin, and its nature and composition is generally determined by rock type, the flow of water, and the distance of parent material from the parent rock to the deposition site.

Alluvial soil is generally shallow to moderately deep or deep over the gravel or stone beds, non-gravelly and well drained. The relief of this landform is generally level to mildly undulating. Most of the floodplains of river Swat and its tributaries comprise this landform.

2.5.3.4 Eolio-Colluvial Plains

These land morphs are developed due to the transportation of eolian material through floodwater from one place and depositing it in another place. This type of soil, though quite deep in formation, cannot be stratified vertically. It is brown to dark brown in color, silty loam in texture, slightly alkaline, and represented by the rock material throughout the profile.

2.6 Agroecology and Farming Systems

The Swat River originates mainly in the alpine and flows within a variety of temperate and subtropical agroclimatic zones. A brief description of the zones recognized in the catchment (Table 2.4) is given below.

Table 2.4 Agroclimatic zones in the Swat River catchment. (Source: Ahmad and Ahmad 2003)

S. No.	Zone	Altitude (m)	Land use	Typical areas	Prominent features
1	Subtropical	600–1000	Double cropping, some tropical, and temperate fruits	Most of the area of Chakdara, Batkhela, and Barikot Tehsils	<i>Acacia modesta</i> , <i>Olea ferruginea</i> , and <i>Dodonaea</i>
2	Humid temperate	1000–1500	Double cropping, temperate fruits, and vegetable	Plains and foot-hills of Matta, Khwazakhela, and Charbagh Tehsils	<i>Pinus roxburghii</i> , <i>Quercus incana</i> , and <i>Pistacia integerrima</i>
3	Cool temperate	1500–1900	Double cropping and some temperate fruits	The side valleys, e.g., Miandam, Malam, Sangar, Shawar, Sakhra, and Dabargi	<i>Pinus wallichiana</i> and <i>Quercus dilatata</i> prominent
4	Cold temperate	1900–2300	Monocropping of potato and maize	Upper limits of the side valleys, e.g., Mianbanr, Sulatnnr, Ushu, and Gabral	<i>Prunus cornuta</i> , <i>Aesculus indica</i> , and <i>Taxus wallichiana</i>
5	Subalpine	2300–3600	No agriculture, livestock grazing, and forest products	The high-altitude forests of Sham Sar, Spin Sar, Daral, and Ladoo	<i>Abies pin-drow</i> , <i>Picea smithiana</i> , and <i>Quercus semecarpifolia</i>
6	Alpine	3600–4600	Mainly used as grazing pastures and medicinal plants collection	The high-altitude meadows of Loi Pandghalae, Daral Sedgai, Boosaro Sar, and Gabhral	<i>Juniperus</i> , <i>Sibbaldia</i> , <i>Potentilla</i> , <i>Primulas</i> , and <i>Aconites</i>
7	Cold desert	4600–6000	Sources of perennial flow of the river Swat	High peaks of the Chitral adjoining areas, Falak Ser, and Mankial glaciers	Permafrost glaciers and ice caps

2.6.1 Subtropical Zone

Most of the plains in Lower Swat come under this category. It extends from 600 m in plains of Lower Swat upto 1000 m in plains of the Upper Swat. This zone comes under monsoon range and is characterized by mild winter (Table 2.5) with very little to no snowfall in winter, especially in its upper extremes. Summer is generally hot and humid. Tropical fruits like citrus, guava, mango, and banana can be cultivated here.

The prevalent farming system in this zone is cereal based; mainly rice and wheat is cultivated as kharif and rabi crops, respectively. Tobacco, onions, tomatoes,

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