Chapter 9
Cyprus

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Coastal landscape between Kakoskali and Loutra, in the Akamas peninsula (photo by P. Delipetrou)

9.1 Introduction

Cyprus, the third largest Mediterranean Island in size (Fig. 9.1), is situated in the north-eastern part of the Mediterranean Sea, 33° east of Greenwich and 35° north of the Equator and has an area of 9,251 Km^2, of which 1,733 are forested. Distance

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Fig. 9.1 Map of Cyprus with the main urban centres

from the mainland ranges from 75 km from Turkey in the north to 150 km from Syria in the east and 380 km from Egypt in the south, while in the west the closest shores are the Greek islands of Karpathos and Rhodes at 380 km. The population of Cyprus is 755,000 of whom 643,000 are Greek Cypriots, 88,000 are Turkish Cypriots and 24,000 are foreigners residing in Cyprus. Since the Turkish invasion and occupation of over a third of the island, the demographic balance has changed dramatically as a result of Turkey's policy. There are around 115,000 illegal Turkish settlers in the occupied area, while a considerable number of Turkish Cypriots have emigrated.

Lefkosia (Nicosia) has been the capital of Cyprus since the 11th century BC. It is situated roughly in the centre of the island and is the seat of government as well as the main business centre. Lemesos (Limassol), extending along the south coast, is the second largest town and the main commercial port. Larnaka, a commercial centre and the seat of the European Consulates in the 18th century, is now the island's second commercial port and also an important tourist resort. Pafos in the south-west is a fast developing tourist resort, and has an attractive fishing harbour. Ammochostos (Famagusta), the centre of the pre-1974 tourist industry is now a ghost town. Keryneia (Kyrenia), the main coastal urban centre in the north, is now inhabited almost exclusively by Turkish Cypriots and Turkish settlers.

The prehistory of Cyprus starts in the Late Paleolithic and Pre-Pottery Neolithic with the first traces of human habitation 9,000 years ago. In the Bronze Age the island was influenced by the Achaean Greeks and in the Iron Age there was a fusion of Cypriot, Mycenaean and Syro-Anatolian elements. In the Geometric

Table 9.1 Main periods in the prehistory and history of Cyprus

Period	Duration
Late Paleolithic Period	9000–7000 BC
Neolithic Period	7000–3800 BC
Chalcolithic Period	3900–2500 BC
Early Bronze Age	2500–1900 BC
Middle Bronze Age	1900–1650 BC
Late Bronze Age	1650–1050 BC
Geometric Period	1050–750 BC
Archaic Period	750–475 BC
Classical Period	475–325 BC
Hellenistic Period	325–50 BC
Roman Period	50 BC–395 AD
Byzantine Period	395–1185
Frankish Rule	1191–1489
Venetian Rule	1489–1571
Ottoman Rule	1571–1878
British Colonial Rule	1878–1960
Cyprus, an Independent Republic	1960
Turkish Invasion	1974

Period Cyprus was a Greek island with ten city kingdoms. The island experienced Assyrian and Egyptian domination (9th–8th century BC), Phoenician settlement (Kition), Persian domination (6th century BC) until in the 4th century BC Evagoras unified Cyprus. Cyprus eventually came under the Hellenistic state of the Ptolemy of Egypt until the Roman period. For almost eight centuries, Cyprus was under the administration of the Byzantine Empire of the East until 1192 when it was sold to the Knights Templar and Lusignan. After a Frankish period (until 1489) and a Venetian period (until 1571) Cyprus came under the Ottoman Rule, until 1878 when it came under the British Rule (Table 9.1). The Republic of Cyprus was established in 1960.

The current landscape of Cyprus is the product of the influence of a long colourful history on the varied abiotic and biotic characteristics of the island. The physical environment is characterized by a rugged morphology and varied geology. The climate of Cyprus is in general at the drier end of the Mediterranean-type climates. The biotic elements are characterized by considerable diversity and endemism taking into account the size of the island. The rural landscape is dominant and usually intermixed with natural elements. The most remarkable recent landscape changes in Cyprus have been brought about by overexploitation of the coastal areas, urbanization, massive population movement, water exploitation, the shift from agricultural to tourism economy and also by an effort towards reforestation and by recent sustainable development policies. Besides having become a national strategy target, landscape conservation is also favoured by European Union (EU) legislation.

9.2 Physical Environment

9.2.1 Climate

Cyprus has a Mediterranean climate with typical seasonal variation: hot dry summers from mid-May to mid-September and rainy winters from November to mid-March are separated by short autumn and spring seasons subject to unstable weather systems (Meteorological Service 1986). The annual average precipitation is about 500 mm but it was as low as 182 mm in 1972/1973 and as high as 759 mm in 1968/1969 (Rosse 2001), while minimum precipitation averages from 300 mm at Mesaoria to 1,100 mm at the peak of Troodos. Local meteorological phenomena are influenced by the two mountain ranges, Troodos and Pentadaktylos, and also by the proximity to the sea (Meteorological Service 1986). The dry period ranges from 7 months to 7.5 months in areas with altitudinal range 0 m to 350 m a.s.l, from 6 months to 7 months at altitudes ranging from 400 m to 850 m a.s.l, and from 4 months to 5 months at mountainous (850 m) and high mountainous (1,700 m) areas.

The bioclimate of Cyprus has been classified according to the climagram of Emberger (Emberger 1930; Daget 1977) and according to the classification system by Rivas-Martínez et al. (2004). The application of Emberger's pluviothermic coefficient (Q2 = 2000 P / M2 – m2, where P = annual precipitation, M = mean of the maximum temperatures of the hottest month in the year, m = mean of the minimum temperatures of the coldest month) applied to 35 meteorological stations of the island resulted in four bioclimatic belts from arid ($15 < Q2 < 25$) to humid ($95 < Q2 < 145$) with thermic variants ranging from hot ($m > 7$) to harsh ($-3 < m < 0$) winters. According to the Rivas-Martínez bioclimatic classification, Cyprus has a Mediterranean Mesophytic to Xerophytic-Oceanean bioclimate with zones ranging from Thermo-Mediterranean – semi-arid (lowlands) to Supra-Mediterranean-humid (Troodos) (Barber and Valles 1995; Andreou and Panagiotou 2004). Eight bioclimatic zones (Table 9.2) have been mapped according to a combination of the above systems (Pantelas 1996).

Table 9.2 Bioclimate zones of Cyprus (After Pantelas 1996)

Bioclimatic belt	P (mm)	M (°C)	Altitude (m)
Semiarid Hot	<400	>6	<100
Semiarid Mild	<400	3–6	<100
Hot Arid	400–600	>6	0–300
Mild Arid	400–600	3–6	300–400
Semi Wet Mild	600–900	3–6	400–900
Semi Wet Cool	600–900	0–3	900–1150
Cool Wet	>900	0–3	1,150–1,500
Cold Wet	>900	<0	>1,500

9.2.2 Geology

In Cyprus geological processes have played an important role in the development of the natural environment. The island came into being as a result of a series of unique and complicated geological events. Some 90 million years ago, part of the bottom of a deep ocean, called 'Tethys', was subject to tectonic movements resulting in the collision of the African and Eurasian plates which gave birth to Cyprus.

About 20 million years ago, two small islands rose above the sea: the forerunners of the Troodos and the Pentadaktylos ranges (Fig. 9.2), which reached their present height about 1–2 million years ago. The ocean crust now exposed at the tip of the Troodos mountain range is an ophiolite which formed 8,000 m below sea level. This was later thrust tectonically to almost 2,000 m a.s.l. The range mostly consists of basic and ultra-basic plutonic rocks (gabbros, diabase, peridotites, dunites and serpentinized harzburgites). Pentadaktylos (Kyreneia range) rises up to c.1,000 m and is made of a succession of mostly allochthonous sedimentary formations. The third major geological terrain is the Mammonia complex in the hilly south-west part of the island (Fig. 9.3). The Mesaoria plain which joins the two mountain ranges is traversed by the rivers Pediaios and Serrachis and mainly formed by alluvial–colluvial soils and also by fanglomerates, biocalcarenites, sandstones and sandy marls with gypsum outposts. The geomorphological characters have produced a varied topography which is now characterized by a variety of microclimates and hence habitats. The coastline of Cyprus ranges from steep inaccessible cliffs and ragged rocky shorelines with sea caves to gentle sloping sandy beaches. Coastal typology includes hard rocks (e.g. Akamas, Cavo Greco)

Fig. 9.2 The principal mountains and river network of Cyprus

Fig. 9.3 Mamonia formation south-west Cyprus (Photo courtesy of Ch. S. Christodoulou) (*See Colour Plates*)

and sand gravel (e.g. Ammochostos, Lemesos) moderately exposed bays of intermediate (30–50 m), mostly, or shallow (<30 m), depth (Argyrou 2000; Argyrou et al. 1999; WL Delft 2004). Most rivers originate in the Troodos range and have steep slopes, except for the rivers in the lowland areas along the southern coast (Water Development Department 2004). There are no rivers with perennial flow along their entire length; only parts of some rivers upstream in the Troodos areas have a perennial flow, such as Xeros, Diarizos and Kargotis (WL Delft 2004). Springs are also mostly located on Troodos and although they are not large enough to contribute substantially to river flow, they are used for supplying drinking water to many villages of the Lemesos and Lefkosia districts (WDD-FAO 2002).

9.3 Biotic Elements

9.3.1 Flora and Vegetation

Cyprus is an island with diverse landscapes due to varied climate and geology, and its proximity to Asia, Africa and Europe. In addition its size (9,251 km^2) is sufficient to support high species and habitat diversity but isolated enough (since the Miocene salinity crisis) for significant endemic biota to form (Böhme and Weidl 1994; Blosat 1998). At the same time, human impact on the island has been long-lasting. Human presence on the island dates back to 10,000–12,000 years ago when sailor-hunter colonizers first arrived (Simmons 1999). Animal husbandry and

farming and consequent plant and animal species introductions started as early as 9,000 years ago (Keswani 1994; Guilaine and Briois 2001; Croft 2002). The landscape of modern Cyprus is a mosaic of natural or semi-natural biotopes at various stages of succession, alternating with large areas of cultivation and urban centres.

Evidence from pollen analysis suggest that early Holocene Cyprus was covered by dense forests of typical Mediterranean trees and shrubs, such as *Ceratonia siliqua, Cupressus, Juniperus, Quercus coccifera, Quercus infectoria subsp. veneris* (Box 9.1), *Laurus nobilis, Olea europaea*, and also riparian *Platanus orientalis* (Holmboe 1914; Bottema 1966; Karali 1996; Palamarev 1987; Hansen 2001). In ancient times Cyprus was a 'Green Island', a ship-building centre and timber exporting country (Thirgood 1987). Pine and cedar are reported as important forest species by Theophrastus and according to Eratosthenes (3rd century BC) the island was 'thickly overgrown with forests' (Hadjikyriakou 2000).There are indications that even the arid plain of Mesaoria was once covered by forest (Jones et al. 1958). Felling started in the Bronze Age along with copper mining. The island went through great fluctuations in population and prosperity and so did the use or abuse of forests. The mines which were in operation from the Phoenician to the Roman period (Table 9.1) provided masts for ships and metal for trade, and led to periods of intensive felling. However, land clearing for cultivation, fire and unrestricted goat grazing have been the main causes of deforestation (Madon 1881; Thirgood 1981) and the consequent erosion (Jenness 1962). This was exacerbated during the Ottoman Occupation (1571–1878), especially during its last 100 years (Thirgood 1987). At the time of the British administration (1878), when the first official forest survey took place, the forests were devastated, even at places not fit for productive cultivation (Thirgood 1987). Moreover, uncontrolled land management led to the degradation of the deep, humus rich soils (Fig. 9.4) that had been widespread (Jones et al. 1958).

Today, the potential natural vegetation of Cyprus is a matter of speculation, as little of it remains. However, after 140 years of rational forest management, forests cover c.20% of the island (Forestry Department 2004) extending on the main part of the Troodos massif with outposts on the eastern Akamas mountains and on the northern Pentadaktylos range (Fig. 9.5). The slopes of the forested mountains are flanked by various types of matorral which extend south of Troodos to the coast, creating the largest continuum of natural biotopes on the island; south-east of Akamas; and east of Pentadaktylos on a green line to the edge of Karpasia. The expanses of cultivated land, c.45% of Cyprus, lie among the mountains, and occasionally within the forested areas and extend to the coastal zone. The vast cultivated areas of the fertile soils of Mesaoria (Fig. 9.6) are only broken by small fragments of low matorral or small patches of bushes or tree stands.

The thermophilous pine forests with *Pinus brutia* are the most extensive and widespread comprising c.66% of forest land; they occur on virtually all the mountainous areas from sea level up to 1,400 m and from dry to sub-humid climate. The Troodos range is well covered with thick pine woodlands, which attain their best development in Pafos forest (Fig. 9.7), where the largest unfragmented and

Fig. 9.4 Pastures and eroded slopes in Pafos (Photo courtesy of Ch. S. Christodoulou) (*See Colour Plates*)

Fig. 9.5 Vegetation map of Cyprus

best conserved *Pinus brutia* forests are found. Pines are locally mixed with cypress (*Cupressus sempervirens*) on Pentadaktylos range. There, on the limestone slopes and rocky crests, cypress is at its optimum and forms pure stands almost all along the length of the range.

Fig. 9.6 Mesaoria: Fields, olive groves and patches of natural vegetation (Photo courtesy of P. Delipetrou) (*See Colour Plates*)

Fig. 9.7 Pafos forest: natural regeneration on the right and reforestation on the left after 33 years of the fire event (Photo courtesy of Ch. S. Christodoulou)

The Troodos range, with the most humid and cool areas in Cyprus, is also home to montane conifers, black pine, cedar and junipers, and to the endemic evergreen golden oak, *Quercus alnifolia*. The black pine, *Pinus nigra* subsp. *pallasiana*, forms a single forest with a total area of 3,488 ha starting at 1,200–1,500 m and

extending up to Chionistra peak (there are only another two small outposts on the peak of Madari). Despite efforts for its protection, the black pine is under considerable threat. Natural regeneration seems to be minimal while the fire prone and fire adapted *Pinus brutia* expands its habitat at the expense of the non-serotinous, fire-evading black pine. Moreover, in the event of climate warming the habitat of the black pine (which is in Cyprus at the southernmost end of its distribution) will shrink to the higher altitudes (C.A. Thanos 2004, pers. comm.).

Cedrus brevifolia, the endemic Cyprus cedar, one of the four species of cedar in the world, growing in a warmer climate and also rarer than its three congeners, is confined to the subhumid to humid zone of Pafos Forest. The main, dense cedar forest occupies the peak and the slopes of Tripylos, but scattered small patches occur on the surrounding mountain slopes at altitudes ranging from 800 to 1,400 m. The montane junipers, *Juniperus foetidissima, J. oxycedrus* and *J. excelsa* are chiefly found in the understorey of pine forest above 1,000 m, occasionally forming small stands at the topmost slopes of Chionistra and Madari peaks. The sclerophyllous golden oak is chiefly found in the understorey of the conifers but it also forms pure stands, mainly at high altitudes in Pafos forest and Troodos. The species has the ability to establish itself on screes where no other trees manage to grow and where it functions as a stabilizer (Fig. 9.8). The semi-deciduous oak, *Quercus infectoria* subsp. *veneris*, although widespread and supposedly the potential vegetation of a large part of west Cyprus at altitudes between 600 and 1,000 m (Jones et al. 1958; Barbéro and Quézel 1979), is chiefly found in small stands or isolated trees among fields (see Section 9.7).

The landscape of the lowlands is dominated by open shrub formations. Evergreen, sclerophyllous Mediterranean shrubs (c.30% of the island) at various stages of development (or degradation), depending mainly on human impact, are widespread in uncultivated areas. The thick and tall olive, carob and lentisc maquis as well as the *Quercus coccifera* subsp. *calliprinos* formations, which include deciduous shrubs at higher altitudes, are the rarest communities and have best survived at Karpasia, Akamas and on the southern slopes of Troodos. At the other end, the low, hemispherical phrygana formations occupy drier and grazed areas and are the pioneer species on abandoned fields. Between these two communities, there is a range of open or closed formations covering large areas and hosting a large variety of shrubs and herbs, including endemic and rare species. The coastal shrub is characterized by the Phoenician juniper, *Juniperus phoenicea*, and ranges from the high woodland of Apostolos Andreas at Karpasia, to the arborescent matorral of Akamas and to the wind shaped, mat-like shrub of Cavo Greco. Notably, both Cavo Greco and Karpasia were once covered by tall and thick junipers (Thirgood 1987). On the other hand, the inner semi-arid zone is characterized by a type of xerophilous shrub with *Crataegus azarolus* and by the open *Zizyphus lotus* matorral which, due to the intense cultivation of its natural area, is today represented by isolated shrubs and rarely by small stands.

The sandy coastal zone, due either to geomorphology or to human activities, is generally narrow with ammophilous communities on low embryonic and shifting dunes. Extended dune systems, including stabilized dunes with shrubs and dune slacks, develop at few places (Apostolos Andreas at Karpasia, Akamas), notably in

Fig. 9.8 Troodos Mountain: eroded slopes with screes on diabase vegetated by *Quercus alnifolia* (Photo courtesy of Ch. S. Christodoulou)

connection with wetlands, i.e. Ammochostos, Agia Eirini and the salt lakes of Akrotiri and Larnaka. Although land reclamation has reduced the area of wetland substantially, there are still areas with halophytic vegetation of glassworts, sea-blites, purslane and tamarisks (Fig. 9.9). Flowing water bodies are many but mainly intermittent. A discontinuous and mostly narrow line of riparian shrub and forest develops along the numerous streams that dissect the island, often offering an oasis of natural habitats in the midst of cultivated land (Fig. 9.10). Standing freshwater bodies are only artificial storage basins and dams, yet, hydrophilous vegetation has established at most of them.

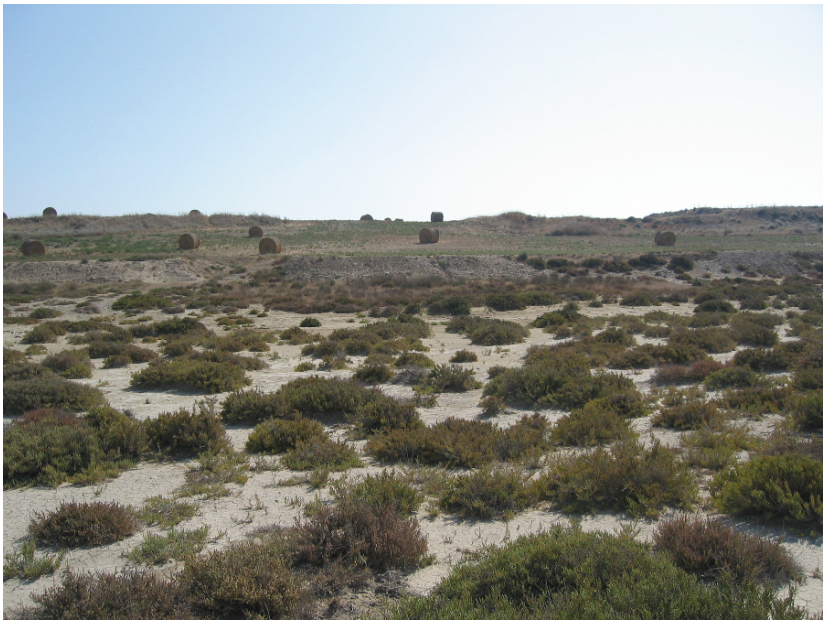

Fig. 9.9 Land reclamation in the wetlands of Larnaka (Photo courtesy of M. Andreou)

Plantations of mainly exotic trees, such as *Acacia* spp., *Eucalyptus* spp., *Pinus halepensis*, established mainly up to the 1930s (Thirgood 1987), but also in later years either for fuel or for stabilization and even for afforestation, cover c.1.3% of the island (Forestry Department 2004). Afforestation saved many sites from erosion, grazing and building and also made a fundamental change to the attitude of the people to trees for shade and as a feature of the landscape (Thirgood 1987). Nevertheless, planting altered the natural landscape with alien species which in some cases proved to be invasive. *Acacia saligna* (Fig. 9.11) has managed to intrude in salt marshes and in riparian wetlands (Christodoulou 2003a) and is capable of expanding on sand dunes (Hadjichambis 2005). Acacias have been planted to such an extent that it would be no exaggeration to say that an unwary visitor would believe them to be common components of the native flora.

Botanical research on the island started in 1787 and was epitomized in the 1980s in the *Flora of Cyprus* (Meikle 1977, 1985). Since then, there have been a considerable number of additions and the flora can be considered to be very well known. In total, the native flora includes 1,610 species or 1,738 taxa to variety level (Hadjikyriakou 1997; Cyprus Flora 2005). This species diversity is lower than that of similar sized continental areas but the more appropriate index *log*species/*log*area is 0.81, comparable to those of other large Mediterranean islands, such as Crete (0.83) and larger than those of Italy (0.68) and Greece (0.73) (Delipetrou and Georghiou 2000; Pignatti 1995; WWF & IUCN 1988; Davis et al. 1994).

Habitat diversity, the varied topography and geographical position (Cyprus incorporates floristic elements of the neighbouring Africa and Asia) are the keys

Fig. 9.10 Riparian forest with *Alnus orientalis* in the dry hilly areas of south-west Cyprus (Photo courtesy of Ch. S. Christodoulou) (*See Colour Plates*)

to species diversity in Cyprus. There is a large number of plants (c.500) which are rare even if widespread or they are locally common but not widespread (Cyprinia 2005). In many cases rarity is apparently the result of a restricted ecological niche. *Calamagrostis epigejos*, a species widespread in many habitats in Europe, is at the southernmost edge of its distribution in Cyprus and confined to a small area of the unique high altitude peat grassland. Also, the rare carnivorous *Pinguicula crystallina* is found in small patches solely at high altitude wet rocks along with the orchid *Epipactis veratrifolia*, which is rather rare but abundant in this habitat. The Mediterranean limestone chasmophyte *Umbilicus horizontalis*

Fig. 9.11 *Acacia saligna* invasion in the wetlands of Larnaka (Photo courtesy of M. Andreou)

occurs in very small populations at a few sites from Cavo Greco to Pentadaktylos. On the other hand, the serpentine endemics *Alyssum troodi* and *Alyssum cypricum* grow abundantly on Troodos, but only there. Notwithstanding the large number of rare plants, there are as yet no confirmed extinctions of native species in the modern era (IUCN 1993; Cyprinia 2005). There are several species that have not been seen for 150–100 years, but this may be due to misidentifications while searches for others have not been made (Cyprinia 2005). Yet, there are one or two cases of likely extinctions, such as *Cionura erecta* which is not found today on the highly developed coast between Lemesos-Amathus, where it had reportedly been common on sand dunes in 1905 (Meikle 1985; C.S. Christodoulou 2005, pers. comm.).

There are 108 endemic plant species (143 taxa) comprising 6.7% of the flora (Cyprus Flora 2005) and corresponding to 12 species per 1,000 km^2. Quantitatively (Samways 1995) endemism is 2.4 times more than expected for the size of Cyprus. Troodos, with a total of 720 species, of which 72 are endemic to Cyprus and 12 are local endemics (Christodoulou 2003b), is the hot spot of endemism but endemics occur throughout the island. Some are widespread and common, such as the thistle *Onopordum cypricum* which grows at a variety of habitats. Others characterise forests, such as the trees *Cedrus brevifolia* and *Quercus alnifolia*. Yet, some others are very rare, such as *Arabis kennedyae* and *Crypsis hadjikyriakou* which only occur at less than five locations each and have a low total population size (Raus and Scholz 2004; Cyprinia 2005). The relict element of the island flora is represented by a

Box 9.1 *Quercus infectoria subsp. veneris*

Quercus infectoria subsp. *veneris* is a semi-deciduous oak occurring in the eastern Mediterranean and Middle East through to Iran (Meikle 1977). As one of a group of Mediterranean oaks occupying deep soils of residual forest communities, it was more extensive in the forests of the last cold stage (Schiller et al. 2004) which are now dominated by *Pinus brutia* or matorral (Quézel and Barbéro 1985). In Cyprus *Q. infectoria* subsp. *veneris* occurs mainly on the northern and southern slopes of the Troodos massif (Fig. 9.12). Isolated individuals are widespread; some are giant and protected as Nature Monuments, e.g. the Lagoudera oak c.800-years old (Forestry Department 2005). Scattered forest thickets at 600–1000 m a.s.l. are common though individuals occur up to 1,450 m in *Q. alnifolia* and *Pinus nigra* forest. The largest thickets have a distinct floristic structure which corresponds to a recognizable syntaxon (*Quercion calliprini: Quercetalia ilicis: Anagyro foetidae-Quercetum infectoriae,* Barbéro and Quézel 1979). Such communities may be remnants of the climatic climax forest of the limestones of the Troodos (Zohary 1973; Barbéro and Quézel 1979) resulting from long term agricultural expansion onto the deep soils. Felling, grazing and accidental fires have also caused degradation to maquis, phyrgana, or the undergrowth of *P.brutia* forest (Zohary 1973; Barbéro and Quézel 1979).

Despite the value of the oak to society, felling to reduce encroachment on agricultural land and for fuel have been widespread (Jenness 1962). In contrast Troodos villagers have protected oaks to ensure a good acorn crop for pigs (Tsintides et al. 2002). Although oak forests 'yield first rate timber and are one of the most valuable assets of the island' (Hutchins 1909), their restoration have never been promoted in Government plans. Today, however, land abandonment, reduced felling and avoidance of wood fuel means that pressure on the oak is reduced. Coupled with the designation of remaining woodlands as protected habitats (Council of Europe 1992), this has promoted restoration programmes by the forest service. Recent expansion of the species onto abandoned land (Fig. 9.13) and successful vegetative regeneration following fire indicate potential for future spread with the numerous stands traditionally left at field or stream borders providing propagules and acting as core areas from which colonization can occur. The well-documented Vouni Panagias woodland provides an insight into *Q. infectoria* subsp. *veneris* dynamics. It occurs in small stands on deep soils and as individuals along field margins or within fields; on rocky limestone slopes, mature trees occur in tall thickets dominated by *Q. coccifera*. Floristic analysis by Delipetrou (Delipetrou 2006, pers. comm.) classifies these thickets as *Q. infectoria* communities. Even though they may be degraded *Q. infectoria* woodlands (Fig. 9.14), they are included in habitat type 93A0 since they are considered to have the potential to develop naturally into proper woodland.

Fig. 9.12 *Quercus infectoria* stands at the borders of vineyards and fields at Vouni Panagias (Photo courtesy of M. Andreou) (*See Colour Plates*)

Fig. 9.13 Regeneration of *Quercus infectoria* and other trees-shrubs at abandoned fields with low intension grazing at Lapithiou (Photo courtesy of M. Andreou) (*See Colour Plates*)

Fig. 9.14 Shrub with *Quercus coccifera-Pistacia terebinthus* and young *Quercus infectoria* at rocky slopes at Vouni Panagias (Photo courtesy of M. Andreou) (*See Colour Plates*)

number of species. *Zizyphus lotus* and *Pistacia atlantica* are believed to be relicts of a former warmer period when xero-tropical elements covered part of their present Mediterranean territory (Zohary 1973). The endemic *Bosea cypria*, a bush occurring at rocky places all over the island, is believed to be an element of the Tethyan-Tertiary period (Meikle 1977).

9.3.2 Fauna

The terrestrial vertebrate fauna includes 30 species of mammals, 22 reptiles and 3 amphibians (Iezekiel 2001, unpublished data). Endemism is significant but probably not as high as would be expected by the long isolation of the island (Göçmen and Böhme 2002). There had been an earlier rich fauna, including the endemic pygmy hippo (*Phanourios minutus*), the pygmy elephant (*Palaeoloxodon cypriotes*) and *Crocidura suaveolens praecypria* which became extinct at the end of the Pleistocene (Bate 1904; Blosat 1998; Simmons 1999; Davies and Lister 2001; Iezekiel 2001). This extinction has been attributed to the epipaleolithic or early prepottery Neolithic hunters (Simmons 2001; Reese 2001), but this is not universally accepted (Olsen 1999; Binford 2000; Smith 2000; Dewar 2001). The endemic Cyprus mouflon, *Ovis orientalis ophion*, the smallest wild sheep on earth, which

lives in the thick forests of Pafos, first appeared in Cyprus in the Neolithic period (8000 BC), probably introduced by humans as a domesticated wild sheep race (Hadjisterkotis 1996; Hadjisterkotis and Bider 1997). The mammal fauna also includes 18 bat species, which are rather thinly spread all over the island. *Rousettus aegyptiacus*, the fruit bat, almost became extinct in the 1980s due to persecution but is now recovering (Hadjisterkotis 2001). The European fox, the lesser white-toothed shrew and the hedgehog are represented by endemic subspecific taxa and there is an endemic spiny mouse species, *Acomys nesiotes*. Among the reptiles, there are seven endemic subspecific taxa and one species, *Coluber cypriensis* (Cyprus whip snake). Two rare endemic reptiles live in streams and ponds, the tortoise *Mauremys caspica rivulata* and the Cypriot Grass Snake, *Natrix natrix cypriaca*, which is now endangered, its decline probably due to the extensive use of DDT in the 1950s and 1960s. The marine herpetofauna includes both the sea turtles of the Mediterranean, *Chelonia mydas*, the most widespread, and *Caretta caretta*.

The resident bird fauna comprises 36 species (Iezekiel 2001, unpublished data), includes 2 endemic species, *Sylvia melanothorax* and *Oenanthe cypriaca*, and 5 more endemic taxa, which makes Cyprus the number one location for bird endemism in Europe and one of the 221 in the world. The endemics are generally widespread on the island though there is a unique population of *Loxia curvirostra guillemardi* on Troodos. Cyprus is also one of the eight main migratory bird routes from North to South and vice versa, and during the spring and autumn passage millions of nocturnal and diurnal migrants stop over. Close to 20,000 flamingos overwinter at the salt lakes of Alykes and Larnaka, a large number of herons and egrets gather at Chrysochou Bay and the freshwater dams support an increasing number of ducks and waders. Eleonora's falcon nests at the rocky coasts of Akrotiri, Episkopi and cape Aspro, and seagulls and swifts nest at the islets off Akamas and Apostolos Andreas cape, the only place where the Audouin's gull breeds. Raptors, including *Accipiter gentilis, Hieraaetus fasciatus* and the rare *Buteo rufinus*, prey in large numbers in Pafos forest and the river valleys south of it and also at Vouni Panagias and Akamas.

9.4 Cultural Landscapes

In Cyprus, as elsewhere in the region, landscape is the outcome of interaction between people and Mediterranean ecosystems. Over a period of more than 10,000 years, anthropogenic influences through burning, grazing, cutting, coppicing as well as terracing and cultivation, degraded the Mediterranean native forest into maquis, garigue, batha and grass communities and converted the land into agricultural and pastoral landscapes (Naveh 1975). Historically, the landscape of Cyprus, Biblical Chittim, was densely forested, making the island a prize possession to early maritime civilizations. By the late 19th century successive occupation and intensive exploitation had reduced the forest area to that of the most inaccessible peaks (Thirgood 1987), while converting previous forestland into a diverse human-maintained cultural landscape.

The landscape in Cyprus is predominantly rural and characteristically Mediterranean. A comprehensive survey in the 1950s (Table 9.3) listed eight broad land-use categories (Christodoulou 1959). A reassessment 50 years later, based on satellite data and CORINE Landcover classification (MANRE 2005b), shows a dramatic reduction in the proportion of cultivated land, mainly of permanent crops (fruit trees, olives, vineyards), in favour of woodlands and built up areas (Table 9.3).

The traditional land-use pattern in Cyprus is largely a product of the island's diverse geomorphology which permits a diversified crop production. Four features predominate (Section 9.2): *mountains*, the Troodos to the southwest and the

Table 9.3 Land-use change in Cyprus 1950–2000 (From Christodoulou 1959; MANRE 2005)

		Cover %	
Land-use Category	CORINE landcover class level 2	1950s	2000
Settlements and associated non-agricultural lands		0.17	7.07*
	1.1 Urban fabric		4.79
	1.2 Industrial, commercial and transport unit		1.74
	1.3 Mine, dump and construction site		0.54
Horticulture with orchards and town gardens		0.14	0.54*
	1.4 Artificial non-agricultural vegetated areas		0.54
Trees and other perennial crops, mainly olive and carob		31.81	3.86
	2.2 Permanent crops (incl. vineyards, fruit trees, olive groves)		3.86
Crop land		39.64	43.96*
	2.1 Arable land (irrigated and non irrigated crops)		28.51
	2.4 Heterogeneous agricultural areas (incl. natural vegetation patches)		15.45
Unimproved grazing		17.5	0.09*
	2.3 Pastures		0.09
Woodlands including dense, open woodland and scrub		10.1	40.63*
	3.1 Forest		16.84
	3.2 Shrub and/or herbaceous vegetation associations		23.79
Swamps and marshes		0.27	0.21*
	4.2 Coastal wetlands		0.21
Unproductive land		0.37	3.64*
	3.3 Open spaces with little or no vegetation (incl sand dunes, bare rocks, burned areas)		3.49
	5.1 Inland waters		0.15

*The 2000 cover values are the sums of the CORINE classes listed in the second column.

Pentadactylos range along the north coast; *foothills*, the hilly terrain and plateaus associated with the two ranges; *plains*, the inland plain of Mesaoria and smaller coastal plains; *ravines*, both short steep seasonal river courses punctuating the coastal plains and broader ones in the Mesaoria. The central plain of Mesaoria is the single large continuous cultivated expansion in Cyprus. Winter rainfall crops, mainly cereals (wheat and barley), are grown in the eastern part. The western part, fed by the rivers of Troodos and traditionally irrigated by a complex system of conduits, is additionally cultivated with potatoes, vegetables, legumes and fodder. The predominant features of the coastal plains are the irrigated citrus orchards the expansion of which during the 1960s caused salinization of the groundwater and their subsequent desiccation in many areas. The hilly terrains, especially at Lemesos and Pafos, are characterized by vineyards, a crop with a history of 5,500 years in Cyprus, now covering no less than 23,500 ha of submountainous and mountainous, stony and rocky land where other cultivations are financially not viable. The narrow Troodos valleys are wherever possible terraced and planted with fruit and nut trees.

Spatial limitations, evolutionary processes and the proximity of marine and terrestrial ecosystems in Mediterranean Islands enhance the alignment between landscape and ecosystem. The complex relationship between landscape and ecosystems in Cyprus contributed to the development of distinct landscape character zones, *ecological landscape associations* (Makhzoumi and Pungetti 1999). In the Kyrenia Region, for example, four ecological landscape associations are distinguished (ibid. 237). The first corresponds to the forest that occupies the Pentadactylos peaks and approximates more than any other to natural dominant ecosystems. A second consists of rich scrubland, namely of Mediterranean maquis, which dominant the northern aspect of the upper foothills. Perennial cropping of olive and carob trees, in association with stone terraces in the foothills and in ravines, form a third and fourth category of associations, albeit cultural ones. The various landscape associations are the building blocks of the regional landscape mosaic (Fig. 9.15). Perennial tree cropping, predominantly of olive (*Olea europaea*) and carob (*Ceratonia siliqua*) and to a lesser extent almond (*Prunus dulcis*), is the most enduring component of the cultural landscape in Cyprus. Olive and carob are native to the Mediterranean, well adapted to the seasonally dry, semiarid climate (Meikle 1977, 1985; Quézel and Barbéro 1985). Archaeological evidence indicates that olive production in Cyprus dates to the Bronze Age (2500–1050 BC) and that it is linked to the development of maritime communication (Hadjisavvas 1992). Carob seeds were an equally valuable export in Cyprus from the 15th century to the early 20th (Jenness 1962). Perennial tree cropping, however, is not only valued in terms of tree production, olive and carob pods, but equally for the agricultural and pastoral uses accommodated within their spatial framework. Variously known as *multi-use tree plantations* (Makhzoumi 1997), *ager-saltus-sylva*, agro-sylvo-pastoral systems (Blondel and Aronson 1999), this landscape represents an age-old land management system in the Mediterranean that combines several rural activities in a single space to optimize microclimatic and edaphic variations. Consequently multi-use plantation ensures efficient use of natural and human resources through diversification of production, since multi-use plantations are in themselves sustainable. They also

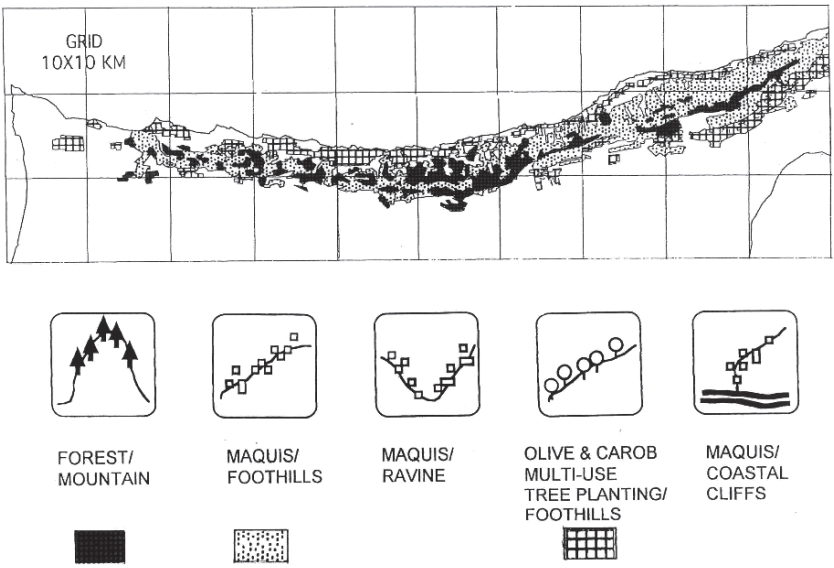

Fig. 9.15 Key landscape associations form the building blocks of the cultural landscape mosaic (Makhzoumi and Pungetti 1999; With permission from Routledge)

sustain the marginal environment they occupy, where the soil is too shallow for conventional, arable uses. It follows that multi-use landscapes of olive and carob in Cyprus should be valued for their environmental role, because they protect watersheds and terrains that are vulnerable to soil erosion. Similarly these landscapes play an important ecological role as wildlife habitat; their wide distribution ensures landscape continuity from mountain peak to coast (Makhzoumi and Gunduz 2002).

The extent and environmental and ecological significance of multi-use olive plantation in Cyprus is considerable. A survey of olive landscapes conducted in the north of the island represented by the coastal and inland foothills of the Pentadactylos and the island's northern coast, provides insight into the flexibility of these traditional landscapes (Makhzoumi 2001). Depending on location, geometry and management, the study identified six categories of olive multi-use landscapes (ibid., p. 54): inland and coastal plains; lower foothills; upper foothills; ravines; village peripheries; urban and suburban. The categories are an indication of the adaptability of these traditional landscapes to varied physical settings, changing socio-economic conditions and modernizing processes (Fig. 9.16). Accepting olive production as one indication of extent, the total production for the region surveyed was estimated at 2,220,000 tons, with the highest production in the Karpasia Peninsula and Ammochostos province, 1,247,000 tons. The total number of olive trees for the same period in 1995 was estimated at 521,848. Cheap olive oil imports from mainland Turkey, the study found, is a key threat to olive production in the regions surveyed. Declining profitability undermines the value of these traditional landscapes and eventually leads to their destruction.

Fig. 9.16 View of carob (foreground) and olive (orthogonal planting) trees in the Kyrenia Range that reflect the versatility of layout and response to climate and landform (Photo courtesy of J. Makhzoumi) (*See Colour Plates*)

Traditional landscapes are also threatened by the constant rise in urban population and growing commercial and tourist development (Makhzoumi and Pungetti 1999). While modernizing processes, namely around the capital Lefkosia and in the coastal plain, fragment and homogenize, rural poverty and agricultural abandonment indirectly undermine the ecological and cultural integrity of the traditional rural landscape. Awareness of the threats to traditional landscapes in Cyprus is reflected in a number of initiatives to protect the island's rural cultural heritage. The Laona Foundation is one such initiative, which promotes eco- and agri-tourism in five villages on the border of the Akamas Reserve (Cyprus Conservation Foundation 2006). Similarly, there is a move towards alternative approaches to nature conservation (Section 9.6). The latter reflect a clear broadening of past emphasis on the productivity and the strictly economic benefits of the forest to valuation that includes environmental and ecological benefits and prioritizes on biodiversity and endemism (Section 9.3). The shift should necessarily be complemented with similar initiatives that aim to protect the mosaic that constitutes the regional landscape in Cyprus, equally as a natural and cultural heritage.

Without comprehensive, island-wide landscape planning, however, the impact of these initiatives will be limited. Future planning should accept that traditional landscapes in the predominantly hill terrain of Cyprus have non-economic values due to 'their combined bio-socio-ecological ecosystem functions for which no alternative is available' and also because their loss would be irrevocable (Naveh 1982). Attempts to conserve the traditional Mediterranean landscape will need to recognize the ecological, environmental and cultural significance of the landscape mosaic as

a starting point. Equally it is necessary to accept human agency as integral to the historical development of the island landscape and a key to maintaining landscape heterogeneity and the high species diversity. Nor should the aesthetic value of the traditional rural landscape be ignored. The regional landscape mosaic provides the Mediterranean 'image' which, among other assets, is a key in marketing tourism in Cyprus as in all Mediterranean Islands.

9.5 Recent Environmental Changes

The milestones that heralded significant changes for the environment of Cyprus can be set in 1878 when Britain assumed the administration of the island; in 1960, when Cyprus became an independent republic; and in 1974, when, after 10 years of unrest, Turkey invaded Cyprus and occupied one third of the island. The main changes in the landscape regarding land-use patterns are illustrated in Table 9.3 and they are related mainly to the trends of economy, but also to changes in the attitude of people towards nature. Under the British administration, the efforts to conserve the then devastated forest resource started. The extent and composition of the forests was recorded and assessed, the first Forest Law was issued and the Forestry Service established. At the onset of the 20th century, an economically and socially retrogressive island, after 300 years of Ottoman rule, was on a slow path to development and the process towards rational forest resource and land management was extremely slow.

The British administration inherited the problems of extensive deforestation and soil loss which were widespread well before the World Wars (Lowdermilk 1948; Jenness 1962; Thirgood 1981). World War I was destructive for the forests and a set back for the implementation of forest policy, but overcutting, overgrazing and firing in peace time were even more destructive. The juniper forests of Cavo Greco and Paralimni were destroyed in the inter-war period, surface soil was washed away and the underlying limestone exposed over the entire area (Thirgood 1987). However, by 1939, illicit grazing and incendiarism had been greatly reduced, new laws established and the public were beginning to appreciate the value of forests. Cyprus just prior to World War II was unique in the Middle East for possessing extensive areas of natural forest (Thirgood 1987). During World War II there was no cutting without control and there came the long demanded conversion from wood to oil fuel. As a result, forests emerged in better condition than ever. Up to 1960, great progress was made, despite the fires caused during the political unrest after 1955. The idea then was that *In Cyprus forests were needed not only for soil and water conservation but also for timber production* (Thirgood 1987). Much effort was put into reforestation and tree plantations and also on the development of a dependable method of regenerating the forest.

In 1960, with the establishment of the independent Republic of Cyprus, the newly formed government accelerated the upgrading of economic and social infrastructure. Part of this involved the shift from an agricultural economy to a mainly

secondary and tertiary sector economy (Press and Information Office of Cyprus 2001). Besides, the end of the decade brought the explosion of tourism (Pasiardis et al. 2002). Nevertheless, the favourable trends of public attitude and government policies towards forests were continued and strengthened and there was a change towards withdrawing forest land from production and development for recreational purposes (Thirgood 1987). Finally, with the motto 'no drop of water to the sea', there was extended water engineering activity which resulted in an increase in freshwater storage capacity from 6 million m^3 to 300 million m^3 (WDD-FAO 2002). The mass construction of reservoirs and storage basins altered the landscape locally and reduced the riparian forests and ground aquifer recharge downstream but also created a new and unique freshwater habitat (Delipetrou 2004).

The war and Turkish invasion in 1974 brought catastrophic fires which destroyed nearly 17% of the total forest land and divided the island in two parts the development of which progressed at different rates and in different directions (Ayres 2004). In the southern part, the area under the government of the Republic of Cyprus, the trends established in 1960 continued. A large restocking programme, with extended bulldozing and terracing, resulted in the reforestation of all burnt forests by 1982 (Thirgood 1987). However, the movement of one fourth of the population along with the loss of the most productive and developed part of Cyprus (Della 1998) made the need for tourism development pressing (Pasiardis et al. 2002). Thus, the southern part suffered a heavy toll from overpopulation, vigorous building activity and rapid expansion of tourism which altered the lowland and especially the coastal landscape quickly and irrevocably while more land for development is in constant demand (Pantelides 2001; Pasiardis et al. 2002; Department of Forests 2005).

It is difficult to estimate the recent loss of coastal dune and marsh habitat since no pre-1982 inventory exists. A fact indicative of the extent of sandy habitat destruction is the case of *Ammophila arenaria*. This plant, which was once the most widespread and important sand-binder and *abundant at the sandy expanses of Agia Napa* (Holmboe 1914), has now become very rare and endangered (Hadjichambis 2005), and is restricted to only one remnant population near Agia Napa.

Yet, since the last decade of the 20th century, growing environmental concern and the accession to the EU have directed the state planning towards controlled and sustainable management of the natural resources. Sustainable development goals were incorporated in the Strategic Development Plans for the periods 1994–1998 and 1999–2003 while environmental legislation was reformed in order to adopt the European law and regulations. The land-use zones established by the Town Planning Department (Department of Urban Planning and Habitation 1996), the characterization of main and minor forests (including Forest and Nature reserves and National Parks) established by the Forestry Department (Forest Regulations 1967–1991), and the Marine Reserves and Protected Areas, established by the Fisheries and Marine Research Department, are important tools for landscape shaping and conservation.

In contrast, in the occupied northern part, agriculture remained a main activity (SPO 2003) and, until recently, the coasts had been left undisturbed. Despite the gradual arrival of over 100,000 settlers from Turkey, there was no increase in urban settlements, since they inhabited the existing built-up areas. Moreover, several

cultivated fields were abandoned and left to a natural succession of vegetation establishment. Notably, at the abandoned and uninhabited city of Ammochostos (Famagusta), which had been the first coastal area to develop in the pre-invasion years, nature has got its own way for thirty years now and the coasts constitute an example of the potential for natural habitat re-establishment. During the last decade, the effort for economic growth initiated a trend for tourism development along with a decline of the agricultural sector (USAID 2001; SPO 2003) which will undoubtedly mark significant changes to the landscape. Moreover, since 2003, there has been an outbreak of road and mass building construction (Stavri 2005). The coastal development, especially at the areas of Kyrenia and of Salamina to Karpasia, is a red alert for the sand dune systems which can be saved by the implementation of sustainable development policies.

The main environmental issues influencing the current, post-1974, landscape trends in Cyprus pertain to the management of the forest and water resources, soil erosion and habitat degradation caused by tourism, agricultural and industrial development. Water availability presents an acute problem especially due to reduced precipitation over the last 30 years (Rossel 2001) and due to over-consumption caused by improved living standards, wasteful use of water, population increase and movement towards the urban centres. The groundwater resources are overexploited by 40% of sustainable extraction (WDD-FAO 2002) and there is ground aquifer salinization (Georgiou 2002). These problems are now being tackled by the use of desalinization plants, water recycling, construction of dams for aquifer recharge (UN 2002) and recent water legislation changes (implementation of the EU Water Framework Directive and the Nitrate Directive).

The forest resources, especially coniferous forests, are well conserved and expanding and the National Forest Programme of 2000 is based on the principles of multiple use and sustainability (UN 2002). Deforestation may be caused by drought and by successive fires and there are also pressures for land reclamation (Department of Forests 2005). However, fires, although a constant threat and cause of damage, are quite effectively counteracted, especially in state forest land (Hadjikyriakou 2000). Moreover, the decline of agricultural activities in favour of the tertiary sector, results in natural shrub and forest regeneration (see Box 9.1). On the other hand, grazing although quite effectively controlled in state forest land is destructive when it follows burning (Department of Forests 2005). Overgrazing has an intense impact in the shrub vegetation of certain rural areas where desertification is possible. Riparian forests, mainly due to drought, water management and land reclamation, but also due to grazing and land management for grazing, are in retreat and their protection has only recently drawn attention.

Soil and water pollution in the form of industrial waste, agricultural chemicals, livestock production effluent and urban sewage and solid waste present a growing problem. Indicatively, nitrate levels increased from 1970 to 2001 (Hydrogeological Services International Ltd. and Geoinvest Ltd. 2002; State General Laboratory, Ministry of Health, Cyprus 2000). Soil loss has not been exacerbated in the last few decades but it remains a problem, endogenous in the Mediterranean landscape, especially on calcareous soils (Hadjiparaskevas 2001). In Cyprus, soil erosion is mainly caused by unsustainable agricultural practices (EEA 2002) and land management

(Hadjiparaskevas 2001), but it may also be due to the special character of the substrate, as on the serpentines of Troodos (Noller 2005). The recent intensification of soil monitoring and the implementation of the EU Common Agricultural Policy (CAP) and of the Convention to Combat Desertification are expected to help erosion control.

The mining industry has been in decline for the last three decades, with only one currently active mine, the Skouriotissa Copper mine (MANRE 2005a) and there is an effort for rehabilitation of the old mines (Kyrou and Petrides 2005). However, there is extensive quarrying of rocks and industrial minerals with c.220 quarries producing various materials and producing heavy impacts to the landscape.

Tourism remains a vital sector for the economy of Cyprus (Blake et al. 2003) and tourist arrivals have been following an increasing trend since 1996 (Pasiardis et al. 2002). In addition, Cyprus is being promoted as a place of permanent residence for foreigners. As a result, there is heavy pressure for further property development at the coastal areas which means further loss and fragmentation of sand dune and shingle and maritime shrub habitats. Moreover, construction activities have started to expand towards the lowland hills (e.g. Agia Napa, Pafos) while trampling, uncontrolled 4 × 4 vehicle expeditions, golf course establishments, beach shaping and cleaning cause further natural habitat degradation. On the other hand, the 'overdependence' of the economy on tourism in parallel with its negative effects both on the natural environment and the quality of life (congestion, criminality increase, increased water consumption, etc.) have triggered a change of policy towards an emphasis on quality rather than on quantity and the search for alternative forms of tourist development such as agro-tourism (Pantelides 2001; Pasiardis 2002). The proposed fundamental restructuring of the Cyprus economy in the direction of expanding and modernizing the productive sectors (Pantelides 2001) might resolve the conflict between sustainable development and economic progress.

9.6 Landscape Conservation

Nature protection in Cyprus has been subject to legislation and measures since the early 1960s (Environment Service 2005). Landscape conservation had principally been a matter of the forest resource management, town and country planning and the combat of soil erosion until the 1980s. The concept of protected areas appeared in the revised Forest Law of 1965–1967 which classified the Forest Estate in Main State Forests including Permanent Forest Reserves, National Parks and Nature Reserves and in Minor State Forests including multiple use forests, municipal and communal forests, nursery gardens and grazing areas (Forest Law 14/1967). In the 1980s another 2,000 ha of wastelands of hills and lowlands were brought under Forestry control (Cyprus Forest Department 1985). During the 1980s and 1990s environmental policy entered the strategic development plans of the island and in 1990s sustainable development was incorporated in political decision-making while during the period of the accession to the EU national legislation was harmonized with the European environmental law and with international conventions (EEA Report).

What is most important for conservation at landscape level, today environmental issues in Cyprus are dealt with through an integrated decision-making process. Overall environmental policy is formulated by the Council of Ministers and coordinated through the Minister of Agriculture (MANRE), Natural Resources and Environment (with the exception of town and country planning issues) who is advised by the Council of the Environment. The Environment Service of MANRE is mandated to advise on environmental policy and to coordinate and ensure the adoption of the EU environmental policy and legislation. Interministerial cooperation is ensured by the participation of all three competent authorities in almost all bodies established under the environmental management system, the physical planning system and the national development planning and control system (EEA Report).

Except for the aforementioned Forest Law and the physical planning regulations (Department of Town and Country Planning 1996), environmental protection is mainly based on the Law on the Protection and Management of Nature and Wild Life (No.153(I)/2003; adoption of the EU Habitats' Directive), Law on the Protection and Management of Wild Birds and Game (No. 152(I)/2003; adoption of the EU Birds' Directive), the Fisheries Law (No. 61 (I)/2001; coastal and marine areas), the law on the introduction of genetically modified organisms (No. 160(I)/2003, EU Directive 2001/18/EC), the legislation on Environmental Impact Assessment of certain Projects (No. 57(I)/2001) and of Plans and Programmes (No. 102(I)/2005) (Environment Service 2005). Finally, sustainable agriculture, including the integration of biological and landscape diversity, is promoted by the Rural Development Plan, for the implementation of the relevant EU regulations and partly financed by the EU (Environment Service 2005). It must be noted that the above legal framework as well as the implementation of the EU *aquis* currently apply only to the area under control of the Republic of Cyprus. There are however UNEP programmes which promote cooperation on environmental issues between the Greek-Cypriot and Turkish-Cypriot communities.

A series of Natural Reserves and National Forest Parks (Table 9.4) including natural forests and arboreal shrubs as well as afforested areas have been designated since 1980 (database BIOCYPRUS). The Permanent Forest Reserves are larger forest land areas with a strict protection which however allows for more human activities and they include the huge forested area of Pafos forest, the reforested area of Stavrovouni, etc. It is notable that the peninsula of Akamas with three permanent forest reserves is managed as a National Park despite the fact that due to conflicting interests the area has not been declared as one. It should also be pointed out that the designation of minor forests has also been important for landscape management. The communal forests, which belong to village communities or town municipalities and were established mainly for the provision of fuel wood, when these needs ceased to exist, were mostly converted to parks or recreation grounds (Environment Service 2005).

Among the most important coastal and marine protected areas are the National Marine Reserve of Lara-Toxeftra (an important sandy beach for sea turtles at Akamas) and the Ramsar Wetlands of the salt lakes of Alyki Larnakas and of Akrotiri. All the three sites are also Barcelona Convention Special Protected Areas (UNEP Directory).

Table 9.4 National Forest Parks and Nature Reserves in Cyprus

Protected area	Area (ha)	Landscape elements
National Forest Parks		
Troodos NFP	9,307	Natural Aegean pine and black pine forests, golden oak and mountain juniper stands, riparian and spring wetlands, screes
Cavo Greco	390	Phoenicean juniper stands, coastal rocks, forest plantations
Petra tou Romiou		Mediterranean maquis and phrygana, pine forest, coastal rocks
Potamos tou Liopetriou	89	Forest plantations and vernal pools, phrygana, river estuary
Athalassa	840	Suburban forest plantations
Paedagogical Academy	45	Suburban forest plantations
Polemidia	125	Mediterranean maquis and forest plantations
Rizoelia	97	Forest plantations and few gypsophilous vegetation patches
Nature Reserves		
Tripylos	823	Cedar forest
Mavroi Kremmoi	2,558	Pine forests, golden oak stands, riparian wetlands, rocks with chasmophytes
Madari	1188	Mountain peak with aegean pine and black pine forest, mountain juniper stands, rocks with chasmophytes
Troodos reserves (4)	220	Riparian wetland, mountain peak, eroded and forested slopes

The regulations of the Town and Country Planning Department (1996) have played an important role for landscape management as they have delimited development zones and protected areas and applied rules regarding physical planning and building which are not only strictly enforced but also generally widely accepted by the public. The protected landscapes include dams, mountain peaks, cliffs and ravines, geological formations, archaeological sites and villages with special social, architectural or historical interest or character. The monitoring and management of water bodies, especially rivers, which function as ecological corridors at landscape level, will be planned according to the Water Framework Directive 2000/60/EC which was recently incorporated in the legislation of Cyprus (Law No. 3812/2004) and will enforce the existing Law 82/30 for Public Rivers Protection.

At the beginning of the 21st century, the NATURA 2000 network, the main tool for the conservation of biodiversity in the EU, has also become of central importance for environmental protection in Cyprus. The EU Habitats' Directive and Birds' Directive mandate the delimitation of sites in which habitat conservation ensures species conservation and for which monitoring and management plans should be implemented. A first list of 39 proposed Sites of Community Importance (SCIs) and Special Protection Areas (SPAs) was prepared by a LIFE project and all the relevant data compiled in a database BIOCYPRUS (MANRE and University of Athens 2001). This list (Table 9.5) intended to cover the island as a whole and included sites in the occupied part of Cyprus and also sites of British Sovereign bases. In the period 2002–2005 political deliberations and consultations with the

Table 9.5 Proposed NATURA 2000 sites and of sites currently included in the National List of Proposed SACs (From BIOCYPRUS 2006)

SITE name (SCIs)	SPA	SACs
Periochi Agias Eirinis – Kormakiti		
Oroseira Pentadaktylou		
Periochi Alakati		
Mammari – Deneia		√
Alykos Potamos – Agios Sozomenos		√
Periochi Mitserou		√
Dasos Machaira		√
Madari – Papoutsa		√
Dasos Pafou**	√	√
Periochi Platy*		√
Koilada Kedron – Kampos*		√
Giouti – Periochi Pachyammou		
Akrotirio Apostolou Andrea – Nisoi Kleides		
Akrotirio Elaia – Limanouri		
Salamina – Limnes Ammochostou		
Kavo Gkreko		√
Thalassia Periochi Nisia		√
Paralimni Lake*		√
Periochi Polis – Gialia		√
Cha-Potami		√
Koilada Diarizou		√
Vouni Panagias	√	√
Episkopi Morou Nerou		√
Thalassia Periochi Moulia		√
Xeros Potamos	√	√
Mavrokolympos		√
Periochi Skoulli		√
Chersonisos Akama		
Periochi Agiatis*		√
Periochi Stayros Tis Psokas – Karkavas*		√
Faros Kato Pafou*	√	√
Dasos Lemesou		√
Alyki Akrotiriou – Ygroviotopos Fasouriou		
Periochi Episkopis		
Ethniko Dasiko Parko Troodous	√	√
Akrotirio Aspro – Petra Romiou	√	√
Koilada Limnati	√	√
Periochi Asgatas	√	√
Kavo Pyla	√	
Alykes Larnakas	√	√
Periochi Lympion – Agias Annas		√
Dasos Stavrovouniou		√
Periochi Lefkaron		√
Ethniko Dasiko Parko Rizoelias		√

*Sites not included in the Life Project proposal; **Sites in national list only as an SPA.

local communities produced the official National List of proposed Special Areas of Conservation (including both SCIs and SPAs) which does not include areas not controlled by the Republic of Cyprus.

This list is still not finalized since for some areas such as Akamas the delimitation of the protected sites is pending. The preparation of management plans for the proposed sites is already under way. As the proposed sites include most of the other protected sites of Cyprus the NATURA 2000 network will act as an umbrella network for nature protection in Cyprus. Most importantly, the integrated management of sites, rather than of individual species or habitats, is an important development for landscape conservation.

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