

Igor V. Belolipov, David E. Zaurov,
and Sasha W. Eisenman

Uzbekistan is a country in Central Asia that extends from the foothills of the Tian Shan and Pamir mountains in the east to just west of the Aral Sea. In the north Uzbekistan borders Kazakhstan, in the east and southeast Kyrgyzstan and Tajikistan, in the west Turkmenistan, and in the south Afghanistan. The country covers 447,400 km² (172,742 sq miles) and has a population of about 26 million. Uzbekistan is divided into 12 provinces and 1 autonomous republic (Fig. 2.1).

The highest point of elevation is in the Gissar mountain range at 4,643 m (15,233 ft), and the lowest point of elevation is the Sarykamysh depression at 20 m (ca. 65.6 ft) below sea level. About 80% of Uzbekistan's land consists of plains and deserts. The vast Kyzylkum desert lies in central Uzbekistan and is largely uninhabited except for mining towns.

There is a wide spectrum of natural environments from the hot sand and gypsum deserts of Kyzylkum to the eternal snows and glaciers of the Pamiro-Alai mountains. All valleys receive their water from glaciers in the Tian Shan and Pamiro-Alai mountains. Uzbekistan's two most important rivers, the Syr Darya and Amu Darya, flow from the Tian Shan and Pamiro-Alai mountain ranges to the Aral Sea.

The climate of Uzbekistan is continental with predominance towards harsh continental. It is characterized by low precipitation (70–100 mm [~2.75 to 3.94 in.] per year) in the plains of the northern-western part of the country and up to 1,200 mm (47.25 in.) of precipitation in mountainous regions.

Over 70% of the precipitation falls in the autumn to spring period, with a maximum in March and April. Summers in Uzbekistan are long, dry, and hot, summer rains are very rare, and summer temperatures may reach 45°C (113°F). In the south the winter is mild, but sometimes with considerable frosts. In the northern regions winters are cold and temperatures may drop to –37°C (–35°F).

The flora of Uzbekistan contains more than 4,500 vascular plants in 650 genera, in 115 families (Chemonics International Inc. 2001). More than 4,000 species of algae and more than 2,000 species of fungi also occur in Uzbekistan (National Biodiversity Strategy Project Steering Committee 1998). The most species-rich plant families account for a large portion of the flora. These families include Asteraceae (600 species), Fabaceae (450 species), Poaceae (>250 species), Brassicaceae, Lamiaceae, Rosaceae, Boraginaceae and Apiaceae.

Agriculture and cultivated crops occupy considerable areas of irrigated and non-irrigated land. Some of the major crops are cotton, maize (corn), alfalfa, wheat, barley, sorghum, rice, mulberry for silkworm culture, vegetables, melons, fruit trees, and others. The natural vegetation of Uzbekistan is a very rich source of fodder (more than 1,700 species), medicinal plants (600 species) and plants with essential oils (>650 species), saponins (>100 species), and tannins (ca. 400 species).

The vegetation of Uzbekistan is divided into four main ecosystems. The main cause for ecosystem zonation is change in hydrothermal conditions. These zones form belts which are directly correlated to an increase in precipitation and elevation. As elevation increases there are changes in environmental conditions. Growing periods become shorter, temperature decreases and precipitation increases. Due to the increase in precipitation water is no longer a limiting factor above 2,500 m (~8,200 ft). Diverse soil conditions, in combination with the environmental conditions, result in a great diversity of vegetation. The local names “chul” (arid plain, desert), “adyr” (foothills), “tau” (mountains), and “yailau” (alpine zone) are widely used by the people of Uzbekistan and correspond to the zones produced by vertical changes in the landscape.

I.V. Belolipov (✉)
Tashkent State Agrarian University, Tashkent-140,
Tashkent 100140, The Republic of Uzbekistan
e-mail: ivbelolipov@mail.ru

D.E. Zaurov
School of Environmental and Biological Sciences, Department of
Plant Biology and Pathology, Rutgers University, 20 Ag.
Extension Way, New Brunswick, NJ 08901, USA

S.W. Eisenman
College of Liberal Arts, School of Environmental Design,
Department of Landscape Architecture and Horticulture, Temple
University, 580 Meetinghouse Rd., Ambler, PA 19002, USA



Fig. 2.1 Uzbekistan with provincial boundaries

The chul zone (arid plain, desert): The chul consists of the flat territory of Uzbekistan, which is usually considered desert. The chul continues up to 500–600 m (~1,640 to 1,970 ft) above sea level and has a dry period of 3–6 months. The climate of the chul zone is ultra-continental and is characterized by low precipitation of 70–208 mm (~2.75 to 8.2 in.) per year and humidity levels that drop to as low as 1–2%. The dry period in the chul zone lasts from May to October. Summer temperatures can reach 45°C (113°F) while winter temperatures often drop below –30°C (–22°F).

The chul zone occupies most of the Central Asian plain (Turan) and displays four soil types: salty chul, sandy chul, gypsum (stony) chul, and clay chul (National Biodiversity Strategy Project Steering Committee 1998). Portions of the salty chul ecosystem that have extremely high salt concentrations support no plant life. Areas of salty chul with lower salt content are dominated by *Artemisia halophila* and species in the Chenopodiaceae family such as *Halocnemum strobilaceum*, *Halostachys caspica*, *Haloxylon aphyllum*, *Salicornia herbacea*, *Salsola dendroides*, *Suaeda dendroides*

and *S. microphylla*. Sandy chul is dominated by *Acanthophyllum korolkowi*, *Ammodendron conollyi*, *Astragalus villosissima*, *Calligonum aphyllum*, *Convolvulus hamadae*, *Ephedra strobilacea*, *Ferula foetida*, *Salsola arbuscula* and *S. richteri*. The gypsum chul is located in the hills of the southwestern and central Kyzylkum desert. *Artemisia* associations predominate in the gypsum chul zone. The most common association is *Artemisia diffusa* (less frequently *A. ferganensis*) with *Convolvulus hamadae* or with co-dominance of *Aellenia subaphylla*, *Anabasis eriopoda*, *Anabasis turkestanica* and *Salsola arbuscula*. The species *Calligonum junceum* and *Reaumuria turkestanica*, and others are commonly found in the gypsum chul and are characteristic for the area. *Nanophyton erinaceum* is less frequent and restricted mainly to the hills.

Where river valleys cut into the chul zone the increased humidity in the valleys facilitates the development of special mesophytic communities that are locally called “tugai”. Common species that occur in these communities are *Alhagi persarum*, *Apocynum scabrum*, *Asparagus persicus*, *Clematis*

orientalis, *Elaeagnus orientalis*, *Erianthus purpurascens*, *Glycyrrhiza glabra*, *Halimodendron halodendron*, *Hippophae rhamnoides*, *Karelinia caspia*, *Limonium otolepis*, *Lycium ruthenicum*, *Phragmites communis*, *Populus diversifolia* and *P. pruinosa*, and *Tamarix* spp.

The adyr zone (lowlands and foothills): The adyr zone is a broad belt at an elevation of around 500–1,500 m (1,640–4,921 ft). This band is found around all the mountains of Central Asia. It occupies the range between two contrasting ecological zones: the xerothermic chul (desert) and the mesothermic tau (mountain region). The soils of the adyr zone contain less salt and more humus than the chul soils and are classified as sierozem (Makhmudov 2001). Bedrock is often found exposed on the surface.

The annual precipitation is between 250 (9.8 in.) and 400 mm (15.7 in.) and rarely reaches 500 mm (19.7 in.). The mean monthly temperature for July is 25°C (77°F), which is 3–4°C lower than in the chul and 5–6°C higher than in the tau zone. The dry period lasts from June to September. Due to its location the adyr zone is exposed to the influence of both the hot desert along its lower edge, and the cooling effects of the mountains on its upper edge. This causes the lower section of the adyr zone to be closer to the environmental conditions of the chul and the upper section to be similar to the mountainous environment of the tau zone. Because of this gradient the adyr is divided into subzones: the lower adyr with rolling relief and the upper adyr with broken relief.

Typical species found in the lower adyr area are *Amygdalus spinosissima*, *Artemisia sogdiana*, *Carex pachystylis*, *Mediasia macrophylla*, *Phlomis thapsoides*, *Pistacia vera* and *Psoralea drupacea*. At altitudes of 1,200–1,500 m in the upper adyr zone, typical species are *Acanthophyllum gypsophiloides*, *Agropyron trichophorum*, *Astragalus eximius*, *Bunium persicum*, *Centaurea squarrosa*, *Cousinia pulchella*, *Onobrychis* spp., *Phlomis salicifolia* and *P. olgae*, *Potentilla soongarica*, *Scabiosa songarica* and *Ziziphora pamiroalaica*.

The tau zone (mid-mountain zone): The tau zone is a broad belt at an elevation of around 1,500–2,800 m (4,921–9,186 ft). The dominant soil of the tau zone is of the brown soil type. Precipitation in this zone exceeds more than 500 mm (19.7 in.) per year, with a dry period that lasts for 3 months from July to September. The growing period is in spring, summer, and autumn with a dormant period in the winter. The mean monthly temperature in July is 19°C (66°F).

In terms of economy, the tau zone is an important area for growing cereals and leguminous crops, for producing hay, and for use as pastures. The dominating wild and cultivated shrub and arboreal species (*Crataegus* spp., *Juglans regia*, *Malus* spp., *Prunus* spp., etc.) of the area provide the local population with fuel, building materials, and food. In the tau zone shrubs can be found in large groups or as individuals. The common species of shrubs are *Berberis oblonga*, *Cerasus*

tianshanica, *Ephedra equisetina*, *Lonicera microphylla*, *Rosa kokanica* and *Spiraea hypericifolia*. Some of the woody species found in the tau zone are gymnosperms such as *Juniperus semiglobosa*, *J. seravschanica* and *J. turkestanica*, and broad-leaved deciduous trees such as *Acer turkestanicum*, *Betula tianshanica*, *Crataegus pontica* and *C. turkestanica*, *Juglans regia*, *Malus sieversii*, *Prunus sogdiana*, *Sorbus persica*, *Ziziphus jujuba* and others.

The yailau zone (high mountain zone): The yailau zone is the high-altitude, subalpine to alpine zone and extends from 2,800 to around 3,400 m (9,186–11,155 ft). This zone is characterized by environmental conditions that will not support the development of arboreal and shrub vegetation. The soil is mainly light brown and of the meadow-steppe type (Kaurichev 1989). Summer is short and rather warm, with sharp changes between day and night temperatures. Summer daytime temperature reaches up to 25°C (77°F), but can drop to 0°C (32°F) at night. In the winter the temperature may drop to –40°C (–40°F). Precipitation varies from 400 (15.7 in.) to more than 600 mm (23.6 in.) per year. This zone has stony taluses, glacial valleys, glacial cirques, and glacial tongues, and fields with heavy clay soils. There are many sheer rock formations in the southwestern Tian Shan and the western Pamiro-Alai.

In terms of economy, the yailau region is utilized as the main summer pasture. While the Karakul sheep graze mainly in the chul, the Merinos and fat-tailed breeds of sheep (including the Gissar breed) are pastured mainly in the yailau. Other agriculture is limited by low temperatures.

Tallgrass meadows are an important portion of the vegetation cover of the yailau. These meadows also contain *Polygonum bucharicum* and *P. hissaricum*. In western Tian Shan and the southern Pamiro-Alai there are Apiaceae-rich meadows with *Ferula tenuisecta* and *Prangos pabularia*. Meadows containing *Alopecurus*, *Artemisia*, and *Geranium* spp. are also common in the yailau zone. Shortgrass meadows, also known as alpine meadows, are found in small patches in the upper yailau. The high-altitude meadows are comprised of a diversity of grasses and other herbaceous genera such as *Gentiana*, *Oxytropis*, *Potentilla* and *Ranunculus*. Meadows of grasses such as *Alopecurus* spp., *Festuca* spp., *Poa alpina* and *Phleum alpinum*, and sedges such as *Carex* and *Kobresia* are also characteristic of the upper yailau zone.

The great extremes of elevation, temperature, precipitation, and soil types found in Uzbekistan provide a wide range of habitats, which support a great diversity of vegetation. Due to human activities many of the natural areas of the planet are being disturbed or destroyed. Conservation of natural environments and resources are of great importance for the future of mankind and the conservation of Uzbekistan's natural resources is no exception.

Medicinal Plants of Central Asia: Uzbekistan and
Kyrgyzstan

Eisenman, S.W.; Zaurov, D.E.; Struwe, L. (Eds.)

2013, XI, 340 p., Hardcover

ISBN: 978-1-4614-3911-0