



LEBANON FOREST & BIODIVERSITY CONSERVATION ASSESSMENT

FINAL REPORT

Prosperity, Livelihoods and Conserving Ecosystems (PLACE) IQC Task Order #86

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Capturing the maximum amount of information in the short amount of field time available to conduct assessments of this nature is always challenging. Planning, logistics, and communications need to function reliably. The Assessment Team relied heavily on the cooperation and goodwill of many others. The entire team is most appreciative of the time given generously by individuals and institutions to assist in our efforts to understand the situation of biodiversity and forest conservation in Lebanon. The complete list of people consulted can be found in Annex D. We are indebted to each of them for the information they provided and sincerely hope that this assessment may also be of value to them and their organizations.

EXECUTIVE SUMMARY

Lebanon is part of the Mediterranean biodiversity hotspot, one of 25 such areas identified around the world by a team of ecologists and biodiversity specialists convened by Conservation International. Lebanon is a “hotspot” because its terrestrial and aquatic biological resources are seriously threatened (primarily) by human activity and the growing threat of climate change

This report is a U.S. Government (USG) mandated assessment prepared periodically to inform USG investment in conservation of forests and biodiversity, as required by the Foreign Assistance Act Sections 118 and 119. United States Agency for International Development (USAID)/Lebanon is currently preparing to initiate a new Country Strategy that will guide USG development assistance to Lebanon over the period 2009 - 2013. The report examines the inventory and status of forests and biodiversity within a socioeconomic, environmental policy and biophysical context, and discusses the institutions and policies that are in place to protect and manage them. The major threats to these resources are identified along with their underlying causes. Ongoing USAID activities aimed at addressing those threats are presented and discussed, as are the efforts of other donor agencies and the Non-Government Organization (NGO) community. The report presents suggestions for priority actions that Lebanon needs to address the causes of the threats identified. Finally, ideas and opportunities for activities that will help address the priority forest and biodiversity conservation needs are presented as potential areas for USAID investment under its new Country Strategy.

Lebanon’s iconic cedar (*Cedrus libani*) is symbolic of all things Lebanese, but grows in its natural state only within a few small protected areas on high mountain slopes. Other natural forests (pines, oaks, junipers) exist and, coupled with other wooded land, cover in excess of twenty percent of the country’s territory. The habitats within these forest systems are made more fragile by the rugged elevation differences that define the country, and, indeed, it is this topography that is the major determinant of forest bioclimatic zones.

The country’s terrestrial and aquatic habitats are estimated to be home to more than 9,000 species, almost equally divided between plants and animals. Relative to its size, Lebanon boasts one of the highest densities of floral diversity in the Mediterranean basin, which in turn is one of the most biologically diverse regions in the world. Floral species distribution by habitat is 81 percent terrestrial, twelve percent marine, and seven percent fresh water. Relative numbers of faunal species by habitat differs with forty-six percent found in terrestrial areas, thirty-eight percent are marine and sixteen percent are in fresh water.

Many of these species and their habitats are protected in Lebanon’s eight reserves and three UNESCO Biosphere Reserves, 15 Important Bird Areas and four Ramsar sites. But taken together, these areas cover less than four percent of the nation’s territory. (Ten percent is considered as an international standard.). Habitats outside these areas are under intense pressures. This assessment noted that habitat conversion or loss represents the greatest threat to forests and biodiversity in Lebanon, a fact that is unchanged since the last assessment conducted in 2002.¹ Other threats come from overharvesting (of birdlife, fish stocks and aromatic and medicinal plants/non-timber forest products), invasive exotic species, and from pollution of aquatic ecosystems.

Since the last assessment (2002) the country has taken some giant steps to shore up its conservation efforts. A national land use master plan has officially recognized an area that can be appropriately categorized as a national park in the north of the country – and if it is officially designated as such will push the total protected area of the country to over ten percent. Environmental awareness in the country is also on the rise. This has been helped with the restructuring of the Ministry of the Environment, a new Environment

¹ ECODIT, 2002

Framework Law, the establishment of a trail system that runs the length of the country and touts Lebanon's natural, cultural and historic heritage and a more visible ecotourism sector that promotes a Green Lebanon.

Unfortunately, most of this is happening piecemeal. There are no national strategies for forests, for fishing, for biodiversity, or even tourism. No plans, at least cohesive ones that attempt to pull things together, to coordinate activities and to make more effective use of weak budgets and inadequate manpower under the national land use master plan. Conflict over management responsibilities for forested land exists between ministries, and donors often bypass government channels and work directly with NGOs whom they know are more effective in accomplishing a task. But there is no larger, big picture vision, about how this contributes to a cohesive, cost-effective approach to conserving terrestrial and aquatic biodiversity and ensuring that there is a rational management system in place for these resources.

The development of the National Strategy for Forest Fire Management is a good example of an exception to how most environmental issues are tackled in Lebanon. The disastrous fires of 2007 and 2008 initiated a call to action that was well coordinated and funded. USAID through its partnership with the USFS participated in this effort that rallied ministries, NGOs, donors, municipalities and the private sector and established an effective mechanism to respond to fires. Now the question remains as to whether a similar effort can happen to address the root causes of most of those fires ... ineffective land stewardship brought about by economic disincentives and inadequate law enforcement.

Strategies, management plans and budgets for Lebanon's protected areas all require strengthening and additional assistance. The draft protected areas management strategy needs to be recognized and implemented along with a national commitment to formally declare Lebanon's first national park, one that is tentatively outlined in the National Land Use Master Plan, but one that will add important and fragile habitats to the too few protected areas that currently exist. It is however the unprotected habitats and species that are at greater risk in the country today. Incentives for better forest land stewardship are also needed as is a national awareness program of how better stewardship will help prevent forest fragmentation, ensure habitat conservation and conserve environmental services. A national forest strategy is needed, especially for the pine and oak forests. Such a strategy would need to address the piecemeal efforts at reforestation and land restoration, make them more technically sound and more effective in achieving their purpose. If no strategies and action plans are developed and implemented to encourage citizens and their leaders to be better stewards of their landscape, today's scattered efforts to conserve the nation's forests, its marine environments, and their biodiversity will only be for naught.

This assessment provides a framework of priority conservation needs and actions necessary to address these broad needs, and also identifies other specific actions that the country can undertake. Current donor actions, including USAID's are catalogued and assessed.

In conclusion, current investments by USAID/Lebanon have no direct impacts on forest and biodiversity conservation. There are cases where activities (tree planting, wastewater treatment, small business linkages in the tourism sector, etc) do have indirect effects. But like many other donors working in the country, these do not contribute to any overall critical mass. Nor are they coordinated with national or municipal governments, or even among the donors themselves. USAID's new Draft Country Strategy for 2009-2013 also does not directly address forest and biodiversity conservation. It does provide, mainly through cross-sectoral linkages, many opportunities to plan and implement actions that can address many of the root causes of the threats to Lebanon's terrestrial and aquatic biological resources identified in this assessment.

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ACRONYMS & ABBREVIATIONS

Abbreviations and acronyms have been kept to a minimum in the text of this document. Where abbreviations or acronyms have been used, they are accompanied by their full expression the first time they appear, unless they are commonly used and generally understood abbreviations such as NGO, kg, etc. However, in order to facilitate understanding of the acronyms used, a complete list is included here.

AFDC	Association for Forest Development and Conservation
AO	(Strategy) Assistance Objective
CAS	Country Assistance Strategy
CDR	Council for Development and Reconstruction
CI	Conservation International
CWR	Crop Wild Relatives
CITES	Convention on International Trade in Endangered Species
CMS	Convention on Migratory Species
DGUP	Directorate General of Urban Planning
EFL	Environmental Fund for Lebanon
FAA	Foreign Assistance Act
GEF	Global Environment Facility
GMO	Genetically Modified Organisms
GoL	Government of Lebanon
GTZ	German Agency for Technical Cooperation
IBA	Important Bird Area
IUCN	World Conservation Union
LMT	Lebanon Mountain Trail
MoA	Ministry of Agriculture
MoE	Ministry of Environment
NTFP	Non-Timber Forest Products
OWL	Other Wooded Land
SDATL	National Land Use Master Plan (from French)
SISPAM	Stable Institutional Structure for Protected Areas Management
SPA	Specially Protected Area (of Mediterranean Importance)
USAID	United States Agency for International Development

I.0 INTRODUCTION AND BACKGROUND

I.1 Purpose of the Assessment

The Foreign Assistance Act (FAA), which authorizes US bilateral foreign aid programs, requires that tropical forestry and biodiversity assessments be conducted in conjunction with the development of new foreign assistance strategies and programs. The purposes of this legal requirement are 1) to assure that US foreign aid does not support activities that harm the tropical forests and biodiversity of host countries; and 2) to inform USAID strategic planning and find ways to support host countries to sustainably use and conserve their tropical forests and biodiversity. Specifically, FAA Sections 118 and 119 (*Annex A*) state, regarding tropical forests and biodiversity respectively, that

“Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of the actions necessary in that country to conserve tropical forests and biological diversity, and the extent to which the actions proposed for support by the Agency meet the needs thus identified.”

The intent of the US Congress in passing these amendments was not to support the conservation of biological diversity and tropical forests for their own sake, but rather to support their conservation because of the belief that they are the foundation for the long-term, sustainable social and economic wellbeing of any country.

Although Lebanon is not within the tropics, its forests are an important habitat for biodiversity, and as such the Scope of Work for this assessment (*Annex B*) stipulated that forest conservation be addressed in the report. Since forests provide habitat for much of the country’s terrestrial biodiversity, an assessment of biodiversity logically includes forests.

USAID/Lebanon conducted its last FAA 118-119 Assessment in 2002 (ECODIT, 2002). Since that assessment, the political and economic situation in Lebanon has changed significantly. Given these changes, USAID/Lebanon requested this updated assessment not only to meet the legal requirement of the FAA, but to help put into context its new 2009-2013 strategy developed within the current socio-political situation of the country

The objectives of this assessment are to update and analyze information on:

- Threats to Lebanon’s forests and biological diversity, and their direct and indirect (root) causes;
- Priority conservation needs and actions necessary to conserve Lebanon’s biodiversity and forests; and
- The extent to which USAID/Lebanon’s current and planned actions meet and support such needed actions within its proposed strategy and program.

I.2 Methodology

This assessment was conducted from September 15 to November 15, 2009, by a team consisting of a Team Leader, a Natural Resources & Policy Specialist, a Biodiversity Specialist, a Bird and Wetland Specialist, a Wildlife Specialist, Marine Resources Specialist and a GIS/Land Use Specialist. See Biographical Sketches of Team Members in *Annex C*. The assessment and analysis contained in this report is based on the following approach:

- Identify Lebanon’s major ecosystems and their component species;
- Identify endangered, threatened and endemic species;
- Identify the direct threats to forests and biodiversity and their root causes or drivers;
- Identify the actions needed to address, remove, and/or mitigate these causes;
- Identify the institutional actors who can carry out or support the needed actions with an assessment of their general effectiveness under current circumstances;
- Identify any perceived potential areas of concern related to impacts of USAID/Lebanon’s current or planned programs on forest and biodiversity and, based on this
- Identify opportunities for USAID to support needed actions and/or key actors within its proposed strategy.

This approach is congruent with USAID guidance on conservation threats analysis as laid out in *Biodiversity Conservation: A Guide for USAID Staff and Partners* (2005) and also follows USAID’s “best practice” guidance provided in *Tropical Forestry and Biodiversity (FAA 118-119) Analyses: Lessons Learned and Best Practices from Recent USAID Experience* (2005).

Information was gathered from numerous sources. No single source by itself was sufficient, and information from one source was validated by and supplemented with information from other sources. This report is an analysis and synthesis of a large amount of information, organized according to the approach stated above. The sources of information include:

- A review of relevant documents including studies, evaluations, media reports, and USAID documents;
- Additional review and research of secondary sources;
- Interviews with a sample of representatives of key stakeholder groups including Lebanese government agencies, national NGOs, private sector representatives, international donors (bilateral and multilateral), – see list in *Annex D*, and
- Field visits and discussions

1.3 Report Structure

This assessment report follows the framework described above. Because the task order had a 30-page limit on the body of the report, a lot of useful information is provided in annexes. An overview of the status of forests and biodiversity in Lebanon, presented in *Section 2*, is followed by the legal and institutional framework for conservation in Lebanon in *Section 3*. *Section 4* then presents the principal direct threats to the country’s forests and biodiversity and the underlying causes of these threats. An analysis of the conservation actions relative to the current socio-political and economic reality of Lebanon and the gaps that still exist in addressing the root causes of the threats is presented in *Section 5*. Actions needed to address, remove, or mitigate these underlying causes are presented in *Section 6*. *Section 7* provides an analysis of USAID/Lebanon’s current and planned activities and the extent to which these meet the identified needs and also points out opportunities to support the needed actions within its new strategy. *Section 8* gives a brief synopsis and conclusions of the overall forest and biodiversity conservation assessment exercise.

2.0 LEBANON'S BIODIVERSITY AND FOREST RESOURCES

This section provides a general geographic and socioeconomic overview of Lebanon followed by a description of the country's forest and biological resources, habitats, and important flora and fauna species. Much of the baseline data for this section remains unchanged from the 2002 assessment (ECODIT, 2002) and this section draws significantly from that document. The "State of Lebanon's Forests" report (AFDC, 2007) is also an important source of information used in this section as is the "Lebanon Forest Resources Assessment" (FAO, 2005).

2.1 Overview of Lebanon

Lebanon is a small country with a surface area of 10,452 km² (approximately 160 miles long and 20 to 50 miles wide). It is located on the eastern end of the Mediterranean Sea (33°50' North and 35°50' East) and is very mountainous. Its 225 km-long (140 mi.) coast is bordered by a narrow plain that disappears in some places. The Mount Lebanon range runs almost north and south forming a central backbone in the country. From the west, it rises from the coastal plain and is separated from the Anti-Lebanon Range to the east by the fertile Bekaa Valley. The mountains are rugged and are mostly made up of Jurassic and Cretaceous limestone and sandstone. The limestone also gives rise to the substantial karst formations (with their sinkholes, underground streams and caves) that cover two-thirds of Lebanon's surface area. These are found primarily on the Mount Lebanon range between 300 and 1,800 meters above sea level

Lebanon has five distinct geomorphological regions. These include:

1. **The coastal zone**, including the shoreline and continental shelf, the coastal plain, and the foothills of Mount Lebanon rises to 250 meters; 13 percent of the country;
2. **The Mount Lebanon range** (or chain), including middle-and high-elevation zones, rises from Akkar in the north and extends south to the hills of Jabal Amel. The highest peak is Qornet el-Sawda (3,087 meters or 9,409 feet) and Mount Sannine (2,624 meters or 7,998 feet) is the second highest peak in the region; 47 percent of the country;
3. **The Bekaa Valley**, a fertile land corridor separating the Mount Lebanon and Anti-Lebanon ranges, is drained to the north by the Aassi River and to the South by the Litani River. The central part of the valley was occupied by lakes and seasonally-flooded marshes until it was drained for agriculture during the 19th century. The only large natural wetland that survived conversion is the Ammiq swamp, a small remnant swamp along the Litani River that all but dries up by the end of September; 14 percent of Lebanon;
4. **The Anti-Lebanon chain**, which extends across the Lebanese-Syrian borders along the eastern part of the country and includes, at its Southern terminus, Jabal el Cheikh (Mt. Hermon, 2,814 meters or 8,577 feet), which distributes rainfall and snowmelt into at least three main watersheds across Lebanon, Syria and Israel; 19 percent of the country; and
5. **South Lebanon**, an elevated plateau that extends a short distance inland from the western shores of South Lebanon to the Mount Hermon foothills in the East. Seasonal streams flowing from east to west into the Mediterranean Sea intersect this region; 7 percent of the country

The climate is Mediterranean with hot, non-rainy (humid on the coast, dry inland) summers and warm, moist winters. The average annual rainfall in Beirut is 820 mm, falling mostly between mid-October and early May when Mediterranean depressions are frequent. Monthly average temperatures on the coast range from 13° Celsius in January to 27° Celsius in July. Temperatures occasionally drop to near 0 degrees Celsius in Beirut during winter but rarely drop below freezing and soar to the high thirties in the summer. Inland, the Bekaa valley is much drier, and winters are cooler than on the coast, with frequent frost and snow.

In general, precipitation decreases from west to east, the Bekaa valley having an average annual rainfall of only about 380 mm. The wettest areas are the higher-elevation western slopes of the Mount Lebanon Chain (up to 1,750 mm of rain, including up to 3 m of snow on average). The driest areas are the northern sections of the Bekaa valley (<250 mm of rain).

Water remains one of Lebanon's most precious resources even though it is relatively abundant. Precipitation falling on the landscape results in an estimated yearly flow of 8,600 million cubic meters (Mm³). This gives rise to 40 major streams and rivers and more than 2,000 springs, but there are no navigable rivers or major natural lakes. Many, if not most of these watercourses run dry before the end of the summer months with the exception of the Litani and Aassi Rivers mentioned above. Groundwater quantities estimated for exploitation varies from 400 to 1,000 Mm³.

The population of Lebanon is estimated at 3.8 to 4.0 million with an estimated growth rate of 1.2 percent between 2000 and 2015. This population is unevenly distributed across the country with more than 90 percent living in urban areas; 60 percent of the population is squeezed onto eight percent of the land in the narrow coastal zone (CDR, 2004). The spatial distribution of the population has major implications for the environment, in terms of demand for land and water resources, the use of land, and for the environmental services it provides.

Within this population there are 18 officially recognized religious groups, and Christians, Sunni Muslims, Shiaa Muslims and Druze predominate. The Lebanese population is relatively young (more than 50 percent is below the age of 24) and the country is one of the most highly educated in the region. Health care is generally recognized as good and the Lebanese life expectancy is about 68 years. Infant mortality is low by regional standards.

Economically, Lebanon has a well diversified private-sector, but growth is constrained by external and internal debt that restricts investment. The conflicts of the 1970s and most recently in 2006 have left the development situation unclear, although there have been many promising signs during the past several years that stability will bring greater and more varied investments.

Agriculturally, in Roman times, Lebanon was widely known as a breadbasket region. The Bekaa Valley still figures prominently in agricultural production but overall, the country is a major food importer. In recent years the growth of horticultural crops has been phenomenal in some of the higher elevations of the country and many of these products are being exported, especially to the Arab Gulf countries. Pesticides and herbicides are widely used, which probably limits export potential to countries with rigid WorldGAP and EuroGAP standards. Many growers have realized the importance of investing in organic farming and this should give rise to new business opportunities and the creation of new jobs.

2.2 Major Ecosystems

Biological diversity, or biodiversity, is the variability and variety of living systems at several levels, including the diversity of ecosystems, of species within ecosystems, and of genes within species. Lebanon's ecosystem diversity results from the country's dramatic topographic and altitudinal diversity, combined with its location at the far eastern end of the Mediterranean Sea.

The biological diversity of the Mediterranean Eco-region, of which Lebanon is part, has been more influenced by humans than by any of the other 24 eco-regions selected as biodiversity hotspots by Conservation International (CI). Human influence in the region dates back 8,000 years when the first significant deforestation began. Since that time landscapes have been as much influenced by people as by nature and today Lebanon's mosaic of overgrazed grasslands, agricultural lands, evergreen woodlands, and brushland is evidence of that.

2.2.1 Forests

Based on the FAO Forest Resources Assessment (2005), forests cover 13.2 percent of the country's territory. Other wooded land (OWL) adds an additional 11.3 percent of the territory, yielding a total of 24.5 percent. **Exhibit 1** illustrates the ownership of these forested lands – Map 1 in **Annex F** shows how the forest cover is distributed throughout the country. About 57 percent of the forest cover is broadleaved species (primarily oaks), with coniferous species (mainly pines) contributing about 31 percent. The remaining portion is mixed broadleaved and coniferous forests.

Exhibit 1. Ownership of forested and other wooded lands in Lebanon, 2004

Ownership type	Forest (ha)	OWL (ha)
Private	84,183	86,702
Public	53,799	14,956
-State	38,189	
-Municipal	13,938	
-Communal	1,672	
Unknown	1,394	6,720
Total	139,376	108,378

Source: FAO, 2005

It should be noted that these data indicate that the forested area in Lebanon is more than what was reported in the previous forest and biodiversity assessment (ECODIT, 2002) when 12.8 percent was the estimate (compared to the almost 25 percent indicated above). This may be attributed to reforestation efforts and more accurate measurements, but the difference may also - at least partially – be attributed to how the FAO defines a forested area. Additional details about the FAO's assessment and the species composition in the forest cover types can be found in **Annex E**. See box on the extent of private ownership in forest lands.

Private ownership of forested lands is slightly more than double that of state-owned forest lands. FAO reports that about half of the private forest lands are owned by religious communities.

From a habitat standpoint, the extent of forest cover in an un-fragmented state probably figures most prominently in its importance to biodiversity. An examination of the forest cover map (**Map 1 in Annex F**) shows the fragility of these forest systems to fragmentation. Lebanon's rugged topography, which is a major factor in the country's forest bioclimatic zones, also contributes to the overall fragility of habitats. *See also Section 2.4.*

2.2.2 Forest bioclimatic zones

Vegetation communities and associated species are best defined by altitudinal zones. The Lebanese mountains have been classified into nine bioclimatic regimes with vegetation associations according to altitude. These are summarized in **Exhibit 2**.

2.2.3 Riparian vegetation and wetlands

The riparian vegetation also changes with altitude. In many areas, riparian vegetation covers river banks. It is highly diverse and constitutes a fragile ecosystem that plays a major role in watershed protection and erosion control. Near sea level, the riverbank vegetation cover includes oriental plane tree (*Platanus orientalis*), oleander (*Nerium oleander*), St John's wort (*Hypericum spp.*), laurel (*Laurus nobilis*), small-flowered pancratium (*Pancratium parviflorum*), officinal chaste tree (*Vitex agnus-castus*), and white willow (*Salix alba*). At higher altitudes, the vegetation cover includes alder (*Alnus spp.*) and Lebanese willow (*Salix libani*) (METAP, 1995).

Lebanon's few swamps and wetlands, principally in Ammiq and Anjar/Kfarzabad, are important habitats for migratory birds. Dominant vegetation in these ecosystems includes Syrian ash (*Fraxinus syriaca*), Lebanese willow, southern reed (*Typha australis*), water iris (*Iris pseudocarus*), and many other species (MoA, 1996).

Exhibit 2. Forest bioclimatic zones in Lebanon

Zone	Altitude (m)	Dominant species	Observations
Thermo-Mediterranean	0 to 500	<i>Ceratonia siliqua</i> , <i>Pistacia lentiscus</i> , <i>P. palaestina</i>	Plant communities in this zone are severely degraded, especially the coastal strip
Eu-Mediterranean	500 to 1000	<i>Quercus calliprinos</i> & <i>Pistacia palaestina</i> . <i>Pinus pinea</i> and <i>P. brutia</i> , <i>Cercis siliquastrum</i> & <i>Styrax officinalis</i>	Species and plant communities here have been continuously affected by wars, logging, charcoal production and firewood collection
Supra-Mediterranean	1000 to 1800	<i>Quercus calliprinos</i> , and <i>Q. infectoria</i> . <i>Pinus brutia</i> & <i>P. pinea</i> .	Vegetation cover is denser as population density is lower with human settlements for recent
Mountainous-Mediterranean	1500 to 2000	<i>Cedrus libani</i> , <i>Abies cilicica</i> & <i>Juniperus excelsa</i>	Zone harbors relic formations of cedar, firs and juniper
Oro-Mediterranean	> 2000	<i>Juniperus excelsa</i>	Juniper is the only tree species here accompanied by xerophytic, dwarf vegetation. Endemism is high due to effects of isolation
Mediterranean Pre-Steppic	1000 to 1500	<i>Quercus calliprinos</i>	Forest land is heavily grazed in the pre-steppic zones and the dominant species are a degraded garrigue. In the Anti-Lebanon chain some endemic species are present on western slopes while eastern side is very dry, overly grazed and severely degraded
Supra-Mediterranean Pre-Steppic	1400 to 1800	<i>Quercus calliprinos</i> & <i>Q. infectoria</i>	
Mountainous Mediterranean Pre-Steppic	1800 to 2400	<i>Juniperus excelsa</i>	
Oro-Mediterranean Pre-Steppic	>2400	<i>Juniperus excelsa</i>	

Source: AFDC, 2007

2.2.4 Marine and coastal areas

Lebanon's short (225 km) coastline is extremely influenced by human activity with only one very small area in the south that remains untouched (from Tyre to Ras el Naqoura). A group of islands off the coast at Tripoli has also been allowed to revert to a natural state. River systems emptying into marine waters have very irregular flows and are almost nonexistent for five to six months of the year. In the spring, sediment loads are heavy and often carry industrial and agricultural pollutants.

The marine and coastal flora of Lebanon is considered to be Mediterranean with some subtropical elements. Most marine organisms and ecosystems are typically Mediterranean, some are of Indo-Pacific origin and their development is due to the opening of the Suez Canal. There are a few invasive species from the Red Sea, which have settled and formed stable communities (MoA, 1996). See also Section 4.1.3 on exotic invasive species.

Sea depths are relatively deep even close to shore, allowing a variety of deeper dwelling marine organisms to occur in Lebanese waters. Several marine habitats are found along the coast and in neritic and oceanic waters, where varying biocenoses develop according to geological and physical/chemical conditions of the sea environment.

2.3 Natural Areas, Habitats of Particular Importance and “Hotspots”

Lebanon, as noted earlier, is included in the Mediterranean eco-region hotspot as defined by Conservation International. The World Wide Fund for Nature (WWF) has also included the Mediterranean region in its Global 200 priorities for biodiversity conservation. Of the 25 eco-regions on CI's list, the Mediterranean ranks 3rd in vascular plant diversity (number of species) and endemism, 17th in bird diversity and 14th in bird endemism, 11th in mammal diversity and 13th in mammal endemism, 14th in reptile diversity and 10th in reptile endemism, and 15th in amphibian diversity and 16th in amphibian endemism. Within this very large eco-region, the small, and poorly studied, country of Lebanon is estimated to have at least 9,119 fauna and flora species (Mittermier et.al., 2000).

Relative to its size, Lebanon boasts one of the highest densities of floral diversity in the Mediterranean basin, which in turn is one of the most biologically diverse regions in the world (Médail and Quézel, 1997). Floral species distribution by habitat is 81 percent terrestrial, twelve percent marine, and seven percent fresh water (MoA, 1996).

The relative number of animal species by habitat varies. Forty-six percent of Lebanon's faunal species are found in terrestrial areas, thirty-eight percent are marine and sixteen percent are in fresh water (MoA, 1996). Lebanon has established eight reserve areas to protect its high endemism and the value of its forests and biodiversity. Internationally, UNESCO-MAB has identified three sites as biosphere reserves and the UNESCO World Heritage lists the Valley of Qannoubine as a cultural landscape including the Arz el Rab cedar forest. Birdlife International has listed fifteen sites as Important Bird Areas and there are four recognized Ramsar sites in the country. Another area in the north is listed in the National Land Use Master Plan of Lebanon (approved by the Council for Ministers in 2009) as a possible new national park. Additional sites (river streams, sinkholes, forests, etc.) are declared as natural sites and landscapes under the protection of the Ministry of Environment and/or Agriculture. Each of these areas is addressed in more detail in Sections 3 and 4.

2.4 Flora and Fauna Species of Importance

Flora and fauna species inventories date back to the Ministry of Agriculture's UNEP-funded study of 1996. Work since then has been with individual species. The MoA study found that in terms of actual number of species, flora and fauna were equal: floral species accounted for 4,633 of the diversity and faunal species numbered 4,486. Richness in floral species is still high despite centuries of deforestation and low forest cover. The soils and bedrock structure coupled with the altitudinal variations within small areas probably contribute to this diversity. Many northern plant species also are found here and reach their southernmost distributional limits.

Birds are important bio-indicators: they can instantly colonize new, propitious grounds and are easily displaced if their habitats are disturbed or destroyed. Many bird species help maintain agricultural pest populations in check; their protection is therefore important for maintaining a healthy ecological balance.

2.4.1 Endemic species

The most recent Lebanon national report to the Convention on Biological Diversity (2009) noted that the country is home to about 2,600 terrestrial plant species with 8.5 percent being broad endemic (endemic to Lebanon, Syria and Palestine) and 3.5 percent endemic to Lebanon. The species to area ratio is 0.25/km²,

which is considered exceptionally high for plants. (Compare with 0.0081/km² for South Africa, 0.022/km² for Jordan, 0.017/ km², 0.011/km² for Turkey). This is also true for faunal diversity compared to neighboring countries. In Lebanon the ratio is 0.028 species/km² while it is 0.019 for Syria, 0.046 for Jordan and 0.017 for Libya. Only two faunal species (the greater mouse-eared bat and the Lebanese common knothole) are considered endemic to Lebanon

Most of the endemic species are located on the high summits of Mount Makmel, Mount Sannine, Mount Hermon, and in the upper reaches of Qammoua and Ehden. The isolation effects of these high elevations provide environmental conditions conducive to high levels of endemism. Medail and Quezel (1997) noted more than 100 species specific to Mount Hermon and the Anti-Lebanon Range.

2.4.2 Endangered and threatened species

Although there is no Red List for species in Lebanon there are a number of species present in the country that appear on the 2009 IUCN Red List. On a global scale, of the 394 bird species found in Lebanon one is critically endangered, two are endangered, eight vulnerable and 17 are near threatened under the IUCN categories (MoE, 2009). Similarly for mammals recorded in Lebanon, 2 species are near threatened, 10 are extinct, and 12 are globally vulnerable. For fish species, the numbers are: one species is listed as vulnerable, three are endangered and two are critically endangered. Estimates of the numbers of invertebrates exist, but they have not been thoroughly studied in Lebanon. The list of globally endangered and threatened bird species is presented in *Annex G*.

Eleven tree species present in Lebanon are on the IUCN Red List, including the *Cedrus libani*, but all are listed at low risk levels. There is greater pressure on shrubs and lesser vegetation, especially those traditionally collected for their medicinal and aromatic uses. One current UNDP/GEF project is cataloging these uses and examining strategies for their management.² *Exhibit 3* lists the classes of these shrubs and lesser plants and the degree to which they are endangered. The number of endemic plants threatened is quite high.

Exhibit 3. Classes of shrubs and lesser plants and the degree to which they are threatened

Class	No. of species	No. of Endangered Species	Percent of Endangered Species
Fodder plants	69	34	49.3
Medicinal plants	236	16	6.8
Mushrooms	207	4	1.9
Lichens	800	--	--
Mosses & Hepatica	219	--	11
Ferns	31	14	45.2
Endemic plants	92	38	41.3
Total	1,654	106	

Source: MoA, 1996

2.5 Genetic and Agro-Biodiversity

Biodiversity is increasingly being recognized as important by agricultural professionals. The trend nowadays is to adopt more commercial and productive crops, including genetically modified organisms (GMOs), at the expense of more traditional crop varieties. Whereas imported and genetically modified crops usually generate higher yields, traditional crops are incontestably hardier: they exhibit higher drought resistance, sometimes

² <http://www.undp.org.lb/ProjectFactSheet/projectDetail.cfm?projectId=133>

also higher resistance to salt and heat stress, and are less susceptible to pests and diseases. Genetic diversity of traditional and crop wild relatives (CWR) allows species to adapt to changing climates and other ecological conditions. This natural genetic diversity will be especially critical to the survival of many species in the face of rapid global climate change fueled largely by anthropogenic sources.

Legacy species and local landraces, especially for horticultural crops such as wild almond, wild pear, wild plums and wild pistachio (and most likely apple, *Malus spp*) are found in Lebanon. The country's high level of endemism is probably also a good indicator that other CWR exist which can provide organic products in response to increasing demand as well as the genetic resources needed to develop crops that are more resilient to diseases, pests and climate change. A UNDP/GEF and ICARDA funded project (2004) initiated a number of studies and farmer-based training in agro-biodiversity in Lebanon in the early part of the decade.

2.6 Ecosystem Services

Biological diversity, including forests, provides three general categories of benefits to Lebanon and its citizens: ecosystem products; ecosystem services; and non-material benefits, such as cultural, recreational, educational, spiritual, etc. In some cases, especially for some ecosystem products and non-material benefits such as the provision of water, nature-based tourism or carbon sequestration, the benefits enter into market systems and can then be valued in monetary terms. In other cases the benefits are not marketed, and therefore are not easily valued in monetary terms. Traditional uses of ecological resources in Lebanon include the use of trees, shrubs and other plants for wild foods and medicines; others have a quasi-commercial value (such as zaatar and pine nuts). Many cultural and spiritual benefits derived from ecosystems, such as family walks in the forest on a Sunday afternoon, or an overnight excursion on the Lebanon Mountain Trail (LMT) are not marketed. Ecosystem services such as hydrological services from watersheds, pollination, and soil nutrient cycling are also typically not marketed or valued in monetary terms. Both ecosystem services and non-material benefits from Lebanon's forests and biodiversity have an undeniable value.

The Lebanon Mountain Trail (LMT) is a national long-distance (275 miles) hiking trail that promotes economic growth in rural areas while encouraging participatory biodiversity conservation and good governance (www.lebanontrail.org). The LMT project was conceived of, designed and implemented by ECODIT with core funding provided by the American people through the US Agency for International Development (Dec 2005 – Mar 2008).

With some effort, these benefits could be quantified, and it might be advantageous for the Ministries of Environment and Agriculture to do so as a way of leveraging additional funds in the future. Structured studies could help determine minimum value for tourism and ecotourism benefits linked to protected areas, UNESCO sites and the LMT. By calculating the labor invested, time spent in training efforts, the equipment purchased and donated and the estimated person hours used to develop and implement the new national forest fire control and management strategy, one could arrive at a basic and minimal value for the pine and oak forests being protected by the strategy. Similarly, the value of carbon stored in protected ecosystems can be determined as global carbon markets are developed.

3.0 LEBANESE LEGAL AND INSTITUTIONAL FRAMEWORK FOR BIODIVERSITY AND FOREST CONSERVATION AND MANAGEMENT

3.1 National Legislation, Policies and Strategies

3.1.1 Forestry laws and management

Lebanon has two overlapping forest laws: (1) the Forest Code of 1949 and (2) the Law on Forest Protection, Law 85 of 1991 then amended by parliament in 1996. While the law of 1949 regulates forest activities including pruning, thinning and charcoal making, the laws of 1991 and 1996 imposed severe restrictions on forest activities and a total ban on harvesting resinous trees including pine (Calibrian, Aleppo and Stone pines), Lebanese cedar, juniper, cypress and fir. The law of 1949 recognizes three types of forests based on land ownership (private, municipal and state) and therefore continues to provide the basis for the management of forests by the Ministry of Agriculture. The ministry's Directorate of Rural Development and Natural Resources has sole responsibility for recruiting forest personnel and operating so called "forest stations." The directorate currently has some 20 forest stations and 186 forest personnel (152 forest guards, 13 inspectors and 21 observers).³ In theory, the forest guards enforce forest legislation (including the Forest Law of 1949 as well as Law 85/1991 and Law 558/1996) and apprehend offenders. In practice however, the guards are noticeably underequipped and also underpaid to do their job well (they earn about \$430/mo plus benefits). The Directorate has received donations including water trucks and utility vehicles but such equipment ends up in graveyards and parking lots after a few years in service due to lack of spare parts and resources to ensure preventive maintenance. Sometimes the vehicles stand idle because their fuel reservoirs are empty.

3.1.2 Reforestation

Forest management is the responsibility of the Ministry of Agriculture (Department of Forests and Natural Resources). During the late 1960s and early 1970s, Lebanon pioneered large scale reforestation programs across the country known as the "Green Plan"; millions of trees were planted and/or seeded in vast areas of the country. While the Green Plan remains today a semi-autonomous directorate under the MoA, its scope and purpose have shifted from reforestation to land rehabilitation. In particular, the Green Plan provides grants to repair and/or build stone terraces, build hill lakes, and install irrigation networks.

Despite this change, the Department of Forests and Natural Resources continues to engage in small-scale reforestation. It produced in 2008 an estimated 200,000 seedlings (its capacity is closer to 1.5 million seedlings assuming 100% germination) distributed in nine plant nurseries across the country (see their locations in **Map 1 in Annex F**). The ministry distributes the seedlings for free and therefore has little control over these after handing over. In the past, when demand exceeded supply, the ministry would import seedlings including cedars from Syria. It should be noted that Decision 108/1 of 1995 prohibits the import of cedar seeds and seedlings. This year however, the Ministry imported a large number of seedlings from Syria and distributed them free; imports by the Ministry or any commercial nursery are not subject to quarantine –*see box*.

Phyto-sanitation in Lebanon?

The MOA currently has limited capabilities to ensure phyto-sanitation but those capabilities could be expanded in coordination with the Lebanese Agricultural Research Institute (LARI) which has already implemented a program for the production of disease-free fruit trees.

³ According to the official and approved organizational structure, the Directorate should have about 240 forest personnel.

In 2001, Lebanese Parliament approved a program that would allocate LBP25 billion (\$16.7 million) to the Ministry of Environment (MOE) over a five year period to implement large-scale reforestation activities in carefully selected areas (Law 326 dated 28/6/2001). The MOE subsequently formulated a National Reforestation Plan (NRP) and implemented Phase 1 (2002-04) and Phase 2 (2004-06) of the plan by contracting private nurseries to collect the seeds, produce and transplant the seedlings on municipal/government land, and provide irrigation and replacement for a period of two years. During this start-up period (2002-06), MOE replanted 305 ha of mostly municipal lands, distributed across 23 sites, using indigenous forest species (e.g., cedar, pine, oak, wild almond and carob).⁴ Notwithstanding the suspension of the plan brought about by the war in 2006, the long-term sustainability of the plan is questionable. In particular, the program was hampered by the lack of coordination between MOE and MOA.

3.1.3 Protected Areas System

Lebanon has been designating protected areas since 1942 when the Government of Lebanon established eight protected sites pursuant to Decree 343 (dated 28/03/42). These early protected sites were very diverse ranging from urban parks (Horsh Beirut), to springs (nabaa el laban), forests (the oak forest in Mrouj and the cedars of Bcharre) and historic monuments (temple of Baalbeck). Since 1942, several ministries have been designating protected areas including the ministries of Tourism, Agriculture, Culture and most recently Environment.

The Ministry of Environment is today the lead government agency responsible for protected area management in Lebanon. Article 23 of Law 690 has mandated the MoE to determine candidate areas for PA establishment as well as develop criteria for PA designation and guidelines for PA management. Lebanon today has 8 legally established nature reserves. Some have also acquired international designations (see complete list in *Exhibit 4*). Unfortunately, the protected areas in Lebanon were not designated based on any formal classification criteria or management objectives.

Exhibit 4. Lebanon's Eight Nature Reserves (listed chronologically)

Nature Reserve	Law (date)	Approximate Area (km ²)	Elevation Zone (meters)	Comments*
Horsh Ehden Nature Reserve (North)	121 (9/3/1992)	17	1,200-1,900	IBA
Palm Island Nature Reserve (North)	121 (9/3/1992)	5 (marine basin)	0-12	RS, SPA, IBA
Karm Chbat (Akkar)	Decision 14/1 (6/10/1995)	5.2	1,400-1,900	-
Shouf Cedars Nature Reserve (Mt. Lebanon)	532 (24/7/1996)	160	900-2,000	IBA, BioR
Tyre Coastal Nature Reserve (South)	708 (5/11/1998)	4	Sea level	RS, SPA
Bentael Nature Reserve (Mt. Lebanon)	11 (20/2/1999)	2	250-800	-
Yammouni Nature Reserve (Bekaa)	10 (20/2/1999)	17.5	1,400-2,000	-
Tannourine Cedars Nature Reserve (Mt. Lebanon)	9 (20/2/1999)	1.5	1,300-1,800	

RS: Ramsar Site - **SPA:** Specially Protected Area of Mediterranean Importance - **IBA:** Important Bird Area - **BioR:** Biosphere Reserve.

Source: Compiled by ECODIT Assessment Team

⁴ MOE, 2007

With grant funding from the EU, the MoE implemented in 2004-06 the “Stable Institutional Structure for Protected Areas Management” (SISPAM) project to capitalize on the vast cumulative experience in PA management and make recommendations for enhancing the PA system in Lebanon. Under SISPAM, the ministry, with technical assistance from ECODIT Liban, prepared a “National Action Plan for Protected Areas” and developed a new PA category system. Inspired by the IUCN classification system for protected areas, the Ministry proposed a national PA system that would comprise four categories:

1. National Park (IUCN Category II)
2. Natural Monument (IUCN Category III)
3. Habitat/Species Management Area (IUCN Category IV)
4. Protected Landscapes/Seascapes (IUCN Category V)

Unfortunately, the proposed category system awaits formal approval by the Lebanese Parliament. If endorsed, the current protected areas would need to be reclassified according to one of the four categories listed above.

3.1.4 Protection and conservation of marine and freshwater resources

Lebanon’s fishing regulation is old and outdated (Decision 2775 of 1929). The sector is controlled by the Ministry of Agriculture (Directorate of Rural Development and Natural Resources, Department of Fishing and Game) which sets guidelines and restrictions on the type of fishing gear used and on minimum fish size. For example, the ministry prohibits the use of mesh size smaller than 20 mm, except for sardines (Decision 408/1 dated 2/11/2007). *See also Lebanese Army security restriction in box.* Compliance with MoA regulations is very questionable considering that the ministry has no resources to patrol the sea and monitor fishing activity. The ministry regulated the scuba-diving industry including permitting procedures and minimum safety measures (Decision 93/1 dated 14/3/2008), and has banned the use of spear fishing by scuba divers. Freshwater fishing is administered by a law of 1948 prohibiting the use of fish traps, dynamite, and other forms of capture that threatened/altered habitats.

Restriction on Fishing Waters

The Lebanese Army has limited fishing to within six nautical miles from the shore. This restriction limits the fishing area and prevents fishermen from catching fish in the deep sea.

Lebanon is a signatory to the Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona, 1975). The convention requires the GoL to reduce land-based sources of pollution (mainly domestic and industrial discharges) and has prompted CDR, the lead planning and donor coordination agency, to draw a master plan for wastewater treatment and secure funding for the design and construction of a dozen wastewater treatment facilities on the littoral – see full list in **Annex H**. Although the plan is several years behind schedule, the first five wastewater treatment plants are set to come online in 2009 (Tripoli, Chekka, Batroun, Jbail, and Nabi Younes). When complete, the master plan for wastewater treatment in the coastal zone will significantly reduce environmental pollution into the Mediterranean Sea by treating wastewater from an estimated 2.5 million people. The plan however does not explicitly encourage water reuse as most of the treatment facilities are located in urban and peri-urban areas where farmland is either scarce or too remote to justify the cost of water delivery.

Inland, Lebanon’s proposed wastewater treatment plants offer interesting opportunities for water reuse. While the Ministry of Environment did develop environmental limit values for wastewater discharged into the sea and surface water (Decision 8/1, dated 30/01/2001), it did not establish water reuse standards per se. In theory therefore, treated wastewater produced by any of the recently completed wastewater treatments plants in the Bekaa Valley (Baalbeck, Aitanit and Ferzol) cannot be reused by farmers directly. In practice however, it is widely reported that many farmers mix raw sewage with irrigation water in times of drought or simply to improve soil fertility. Several treatment plants are not receiving the minimum required inflow because farmers divert the wastewater upstream. Finally, in regards to solid waste management, the MoE prepared in 2004 two decisions on 1) the use and disposal of sewage sludge and 2) the utilization of compost in agriculture, horticulture and landscaping. Those ordinances however have not been formally approved.

3.1.5 Protection and conservation of flora and fauna

Lebanon is a signatory to the Convention on Biological Diversity and has taken noteworthy steps to promote flora and fauna conservation – see in particular **Section 5.2** on conservation in protected areas. The Ministry of Agriculture has issued a number of decisions/circulars prohibiting or restricting wild cultivation and the commercial trading of a selection of plant species including aromatic and medicinal plants. For example, Law 340/1 of 1996 permits the harvesting of wild thyme (“zaatar”) and sage (“mariamieh”) during the period from August to December (sage however requires prior approval from MOA’s Directorate of Rural Development). Ground (processed) thyme can be exported year-round but sage can only be exported during the harvest period and also after obtaining prior approval from MOA.

Hunting in Lebanon is widespread and often indiscriminate. There are reportedly more than 300,000 hunters in the country and an even greater number of shooters.⁵ Lebanon’s first hunting law dates back to 1952. In 2004, the Parliament ratified a new and long-awaited hunting law (No. 580), which resembles the law of 1952 but recognizes the heritage value of wild fauna and advocates measures to ensure sustainability, partly to comply with the EU “Birds Directive.” For example, the new law prohibits hunting and trapping of internationally threatened bird species and all species during spring migration, as well as the breeding and nesting seasons. Furthermore, the law prohibits the hunting of all birds and terrestrial mammals, resident or migratory, *except species designated as game*. It also established the “Higher Council for Hunting” chaired by the Minister of Environment, and outlines the conditions necessary for obtaining a hunting permit (e.g., possessing a gun permit, having insurance against accidents and passing a formal hunting exam). Important application decrees are still missing including a decree on mandatory insurance for hunters (not drafted yet) and a decree to establish formal hunting schools (drafted but awaits approval by the next ministerial council). The Council convened for the first time in 2009 and agreed to draft the required application decrees to be enacted by the Council of Ministers. Although the new hunting law offers new opportunities to protect fauna and wildlife, it also presents serious deficiencies as summarized below:

- Articles 6 and 20 contradict with Decree 137 of 1959 related to firearms and ammunition. The hunting law stipulates that firearms from categories 4 and 5 of Decree 137 can be used for hunting. According to Decree 137, only Category 5 weapons are classified for hunting (Category 4 weapons, while non-military, are not).
- No criteria for the identification of game species
- No criteria for the classification of species harmful to agriculture and ecosystems

In light of these deficiencies, some members of the Council are lobbying to incorporate a wide range of birds and mammals including some endemic species and sub-species among the designated game species. The GoL imposed (but did not enforce) a total ban on hunting since 1995. Not only was enforcement ludicrous, but the government did very little to limit or restrict the import, production and sale of hunting gear and ammunition, as well as game calls and other forms of luring devices. The new hunting law offers synergies with the draft framework law on protected areas as well as the draft law on “Access and Benefit Sharing.”

3.2 International Conventions and Treaties

The GOL has signed and ratified most of the international conventions related to environmental protection and conservation including the Convention on Biological Diversity (Rio, 1992), the UN Framework Convention on Climate Change (Rio, 1992), and the UN Framework Convention for Combating Desertification (Paris, 1994). Of the remaining conventions and treaties that Lebanon did not sign yet are the Convention on International Trade in Endangered Species, CITES (W/DC, 1973) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979). See full list of treaties and conventions signed by the GoL in **Annex I**.

⁵ Hunters carry a valid hunting and/or firearm license whereas shooters do not (they carry no license but practice hunting).

4.0 THREATS TO BIODIVERSITY AND FOREST CONSERVATION IN LEBANON

4.1 Threats

The key threats to Lebanon's biodiversity and forests are:

- Loss, conversion, and degradation of forests and other natural habitats;
- Overharvesting of selected species;
- Exotic invasive species; and
- Pollution of aquatic ecosystems.

The ranked order of this list varies slightly depending on the key stakeholders that were interviewed during the course of this assessment and the review of secondary sources. It is based generally on perceived severity, the area affected, the number of species affected, the degree of urgency, and other factors. The ranking is consistent with other recent efforts to categorize and prioritize the principal threats to Lebanon's natural resources (e.g., MoE 2009). In all cases it is the loss, conversion, and degradation of forests that is by far the most severe and urgent threat (This was also the same first priority identified in the 2002 assessment; and each of the listed threats was also discussed in the previous report). Pollution of aquatic ecosystems is pervasive in some areas, but the actual impact of this pollution on particular species, species diversity, and ecosystem functions is not well known or studied. This type of pollution is oftentimes also reversible. Exotic invasive species may pose more of a threat than is recognized, given the lack of studies of such species and their ecological impacts. Overharvesting is a very sensitive issue in the area of hunting, especially where bird hunting is concerned. Cutting of forest trees for any purpose (other than for charcoal production during certain seasons), even dead wood/stubs after a fire, is illegal everywhere unless the MoA grants a permit. The collection of medicinal and aromatic plants and of the non-timber forest products (NTFPs) is likewise widespread and uncontrolled.

Global climate change caused by human activities, mainly the burning of fossil fuels and the production of greenhouse gases, could be described as a threat to biodiversity and forests, or it could be considered a cause of one or more of the direct threats above. Generally speaking, climate change will either affect the composition or location of forests and other natural habitats, or will reduce populations of sensitive species, making them more susceptible to overexploitation. Climate change may also exacerbate problems from exotic invasive species. For these reasons, this report treats climate change as a cause of direct threats to biodiversity and forests, rather than as a direct threat itself.

4.1.1 Loss, conversion, and degradation of forests and other natural habitats

The major threat to Lebanon's biodiversity and forest cover is from human activities that change land use or degrade and alter the vegetative cover. The MoE's Fourth Report to the Convention on Biological Diversity (CBD) notes that "... *uncontrolled urban expansion, destruction and/or permanent alteration of the coastal zone, extension of agricultural areas, quarries, sand removal, destruction of sea bed habitats through diverse pollutants or trawling, and forest fires all contribute to habitat loss.*" And, unchanged since 1996, is the fact that urbanization is the main cause of habitat loss, fragmentation and species decline. Land clearing, land conversion, new construction and reconstruction is occurring in every corner of the country and encroaching steadily into forested and other wooded lands.

Forest fires, especially in the catastrophic years of 2007 and 2008 have destroyed the vegetative cover on over 4,200 ha of Lebanon's landscape. The damages from those fires were large and they reduced large amounts of the forest cover in a relatively short period of time. They also raised concern at the national and

international levels that they could lead to total eradication of forests if radical steps were not taken to solve the problem (Mitri, 2009). The effects of this forest destruction have led to fragmentation and loss of the forest ecosystem services, which in turn has had a devastating impact on the livelihoods of local communities.

Forests, particularly those in the 500 to 1,800 meter altitude zone are especially vulnerable to fires. And apart from the frenzied urban building in the coastal zones, it is at this altitude where significant amounts of unmonitored construction is encroaching on forested and other wooded lands. Pine and oak ecosystems are suffering the most. **Exhibit 5** originally appeared in a 1996 study that provided a biodiversity baseline for Lebanon (MoA, 1996). Modified slightly, it still remains valid today.

Exhibit 5. Threats to selected forest species based on the degree of severity

Species	Abusive harvesting	Over-grazing	Urban development	Fires
Kermes oak (<i>Q. calliprinos</i>)	3	4	3	3
Haired oak (<i>Q. cerris</i>)	4	4	4	--
Aleppo pine (<i>P. halepensis</i>)	3	3	4	5
Brutia pine (<i>P. brutia</i>)	3	3	3	5
Stone pine (<i>P. pinea</i>)	1	2	4	3
Cedar of Lebanon (<i>Cedrus libani</i>)	2	2	1	--
Fir (<i>Abies cilicica</i>)	3	4	3	--
Juniper (<i>Juniperus excelsa</i>)	4	5	2	--
Cypress (<i>Cupressus sempervirens</i>)	3	4	2	2

Source: MoA, 1996

Severity scale is from nil (lowest) to 5 (greatest)

Climate change is apt to significantly affect water resources in Lebanon. Models show greater warming trends where precipitation will shift more to rain leading to increased runoff and less infiltration recharge to groundwater sources. This also means that more drought resistant vegetation will dominate habitats and that bioclimatic zones will shift upward in altitudes. The habitat changing events will also affect the distribution of mammals and adaptation of birds; migration routes will also change as will adaptation of various species to the changing water and temperature regimes on the Lebanese landscape. The importance of vegetative cover will become even more critical for improving infiltration and groundwater recharge.

4.1.2 Overharvesting of selected species

Unsustainable hunting practices particularly those bordering on what can only be called massacres of all varieties of birds, the overfishing of several marine species and liberal harvesting of medicinal and aromatic plants are the greatest overharvesting threats in Lebanon. Cutting and harvesting of tree species is banned and although illegal activities do occur, they are not as severe a threat to forests as those listed in the previous section.

4.1.3 Exotic invasive species

Non-native *plant* species are introduced, propagated and spread independently throughout the country. Even with policies to the contrary, tree seeds of forest and horticultural species are imported and planted in nurseries and the seedlings out-planted around the countryside. The same is true for agricultural species. Likewise, genetically modified organisms (GMOs), especially for food products, find their way uncontrolled or monitored into Lebanon. Introduced species are often in conflict with endemics, endangering habitats and competing for resources needed for their survival. Invasive species are able to reproduce in large numbers and grow rapidly with no natural controls and quickly take over the habitat of native species. They degrade

ecosystems and contribute, along with land use change and climate change, to the extinction of native flora and fauna. In Lebanon invasive species remain a low national priority, but are a significant threat to the diversity of the biological resources and forest habitats of the country.

Exotic *bird* invasive species in Lebanon are limited to three species. Two of them originate from escaped individuals from captivities (Rose-ringed parakeet *Psittacula krameri* and Common Myna *Acridotheres tristis*). Escapees grow in number in large urban green areas (AUB Campus, Pine Forest of Beirut) and then expand in various habitats. The third species was introduced by hunters in 1994-95 (The Rock Partridge *Alectoris graeca*).

Exotic *fish* invasive species is another dilemma for conservationists. The connection established by the Suez Canal in 1869 resulted in the introduction of Indo-Pacific marine organisms (Lessepsians) into the eastern Mediterranean. In Lebanon, at least 67 recorded species (nektons, nectobenthos, benthos fauna and flora) originated from the Red Sea.

4.1.4 Pollution of aquatic ecosystems

The discharge of industrial effluents into streams and runoff from agricultural and horticultural lands and human settlements carries significant chemicals loads that often run directly into streams. Pesticides and herbicides are often applied unmonitored on fruit trees and vegetable crops. The Lebanon State of the Environment Report (2002) reported that sinkholes are often receptacles for dumping refuse, raw sewage and other untreated waste that often flow directly into water systems used for public consumption, watering gardens, nurseries and the like. In the Bekaa Valley, the accumulation of pollutants during low flow periods directly impacts the avifauna and mammals that inhabit the few existing wetlands. During the six months of low flow in the country's aquatic ecosystems, these water courses can become especially toxic. The discharge of these pollutants into the sea threatens the survival of sea grasses, birds, and marine life such as turtles, fish and mammals.

4.2 Root Causes of Threats

Direct threats to biodiversity and forest ecosystems have multiple underlying root causes or drivers. These can be broadly categorized as political, institutional, economic, external (or global), and social causes and are affected by the prevailing socio-political context.

Some of the specific causes mentioned below came from discussion and debate within the professionals on the assessment team, from interviews with key stakeholders and also from review of secondary data and information.

4.2.1 Political and institutional causes

Intransience in the national and municipal government. The inability to make key decisions to move government processes forward, whether due to political conflict or lack of political will, constrains opportunities for the progressive management of natural resources. This lack of will also breeds a lack of enforcement at all levels of government and/or the ability of granting favors.

Inadequate institutional/legal framework and unclear mandates. Lebanon has a substantial legal framework in place for environmental protection but this is often not institutionalized with workable strategies and action plans. In other instances, such as between the Ministries of Agricultural and Environment, mandates are unclear, overlapping, or in conflict.

Need for stronger institutional capacity at multiple levels. Environmental units within the government are generally understaffed and underfunded. This often results in NGOs implementing activities by default and without the guidelines of a clearly defined national strategy. Similarly, organizations operating the PAs are too

understaffed to carry out their responsibilities clearly and they often lack job security as their employer has no formal status and therefore cannot provide social security and other benefits under Lebanese labor law.

Property rights and obligations are often uncertain. Permits are required from the MoA in order to change or alter land use, including clearing for new construction. Inadequate monitoring and lack of clear zoning guidelines allows the wholesale clearing of sites that are often fragile and/or fire prone. Nor are there any incentives for landowners to act responsibly and reduce the fire risk by thinning and clearing combustible materials from their lands.

4.2.2 Economic causes

Economic incentives that favor land clearing over conservation. Positive incentives are also needed for conservation, forest management, and avoiding deforestation.

Planning development and growth. This is especially sensitive at municipal levels. Strategies and plans that encompass recognized land-use zoning principals are needed along with guidelines for monitoring growth and enforcing development principals especially in regards to forest and other wooded lands within a municipality's territory. These need to be further tied to the overall National Land Use Master Plan (CDR, 2004).

New (and old) actors need improved technical and business skills. Staff responsible for managing biological resources often have limited business and marketing skills, and poor administrative savvy. Their technical capacities have been upgraded mainly through irregular and uncoordinated training and on-the-job-learning. Greater coordinated efforts are required to increase the numbers of competent staff as well as the depth of their knowledge and experience.

4.2.3 External Causes

Global market forces and trends. Trends such as international food crisis, financial and economic shocks, and commodity markets for hydrocarbons all indirectly impact the management and conservation of natural resources.

Regional infrastructure development and integration with regional markets. Lebanon's significant trade and tourism ties with the Arab Gulf region fosters local decision making that promotes land clearing and building. Pressure on real estate, especially during the recent global financial crisis, has encouraged urban encroachment onto the natural landscape. This skews budgets and even donor activities away from conservation needs.

Global climate change. Lebanon has a reduced domestic ability to mitigate and adapt.

Some positive external forces must be kept in mind in the development of actions needed, such as the trends to international standards, certification, joint implementation agreements, cap and trade policies, and Reduced Emissions from Deforestation and Degradation (REDD).

4.2.4 Social Causes

Limited awareness, understanding and information on conservation. For example, on the damaging role of fire in forest degradation; role of forests in providing hydrological ecosystem services; the negative effects of ignorance on wildlife populations; effects of pollution on human health and aquatic ecosystems; and climate change impacts and mitigation measures. On the other hand, the growing awareness about biodiversity and forests by more of Lebanon's population, due to participation in ecotourism activities like the LMT and the very visible national forest fire strategy is definitely positive.

5.0 STATUS OF CONSERVATION ACTIVITIES IN LEBANON

This section discusses the status of conservation activities inside and outside protected areas, analyzes the institutional capacity of lead actors in conservation management and assesses the contribution and impact of other donor efforts in conservation activities in Lebanon.

5.1 Outside of Protected Areas

Conservation activities and programs in Lebanon have intensified after the civil war in response to (1) increased awareness of the need to protect the country's natural (and cultural) heritage and (2) increased pressure on natural resources from urban encroachment, pollution and fires – see discussion of threats and root causes in *Section 4*.

5.1.1 National government

Conservation of forest resources is the responsibility of the Ministry of Agriculture. While MoA forest personnel monitor and patrol forest areas that are accessible by roads, their ability to apprehend offenders is very limited. For example, charcoal production is prohibited during the hot/dry season (July 1 - October 31) and must be located at least 200 meters from the nearest house. While forest guards will confiscate charcoal produced during the banned season and fine the offender LBP20,000/kg (\$13.3/kg) of charcoal, the final sentence and the fine levied against the offender is decided by the judge. Judges have been reported to reduce the fine considerably and arbitrarily -- in the case of one ton of confiscated charcoal, from about \$13,000 to as little as \$100.

The Lebanese Army acquired in the summer of 2009 three Sikorsky N61 fire-fighting helicopters as part of a national “Forever Green” fund-raising campaign led by the Minister of Interior in 2008 and which raised about \$15 million.⁶ These helicopters bolster the country's modest aerial fire-fighting fleet that already include half a dozen Lebanese Army helicopters known as “Huey” (or Bell UH-1 Iroquois) equipped with carry buckets. The Sikorsky can carry 4,000 liters of water while the Huey carries only about 600 liters. The Lebanese Civil Defense operates ground firefighting equipment including water vehicles and trucks (15 and 19 meters long) with a maximum water capacity of 7,600 liters. *Read more about Lebanon's fire fighting management plan in Section 5.1.3.*

5.1.2 Municipal governments and religious endowments (Awqaf)

Many municipalities own land especially in the high mountain areas. They often lease their land to shepherds who will graze their animals during summer (agro-pastoralism is strongly rooted in Lebanese society and the rural economy). This form of rent, while not expensive, brings much needed cash to the municipal treasury. Another important land owner in Lebanon is the church. They own large swaths of land in valleys and mountains in several governorates and usually observe a very strict land policy dictated by the Vatican Church. While the Catholic Church cannot sell the land it owns, it can rent it to support economic development and other public interest projects. This loophole has led to many flagrant abuses of the religious estate in the form of commercial centers and residential blocs, serviced by new roads that dissect pristine forested landscapes – the Harissa Mountain overlooking Jounieh Bay is probably the most striking example of urban encroachment on church land.

⁶ The GoL has on occasions requested aerial assistance from neighboring countries including Cyprus and Jordan.

5.1.3 Non-governmental organizations

A handful of NGOs have been working very actively to protect forests and landscapes in localized areas. Perhaps the boldest initiative to date is the work of **Mada**, a Lebanese NGO established in 2000. The organization has been advocating the establishment of a national park in the upper ranges of Akkar and Dinnieh in north Lebanon for many years. The area offers extraordinary diversity in landscapes and constitutes the largest continuous natural space for wildlife and open forests in Lebanon. In 2006, Mada defined a pilot zone (about 270 km²) stretching from Brissa to Qbaiyat, and signed cooperation protocols with the municipalities of Qbaiyat, Hrar, Michmich and Fnaideq to formulate a regional action plan to promote and enhance the natural resources of the area. The organization also conducted studies on flora and avifauna and will soon extend those studies to fauna as well. The proposed national park is today embedded in the “National Land Use Master Plan” (Decree 2366 dated 20/06/2009) along with six other *regional* parks.

The **Association for Forest Development and Conservation** (AFDC), established in 1995, has been advocating forest management and fire prevention for almost a decade. The NGO is reportedly the largest environmental NGO engaged in forest activities in Lebanon and is frequently consulted by governmental agencies (including the Office of the Prime Minister) on forest-related issues. Following the devastating fires of 2007, the Prime Minister formed an inter-governmental committee (Decision 119 dated 6/11/2007) that later became a National Executive & Technical Committee chaired by the Ministry of Environment. Four working groups emerged from the committee to address the following priorities:

- (1) Securing fire-fighting equipment;
- (2) Establishing a central unit for fire control;
- (3) Developing a training and capacity building program; and
- (4) Developing Lebanon’s National Strategy for Forest Fire Management.

In an effort to expedite priority #4, the Council of Ministers approved an MOU between the Ministry of Environment and AFDC to develop and implement an action plan for forest fire prevention and landscape restoration (Decision 138 dated 27/10/2007). Working in collaboration with the World Conservation Union (IUCN), the AFDC released in May 2009 the long-awaited “Lebanon’s National Strategy for Forest Fire Management: Building Partnerships” --see participating agencies in box. The strategy builds on five pillars: (1) Research, information and analysis, (2) risk modification, (3) readiness and pre-suppression, (4) response and (5) recovery, post-fire management and rehabilitation.

The **National Strategy for Forest Fire Management** was produced in collaboration with the:

- Ministry of Environment
- Ministry of Interior & Municipalities
- Ministry of Agriculture
- Lebanese Civil Defense
- Lebanese Army

Friends of the Cedars of Bsharre Committee, a well-established organization based in north Lebanon and charged by the Ministry of Tourism to oversee and manage the ancient cedar grove of Bcharre (aka Arz el Rab, a World Heritage Site), has been implementing increasingly larger and bolder reforestation activities in the area. The organization today manages its own plant nursery (located in Bcharre) and transplants approximately 10,000-12,000 seedlings per year, mostly cedars, to restore the cedar mantle overlooking the Qadisha Valley (about 2,000-2,200 meters above sea level). Members of the organization who have participated in the program since the beginning report that survival rates have increased dramatically from as low as 10% when the program started in the 1990s to as high as 90% today. This increase was gradual and based on the results and lessons drawn during many years (e.g., site location and preparation, seedling size and age, irrigation regime, fencing to divert grazing

The **Committee received \$800,000 from a Lebanese-Mexican expat to:**

- a) Build a hill lake for harvesting snow-melt
- b) Install four kilometers of piping to channel water to reforestation sites
- c) Produce and transplant 50,000 seedlings with three years of aftercare
- d) Build a small, eco-friendly visitor center / outpost in the upper ranges of Bcharre

flocks during summer, and signage to warn snowmobiles during winter). The committee was able to scale up their activities thanks to a private donation from the Lebanese Diaspora – see box.

Animal Encounter is an educational center for wildlife conservation, the only one of its kind in Lebanon. The center was established in Aley in 1993 with the support of Greenline Association and then relocated to Ras el Jabal in 2000 to a 3,000-sqm land donated by the Municipality of Aley. It has more than 30 native animals in captivity (such as hyenas, jackals, foxes, jungle cats, and porcupines), receives about 20,000 students per year, and rehabilitates dozens of injured animals (mostly raptors). Its owner, a mammalogist by learning, is also member of the Lebanese Higher Council for Hunting. The Animal Encounter was registered as an NGO in 2000.

5.2 Protected Areas

Conservation activities inside protected areas have produced very encouraging results. The UNDP/GEF Protected Areas Project (PAP, 1995-2000) targeted only three of Lebanon's eight nature reserves. In those reserves (Al Shouf Cedars, Horsh Ehden and Palm Islands), strict conservation measures and uncouncted confrontations with hunters and shepherds has produced very desirable results at the ecosystem level. Natural regeneration in the Shouf Cedars and Horsh Ehden is phenomenal; ground vegetation has increased, wildlife populations are bouncing back and birds have found a sanctuary from hunters and shooters. The extent of this regeneration however is poorly documented as the management teams have so far not been able to build and sustain their ecological (flora/fauna) monitoring systems despite modest efforts during the PAP. A no-fishing zone around the Palm Island marine basin has no doubt helped restore fish stocks and lure larger species including dolphins and sea turtles. But, again, actual field data is missing to support these conclusions.

The Protected Areas Project helped boost conservation efforts in Lebanon and probably inspired other donors to also invest in Lebanon's protected areas and conservation activities. The largest contributions came from the Italian Cooperation (ROSS Program), the Agence Francaise pour le Développement (AFD) and the Global Environment Facility (GEF), as described next in **Section 5.3.2**. Meanwhile, Lebanon is also experiencing private sector interest in conservation management. The most striking and results-oriented initiative to date is located in Jabal Moussa. A private entrepreneur (and the CEO of one of Lebanon's four Portland cement factories) decided to protect Jabal Moussa from unwanted development and illegal encroachment. He lobbied the church to revoke several permits that it had issued to loggers, charcoal producers and shepherds; rented large swaths of land himself; and hired local rangers to patrol the mountain. He also hired a local team of experts in wildlife, forest, plants and ecotourism to draw a plan for managing the site and prepare the necessary documentation for PA designation. Within a record time, the "Association for the Protection of Jabal Moussa" was established and the site was proclaimed a Biosphere Reserve by UNESCO (February 2009) as well as an IBA by Birdlife International (April 2009). While it is doubtful that such an initiative can be replicated to other parts of Lebanon, it did bring Jabal Moussa to the forefront of forest and biodiversity conservation and thereby conserve an important wildlife habitat.

5.3 Current Donor Activities

5.3.1 USAID Activities

Current USAID investments are not directed at forest and biodiversity conservation. There are numerous projects that undertake tree planting activities in conjunction with other tasks. Municipalities receive grants that are in some instances used to plant trees; youth groups may also have field trips that provide direct encounters with nature's attributes, or a water treatment plant helps to clean municipal waste water before it is returned to a watercourse thus protecting not only human health downstream, but also other living plant and animal organisms. Other invests serve to provide assistance to small enterprises like ecotourism business that depend on, and build on, the necessity of a clean and healthy environment to attract clients and to make their businesses grow. **Annex L** provides additional detail of USAID's current investments.

5.3.2 Other Donor Activities

AFD is financing a €1.4 million program to develop and strengthen Lebanon's network of protected areas through the provision of financial, technical and administrative support (August 2008 – July 2011). In particular, the program is (1) supporting biodiversity conservation activities, (2) promoting social development in and around the reserves, (3) providing support to ecotourism activities, and (4) subsidizing the salaries of the management teams –for more information, visit <http://www.lnpas.org>.

The Italian, Spanish and French cooperation agencies are the most active donors in the sector that support forest and biodiversity conservation activities. The UNDP also has an active small grants program for NGOs and municipalities. Italian aid continues along the path of rehabilitation activities and assistance to protected areas. Spain and Italy were also both active in the National Forest Fire Management Strategy mentioned in Section 5.1.3 of this report. Additional details are noted in *Annex J*.

5.4 Assessment of the Effectiveness of Conservation Activities

5.4.1 National legislation policies and strategies

There are a fair number of laws and policies in place that if enforced and properly funded would most likely result in a significant improvement to the status quo of the environmental sector in Lebanon. The enforcement of the regulations related to forest fire management strategy is one case in point. Donors and the government have worked effectively together to adequately fund and implement this program. But in most cases manpower and funding are lacking from monitoring the fishing industry to understory cleaning in the pine forests. Existing laws also do little to encourage land and environmental stewardship, in fact there are more incentives to clear the land and in the process destroy the habitats than there is to preserve and protect the landscape. Urban growth everywhere is encouraged with very little regard to a sensible and rational zoning (and subsequently, planning) strategy.

There is no central body that plans, coordinates and oversees activities on the Lebanese landscape, even though a national master plan exists. No one ministry or departments within ministries are responsible for implementing it. Consequently, opportunities and activities that would greatly promote and enhance forest and biodiversity conservation are not undertaken, or if they are, are done so with no coordination and in a highly ineffective manner.

The Green Party of Lebanon, officially registered in 2008, has the potential to impact the environmental sector in Lebanon across non-confessional lines. It remains to be seen if it can be an effective lobby for implementing existing legislation, enacting new policies, and being an advocate and supporter for more sustainable natural resources management through the MOE, the MOA and in the municipalities.

5.4.2 NGO and municipal activities

NGOs and municipalities are the most effective implementers of conservation activities in the country. And they should be. They are where the action is. But they are constantly struggling with funding and manpower issues. They are also out competing directly for donor funds. Some are more successful than others, but in almost all cases, there is very little coordination among their activities which results in tremendous inefficiencies, conflicts and lost opportunities.

Tree planting is probably one of the most ubiquitous and glaring examples. The MoA, the MoE, NGOs, municipalities and the private sector (including individuals) all plant trees. Each of these entities operates their own tree nurseries to produce the seedlings. The government has a strict policy for planting native species. But, there is little control on seed sources/provenances and no coordination about who is planting what and where, nor is there much sharing of information about what is succeeding and what is not. Planting

trees is a very labor-intensive and ripe with photo opportunities for the politician or donor. What is not so glorious is the follow-on maintenance and post planting care that is an absolute necessity in the Lebanese environment. Proper care can ensure a 95% survival rate after three years; improper care can result in a 5-10% survival rate. A national strategy for tree planting, properly implemented, could move Lebanon in a significant direction in its reforestation effort. Without it, it will take much longer and cost substantially more.

5.4.3 Donor activities

In most circumstances, donors who are trying to make a difference in the green side of the environment sector bypass the government/ministry connection and work directly with NGOs and or municipalities in order to accomplish their tasks effectively. This not only saves transaction time, but quite often results in effective economies of scale as well. Yet as noted above, there is little coordination and even awareness among donors of what each of the others is doing. This in turn prevents an effective approach to (in this case) forest and biodiversity conservation activities, results in an inequitable distribution of investments and less environmental awareness among the Lebanese population.

6.0 PRIORITY CONSERVATION NEEDS AND ACTIONS NECESSARY TO CONSERVE LEBANON'S BIODIVERSITY AND FORESTS

Actions to reduce the direct threats to Lebanon's biodiversity and forests must be directed at political, institutional, economic, external, and social causes and drivers. The box shows the *general* types of actions Lebanon can undertake to address threats to its forests and biodiversity. Some of the donor and NGO activities discussed in **Section 5**, and others summarized in **Annex J**, address directly some of the actions needed. According to the analyses conducted for this assessment of current activities, interviews with government officials, NGOs, donors and the private sector a more extensive matrix of ideas/actions needed to address the four major threats identified in **Section 4** is presented in **Annex K**.

The actions framed in Annex K, and the subset of those actions congruent with USAID/Lebanon programming (described in the following section), all fit within the four broader actions identified as paramount in this assessment.

A strategic national plan is needed for the nation's forests, the oak and pine forests are especially at risk and actions are needed quickly to manage these resources with a long-term view. Coordinating reforestation efforts and making them more effective and strategic is part of this effort. It would involve the MoA, the MoE, municipalities, NGOs, the private sector and donors. It would be tied in directly to the Lebanon National Land Use Master Plan and have a fit with the Draft Protected Areas Strategy, the National Forest Fire Management Strategy, etc.

Stronger and rewarding incentives are needed for forest land stewardship by private and municipal owners to prevent fragmentation and preserve environmental services. The awareness of the importance of good stewardship, what it is, how it is best accomplished and what it means for the landowner needs to be a thorough national effort. It is also directly tied to a national forest plan.

The awareness of the importance of good stewardship, what it is, how it is best accomplished and what it means for the landowner needs to be a thorough national effort. It is also directly tied to a national forest plan.

The draft protected area strategy needs to be officially recognized and implemented and the national park currently outlined in the National Land Use Master Plan needs to become *a reality*. These actions would create Lebanon's only national park, ensure the conservation of critical habitats in the country and provide a solid link to global efforts for protected area management.

Finally, *indiscriminant shooting and illegal hunting of birds needs to be more effectively addressed*, and soon. A more personal level of awareness of the importance of birds in Lebanon's environment is needed. This is an integral part of raising a national consciousness about the environment.

Actions Needed, in General Terms

Political and institutional actions:

- Develop an adequate legal and policy framework (e.g., National Forest Program)
- Apply and enforce laws and regulations
- Improve/clarify access, rights, and tenure over land and natural resources

Economic actions:

- Increase positive incentives, or remove perverse incentives
- Improve capacity of planning for environmentally and socially sustainable development
- Improve business skills and capacity

Actions to address external pressures (or global forces):

- Maintain and strengthen national participation in global climate change and biodiversity treaties, negotiations, and mechanisms
- Develop adequate environmental safeguards for agricultural production for international markets (e.g., medicinal and aromatic plants)

Social actions:

- Improve social participation in environmental decision making through access to information, environmental communication, and education
- Change unsustainable practices and behaviors through public

7.0 EXTENT TO WHICH USAID/LEBANON'S CURRENT AND PLANNED ACTIONS MEET THE CONSERVATION NEEDS IDENTIFIED

7.1 Analysis of Current and Planned Program Activities

FAA Sections 118 and 119 require that this assessment discuss “the extent to which the actions proposed for support by the Agency meet the needs thus identified.” The degree to which the Assessment Team was able to address this question was based on the state of USAID/Lebanon’s strategy development, and the level of detail about the new strategy provided to the assessment team. Our review of country-wide conservation activities presents “good fit” opportunities to address the actions needed for the conservation of biodiversity and forests in Lebanon within each of USAID’s technical assistance areas. Past and current programming figures prominently in this analysis as does USAID’s existing partnerships with Lebanese ministries and other institutions (see *Annex L* for a tabular summary of current programming).

7.1.1 Extent to which the current activities meet identified needs

Most of USAID’s current actions, with one notable exception –see box on USAID/USFS partnership program, address the identified mitigation needs in indirect ways. This is not a negative comment on program and project activities, but only an observation that most of USAID/Lebanon’s current investments do not directly address the main threats to forests and biodiversity, nor did they intend to.

There are numerous other USAID investments that indirectly address habitat conversion/loss mainly through support to community/municipality-initiated tree planting efforts. Program funds help to support the purchase of seedlings, training for planting, and post-planting maintenance activities all across the country.

USAID also currently supports investments in costly municipal wastewater treatment plants. These facilities treat municipal effluent that if left untreated could harm downstream wildlife, fish and other elements of the aquatic ecosystems, in addition to the public health aspects these facilities were designed to protect. Dried sludge from these plants is also being explored as a possible soil additive that could reduce farmer dependence on chemical fertilizers.

USFS/USAID Partnership Program

The US Forest Service–USAID/Lebanon partnership activities approach the identified needs most directly, but programmatically, the results will not address the main threats. In the 2009 fiscal year, the USFS and USAID worked jointly with other partners to assist Lebanon in initiating the National Forest Fire Management Strategy (Peterson, 2009). Forest fires in Lebanon contribute substantially to forest cover loss and habitat degradation; both of which are threats to biodiversity. The USFS-USAID partnership has supported (through equipment, training, strategy development, etc.) actions that should prevent or limit such habitat conversion/loss in the future. (The USFS, a partner in Lebanon for many years, has supported programs that contributed to community-based natural resource management planning). The USFS-USAID partnership also contributes to climate change adaptations. Prevention of forest fires reduces carbon emissions, a key ingredient in global climate change.

7.1.2 Extent to which the proposed actions meet identified needs

USAID/Lebanon’s Draft Country Strategy 2009-2013 does not directly address conservation of biodiversity and forests, but it does provide numerous opportunities for actions that can be undertaken to address the root causes of the threats identified in this assessment. **Exhibit 6** provides a quick summary and a starting point for discussion of where these actions might be addressed in USAID’s Country Strategy and provides

examples of specific opportunities that can be linked to the priority actions outlined in *Section 6* and described in more detail in *Annex K*.

7.1.3 How likely/unlikely are planned activities and investments to adversely affect biodiversity and forests

The assessment team did not read or hear about plans for any USAID activities that would create threats to the forests or biodiversity of Lebanon. We are confident that the standard environmental compliance procedures that the Agency must follow (22 CFR 216) in the course of implementing programs will suffice to prevent any direct or indirect threats to forests and biodiversity.⁷ In our assessment of the limited information presented in the Draft Country Strategy and discussions with the Mission we see no planned activities or investments that will adversely affect biodiversity and forests. On the contrary, there are several programmatic areas outlined in the Draft Country Strategy 2009-2013 where investments will most likely have a *positive* impact on forest and biodiversity conservation in Lebanon, as explained next.

7.2 Opportunities for USAID to Support Biodiversity and Forest Conservation

7.2.1 Cross-cutting or cross-sectoral linkages with proposed activities

There are numerous opportunities for USAID Lebanon to address forest and biodiversity conservation under its new Country Strategy – most of these could be most effectively achieved through cross-sectoral linkages. As illustrated with the selected examples in **Exhibit 6**, Governance, laws, and policies could be addressed under IR 1.1 while at the same time linked to IR 2.4 which seeks to improve resource management. Likewise, the education objective, especially under IR 3.2 and linked to USAID’s experience with municipalities, there are opportunities to capitalize on Lebanon’s natural heritage and improve extra-curricular activities and awareness among its youth about the nation’s forests, its biodiversity and the ecological services they provide. Similar linkage opportunities exist (within I.R. 2.2, I.R. 3.2 and I.R. 4.2) for greater awareness of pollution effects on downstream wildlife and aquatic ecosystems. Reforestation activities under a structured national forest strategy can link I.R. 1.1, I.R. 1.3 and I.R.2.4 and also offer job creation opportunities country-wide. And, under assistance geared toward economic growth (I.R. 2.1 and I.R. 2.2) there are options for improving capacities of businesses in the tourism sector about the importance of healthy forests and biodiversity.

7.2.2 Gaps where USAID could best leverage funds

USAID’s wealth of experiences around the globe can help leverage additional opportunities in Lebanon. Its partnership with the USFS is especially well-placed and as a next step beyond its forest fire management assistance it should help examine practical ways to prevent fires. A strategy and action plan with the Italians, Spanish and FAO, working together with the MoA (and the MoE) is needed to give greater incentive to private land owners and municipalities to be better land stewards. Behavior changes and legislation are needed to insure that municipal lands are zoned to protect green space and that it is more favorable for landowners to maintain tree cover rather than exploit it for other purposes.

National focus is apt to remain on the cedars. But with the protection tools now in place, these habitats are the least threatened. The oak-pine forests, which are now the most extensive, are the most threatened. There is a growing gap in their conservation and management and USAID through its new Country Strategy could work with other donors who have experience in this type of forests to leverage opportunities and funds.

⁷ http://www.usaid.gov/our_work/environment/compliance/22cfr216.htm

Exhibit 6. CAS Opportunities for USAID Lebanon in Forest and Biodiversity Conservation

A.O.	Intermediate Result (IR)/Sub-IR ¹	Opportunities to Address Conservation Needs
A.O. 1	IR 1.1 National Governing Institutions Strengthened	<ul style="list-style-type: none"> • Work with MoA and MoE to make existing forest and conservations laws, policies and standards more effective; working with other partners and government agencies, seek a national forest strategy, one that also promotes green jobs and improves job security in the environmental sector
Targeted Governing Institutions and Civil Society Organizations are More Responsive to Lebanese Citizens	IR 1.1.1 Enhanced Policy Processes in the Executive Branch	
	IR 1.1.2 Increased Legislative Capacity	<ul style="list-style-type: none"> • Assist the judiciary to review and enforce fines levied against violators (for marine and terrestrial resources)
	IR 1.2 Competitive Elections Contribute to Consensus Policies	None likely
	IR 1.2.1 Free and Fair Elections Contribute to Consensus Policies	
	IR 1.3 Government Services Provided Effectively and Transparently	<ul style="list-style-type: none"> • Continue work with municipalities and encourage more decision-making and responsibilities at that level; seek to promote sustainable economic uses for municipal forests & associated biodiversity habitats
	IR 1.3.1 Increased Government Responsiveness to Citizens at the Local Level	<ul style="list-style-type: none"> • Work for greater/better stewardship by forest landowners (municipal, private and church lands)
	IR 1.3.2 Increased Access to Effective and fair Sector Institutions	
	IR 1.4 Engaged on Reforms that Serve the National Interest	<ul style="list-style-type: none"> • Engage youth and civic organizations on designing/implementing awareness campaigns on national forest fire management strategy, etc
	IR 1.4.1 CSOs are Sustainable Institutions	<ul style="list-style-type: none"> • Draw on previous experiences with outreach by CHF, OTI, AFDC & others where focus may be on addressing main threats to forests and biodiversity; link with municipal programs as well.
IR 1.4.2 CSOs Effectively Advocate and Monitor at national and Local Level		
A.O 2	IR 2.1 Selected Value Chain Efficiency Improved	<ul style="list-style-type: none"> • Establish stronger/more active links with eco-tourism activities to promote awareness of threats due to habitat conversion/loss
Incomes and Jobs Increased	IR 2.1.1 Access to Markets Improved	<ul style="list-style-type: none"> • Improve capacities of Lebanese tour operators to inform clientele of importance of healthy forests and biodiversity
	IR 2.1.2 Competitiveness Improved	
	IR 2.1.3 Business Linkages Developed	
	IR 2.2 Business Enabling Environment Improved	<ul style="list-style-type: none"> • Promote the improvement of advocacy capacity and transparent regulations and procedures (such as those related to hunting) and work to engage the private sector (hunting equipment dealers), civil society (conservationists) and local governments (municipalities)
	IR 2.2.1 Advocacy Capacity for Private, Civil Society and Local Governments Improved	
	IR 2.2.2 Laws Regulations and Procedures Relevant to Economic Growth and Trade Improved	

	IR 2.3 Access to Credit Increased	
	IR2.3.1 Barriers to Bank Credit Access Removed	None likely
	IR 2.3.2 Liquidity of MFIs Increased	
	IR 2.4 Management of Forest Resources Improved	<ul style="list-style-type: none"> • Continue with USFS partnership & forest fire management/prevention; • Work with other donors & NGOs to help develop a national forest management (including reforestation) strategy; build a network of coordinated tree nurseries to boost capacity and species diversity; improve survival rates of seedlings by ensuring adequate aftercare;
	IR 2.4.1 Forest Regeneration and Conservation is Increased	<ul style="list-style-type: none"> • Tap carbon credit schemes thru reforestation; • Work with municipalities and youth to focus on forest cleaning and forest owner stewardship incentives
	IR 2.4.2 Income Generation and Motivation for Civic Activities Improved for Youth	
A.O. 3	IR 3.1 Improved Teacher and Administrator Performance in the Public School System	None likely
Student Achievements Improved	IR 3.1.1 Pre-Service Training Improved	
	IR 3.1.2 In-Service Training Improved	
	IR 3.2 Learning Environments Improved	<ul style="list-style-type: none"> • Work to substantially improve extra-curricular activities by promoting nature trips to educate youth about Lebanon’s forests, biodiversity and habitats. Use nature destinations such as protected areas, the Lebanon Mountain Trail, Animal Encounter, IBAs, UNESCO sites, etc.
	IR 3.2.1 Physical Repairs Provided to Schools	<ul style="list-style-type: none"> • Help establish small-scale wildlife and rehabilitation centers in the North and South to address perceived conflicts between people and wildlife.
	IR 3.2.2 Instructional Environments in Schools Improved	
	IR 3.2.3 Educational Environments Improved through Parent and Community Participation in School Governance and Management	
	IR 3.3 Scholarship Assistance Provided	<ul style="list-style-type: none"> • Assist to address gaps in technical professions related to forests (forestry, plant taxonomy, biological monitoring, etc.)
A.O. 4	IR 4.1 More Efficient, Equitable and Sustainable Water Management	<ul style="list-style-type: none"> • Promote greater awareness about pollution prevention; and about the adverse impacts of uncontrolled groundwater pumping; and about the effects of drawdown on seawater intrusion in coastal areas.
Improved Water Services and Increased	IR 4.1.1 Improved Capacity of Sub-National Water Institutions	
	IR 4.1.2 Increased Stakeholder Involvement	
	IR 4.1.2.1 Increased Public Awareness	
	IR 4.1.2.2 Strengthened Water User Groups	

	IR 4.2 Improved Water Supply and Sanitation Infrastructure	<ul style="list-style-type: none"> • Promote greater awareness about pollution prevention and water saving devices (including practices) • Demonstrate compliance with effluent and sludge standards; launch a policy dialogue on water reuse standards; and address the widespread practice of raw sewage water in irrigation
	IR 4.3 Strengthened Water Governance	None likely

¹ USAID/Lebanon, 2009. Draft Country Strategy

8.0 CONCLUSIONS

Despite mounting pressures on forests and biodiversity, Lebanon has recorded several milestone achievements in the period since the last assessment was published in 2002, namely (in chronological order):

1. Lebanese Parliament approved the long-awaited **Environment Framework Law** (Law 444/2002);
2. The **Green Party of Lebanon**, which represents a visible environmental consciousness, was officially registered and started operating in 2008 –it now counts more than 800 members;
3. The 440-km **Lebanon Mountain Trail** was launched in April 2008, offering novel opportunities for natural and cultural heritage conservation and rural livelihoods. While the **Lebanon Mountain Trail Association** was officially registered as an NGO in October 2007, the LMT still needs official government recognition and protection. This will require a concerted effort by dozens of municipalities and government agencies, as well as grassroots support, to protect the trail corridor from unwanted activities and developments over the long-term;
4. UNESCO designated Jabal el Rihane and Jabal Moussa as two new **Biosphere Reserves** in Lebanon (bringing the total number to three);
5. CDR prepared the “**National Land Use Master Plan**” (2002-2005) and the Council of Ministers recently approved the plan (Decree 2366/2009);
6. The Council of Ministers approved the long-awaited **restructuring of MoE** --proposed in 2001 (Decree 2275/2009);
7. AFDC in collaboration with the five national agencies produced Lebanon’s first **National Strategy for Forest Fire Management** (May 2009)
8. Parliament approved the new **Hunting Law** (Law no. 580/2009) with opportunities to reconcile game management with wildlife conservation

Each of these achievements represents giant steps in raising the environmental consciousness of Lebanon and there is a growing awareness among the Lebanese population of the importance of its “green heritage”. But forests and biodiversity remain very much at risk in the country. This assessment has shown that in spite of numerous actions by government, municipalities, donors, NGOs and the private sector, there is very little coordination and communication among the conservation activities on the ground.

The lack of a clear forest strategy means the actions are not only inefficient, but they may also be in conflict. At the protected area level there are earnest attempts at standardizing management, while an on-going effort to have a national approach and strategy on these landscapes is, for the moment, stymied. These two facts alone put biodiversity and forests in significant jeopardy.

Thanks to the new National Strategy for Forest Fire Management, municipal and private forested lands, especially those in the pine-oak zone that are most prone to forest fires, are now more apt to receive competent attention if a fire does break out. But the root causes of forest fire threats and the habitat destruction they cause remain. Current laws that are inadequately enforced, the lack of a cohesive and regulated land management policy, and disincentives for landowner stewardship mean that the fires will continue.

The same gaps exist in the policies and enforcement for coastal and marine resources. Greater efforts to develop and implement transparent and enforceable strategies are sorely needed to secure Lebanon’s forest and biological diversity.

RESOURCES CONSULTED

Documents, Reports, Articles, Special Communications

Al Shouf Cedar Society. 2008. Al-Shouf Cedar Nature Reserve Eco-Guide, Western Side. Simkanieh (Lebanon). ACS. 55p. +annex.

Anonymous. 2007. Draft agreement for the disposal of wastewater sludge from the proposed Aitanit/Qaraoun Waste Water Treatment Plant to the Zahle landfill. Lebanon Small Village Waste Water Treatment Systems Project. 2p.

Anonymous. n.d. Ordinance on the use and disposal of sewage sludge. Beirut, Ministry of Environment. 12p.

Antill, M. 2009. Small Village Waste Water Treatment Systems – Internal Memorandum. Beirut, CDM Constructors, Inc. 8p.

Associates in Rural Development. 2005. Tropical Forestry and Biodiversity (FAA 118 and 119) Analyses: Lessons Learned and Best Practices from Recent USAID Experience. USAID. Bureau for Economic Growth, Agriculture and Trade, Office of Environment and Natural Resources. PN-ADE-195. 74p.

Association for Forests, Development and Conservation. 2007. State of Lebanon's Forests. Beirut. 128 p.

Cantwell, L. n.d. *Historic Trees of Lebanon*. Beirut, Chemaly & Chemaly, s.a.l. 106p.

Carter, T., L. Dunston, and A. Thomas. 2008. *Syria and Lebanon*. Oakland (CA), Lonely Planet. 436p.

Chemonics International, Inc. 2005. Best Practices for Biodiversity and Tropical Forestry Assessments. USAID. Bureau for Economic Growth, Agriculture and Trade, Office of Agriculture. PN-ADE-673. 28p.

Conseil du Développement et de la Reconstruction (CDR)-Liban. 2004. Schéma Directeur d'Aménagement du Territoire Libanais—Rapport Final. IAURIF/DAR. Var. pg.

ECODIT, Inc. 2008. A Guide to the LMT (Lebanon Mountain Trail). Beirut, Dar el Kotob. 104p.

ECODIT Liban. 2006. National Action Plan for Protected Areas, Final Report (a component of SISAM, a program funded by EC-Life Third Countries). Beirut, Lebanon Ministry of Environment. 44p +annexes.

ECODIT, Inc. 2002. Conservation of Forests and Biological Diversity in Lebanon, FAA 118/119 Report. Prepared for USAID under Task Order No. LAG-I-00-99-00017-00. 65p.

Food and Agriculture Organization of the United Nations (FAO). 2005. Global Forest Resources Assessment Country Report – Lebanon. FRA2005/059. Rome. FAO. 34p.

GEOprojects. 2008. Lebanon (map), 1:200,000. Arab World Map Library. Beirut.

Guadagnoli, G. 2009. Hermel – Rich in Resources and Marginalized – A Survey of Social and Economic Establishments in Five Municipalities. Beirut, ARCS and Association Mada. 40p.

Hani, N. and W. Abdou Daher. 2005. Biodiversity – Al-Shouf Cedar Nature Reserve. Beirut, Al-Shouf Cedar

Society. 160p.

Houri, A. and N.M. Hourri. 2008. *Photographic Guide to Wild Flowers of Lebanon, Vol II*. Beirut, Association for Forest Development and Conservation and Hanns Seidel Stiftung. 424 p.

Medail, F. and O. Quezel. 1997. Hot-spots analysis for conservation of plant biodiversity in the Mediterranean Basin. *Annals of the Missouri Botanical Garden* 84":112-117.

Merhebi, F. 2005. Sludge Management Master Plan Study for Lebanon. *Unpublished memorandum* on study conducted by Tecslut International, Ltd and KREDO Consulting Engineers. 6p.

METAP (Mediterranean Environmental Technical Assistance Program). 1995. Lebanon: Assessment of the State of the Environment for the Ministry of the Environment, Final report. EU/EIB/WB/UNDP. (Prepared by Environmental Resources management).

Ministry of Agriculture-Lebanon. 1996. Biological Diversity of Lebanon – Country Study Report. UNDP, Project GF/6105-92-72. Publication No. 9. 255p.

Ministry of Environment-Lebanon. 2009. Fourth National Report of Lebanon to the Convention on Biological Diversity. MoE/GEF/UNDP 2009.

Ministry of Environment-Lebanon. 2007. National Reforestation Programme Brief. Beirut. MoE. 3p.

Ministry of Environment/ECODIT. 2002. Lebanon State of the Environment Report, 2001. Prepared for the Ministry of Environment by ECODIT-Liban. 246p.

Mitri, G. 2009. Lebanon's Strategy for Forest Fire Management. Ministry of Environment-Lebanon/AFDC/IUCN.

Mittermeier, R.N., N. Meyers, P.R. Gil, and C.G.Mittermeier. 2000. Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Eco-Regions. Conservation International, Washington, DC and CEMEX, Mexico.

Mouchref, A. 2008. Forgotten Akkar – Socio-Economic Reality of the Akkar Region. Beirut, Association Mada with Handicap International, UNDP and EC. 32p.

Pagliani, M. 2008. Land of Cedars Programme Portfolio, Final Draft. Simkanieh (Lebanon). Al Shouf Cedar Society. 59p.

Peterson, J. 2009. USFS-USAID Lebanon Partnership FY2009 Activity Report Summary. Washington, DC. US Forest Service International Programs. 10p.

Ramadan-Jaradi, G. 2007. Revised checklist of the birds of Lebanon, 1999-2007. *Sandgrouse* 30(1):22-69.

Tohmé, G. and H. Tohmé. 2002. *A Thousand and One Flowers of Lebanon*. Beirut, Lebanese University. 309p

United States Agency for International Development-Lebanon. 2009. Country Strategy 2009-2013. (Edited DRAFT 30 Sept 2009) Beirut. 36p

United States Agency for International Development. 2005. Biodiversity Conservation – A Guide for USAID Staff and Partners. USAID. Bureau for Economic Growth, Agriculture and Trade, Office of Environment and Natural Resources. PN-ADE-258. 197p.

Websites

Agrobiodiversity and crop wild relatives. 2009. Accessed October 2009.

<http://www.diversitas-international.org/docs/secretariat/agroBIODIVERSITY%20symposium/Casas%20et%20al%20-%20conservation%20and%20sustainable%20use%20of%20crop%20wild%20relatives.pdf>

Agrobiodiversity in Lebanon. 2009, Accessed October 2009.

<http://www.undp.org.lb/programme/environment/newsletters/agro/AgroIssue2English.pdf>

<http://www.undp.org.lb/programme/environment/newsletters/agro/AgroIssue3English.pdf>

<http://www.undp.org.lb/programme/environment/newsletters/agro/AgroIssue7English.pdf>

<http://www.icarda.org/Publications/HarvestofResearch/WARP.pdf>

Al-Shouf Cedar Reserve. 2009. Accessed October 2009.

<http://www.shoufcedar.org>

American University of Beirut. 2009. Accessed October 2009.

<http://www.aub.edu.lb>

Association of Friends of the Cedar Forest. 2009. Accessed October 2009.

<http://www.cedarfriends.org>

Beyond Beirut. 2009. Accessed October 2009.

http://lebanon.usembassy.gov/latest_embassy_news/09pressreleases/praid061809.html

<http://www.beyondbeirut.com/>

Birdlife International. 2009. Accessed October 2009

<http://www.birdlife.org/worldwide/national/lebanon/index.html>

CHF-Lebanon. 2009. Accessed October 2009.

<http://www.chflebanon.org>

Convention on Biodiversity-Lebanon. 2009. Accessed September-October 2009

<http://www.cbd.int/countries/?country=lb>

Climate change, general. 2009. Accessed September-October 2009

<http://unfccc.int/2860.php>

http://www.fs.fed.us/global/topic/climate_change/welcome.htm

<http://www.gofc-gold.uni-jena.de/redd/index.php>

Environmental Fund (GTZ) for Lebanon. 2009. Accessed October 2009.

<http://www.efl.cdr.gov.lb>

Horsh Ehden Nature Reserve. 2009. Accessed October 2009

<http://www.horschedhen.org>

Italian Development Cooperation

<http://www.cooperazioneallosviluppo.esteri.it/pdgcs/inglese/intro.html>

<http://www.cooperazioneallosviluppo.esteri.it/pdgcs/italiano/iniziative/Paese.asp?id=101>

Lebanon cedar (*Cedrus libani*). 2009. Accessed October 2009

http://www.blueplanetbiomes.org/lebanon_cedar.htm

<http://www.2020site.org/trees/lebanon.html>
<http://almashriq.hiof.no/lebanon/300/360/363/363.7/cedars2.html>
<http://alumni.cecs.berkeley.edu/~dany/lebanon/Cedars/cedar2.txt>

Lebanon environment-general. 2009. Accessed September-October 2009
<http://www.lebweb.com/dir/lebanon-environment>
<http://www.fao.org/countryprofiles/index.asp?lang=en&iso3=LBN&subj=5>
<http://www.jeitagrotto.com>

Lebanese Network of Protected Areas. 2009. Accessed October 2009
<http://www.lnpas.org>

Lebanon Ministry of the Environment. 2009. Accessed September 2009.
<http://www.biodiversity.moe.gov.lb>

Lebanon Mountain Trail Association. 2009. Accessed September 2009
<http://www.lebanontrail.org>

Municipalité de Zgharta-Ehden. 2009. Accessed October 2009
<http://www.zgharta.gov.lb>

Nature Conservation Center for Sustainable Futures. 2009. Accessed October 2009
<http://www.ibsar.org>

St. Joseph University, Beirut, Lebanon. 2009, Accessed October 2009
<http://www.usj.edu.lb/en/index.html>

Society for the Protection of Nature in Lebanon. 2009. October 2009.
<http://www.spnl.org/spnl.php>

United Nations Development Programme-Lebanon. 2009. Accessed October 2009
<http://www.undp.org.lb/>
<http://www.undp.org.lb/ProjectFactSheet/index.cfm>
<http://www.undp.org.lb/ProjectFactSheet/projectDetail.cfm?projectId=133>

United Nations Food and Agriculture Organization (FAO)-Lebanon Data. 2009. Accessed October 2009
http://earthtrends.wri.org/pdf_library/country_profiles/wat_cou_422.pdf
<http://www.fao.org/nr/water/aquastat/countries/lebanon/index.stm>

United States Agency for International Development environmental compliance. 2009. Accessed October 2009
http://www.usaid.gov/our_work/environment/compliance/22cfr216.htm

United States Agency for International Development (USAID) biodiversity and conservation development documents. Accessed September-October 2009.
http://pdf.usaid.gov/pdf_docs/Pnade195.pdf
http://pdf.usaid.gov/pdf_docs/PNADE258.pdf
http://pdf.usaid.gov/pdf_docs/PNADE673.pdf

USAID Lebanon. 2009, Accessed September-October 2009.
<http://www.usaid.gov/lb/>
<http://www.usaid.gov/lb/programs/environment.html>

United States Forest Service International Programs. 2009. Accessed September-October 2009.

<http://www.fs.fed.us/global/>

<http://www.fs.fed.us/global/globe/mideast/welcome.htm#3c>

http://www.fs.fed.us/global/topic/climate_change/welcome.htm

<http://www.fs.fed.us/global/is/ispam/>

World Vision Lebanon. 2009. Not accessed in October 2009. Site under reconstruction.

<http://worldvision.org.lb>

Annex A – Foreign Assistance Act, Sections 118 and 119

Part I, Section 118\73\ - Tropical Forests

(a) Importance of Forests and Tree Cover.--In enacting section 103(b)(3) of this Act the Congress recognized the importance of forests and tree cover to the developing countries. The Congress is particularly concerned about the continuing and accelerating alteration, destruction, and loss of tropical forests in developing countries, which pose a serious threat to development and the environment. Tropical forest destruction and loss--

(1) result in shortages of wood, especially wood for fuel; loss of biologically productive wetlands; siltation of lakes, reservoirs, and irrigation systems; floods; destruction of indigenous peoples; extinction of plant and animal species; reduced capacity for food production; and loss of genetic resources; and

(2) can result in desertification and destabilization of the earth's climate. Properly managed tropical forests provide a sustained flow of resources essential to the economic growth of developing countries, as well as genetic resources of value to developed and developing countries alike.

(b) Priorities.--The concerns expressed in subsection (a) and the recommendations of the United States Interagency Task Force on Tropical Forests shall be given high priority by the President--

(1) in formulating and carrying out programs and policies with respect to developing countries, including those relating to bilateral and multilateral assistance and those relating to private sector activities; and

(2) in seeking opportunities to coordinate public and private development and investment activities which affect forests in developing countries.

(c) Assistance to Developing Countries.--In providing assistance to developing countries, the President shall do the following:

(1) Place a high priority on conservation and sustainable management of tropical forests.

(2) To the fullest extent feasible, engage in dialogues and exchanges of information with recipient countries--

(A) which stress the importance of conserving and sustainably managing forest resources for the long-term economic benefit of those countries, as well as the irreversible losses associated with forest destruction, and

(B) which identify and focus on policies of those countries which directly or indirectly contribute to deforestation.

(3) To the fullest extent feasible, support projects and activities--

(A) which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and

(B) which help developing countries identify and implement alternatives to colonizing forested areas.

(4) To the fullest extent feasible, support training programs, educational efforts, and the establishment or strengthening of institutions which increase the capacity of developing countries to formulate forest policies, engage in relevant land-use planning, and otherwise improve the management of their forests.

(5) To the fullest extent feasible, help end destructive slash-and-burn agriculture by supporting stable and productive farming practices in areas already cleared or degraded and on lands which inevitably will be settled, with special emphasis on demonstrating the feasibility of agroforestry and other techniques which use technologies and methods suited to the local environment and traditional agricultural techniques and feature close consultation with and involvement of local people.

(6) To the fullest extent feasible, help conserve forests which have not yet been degraded, by helping to increase production on lands already cleared or degraded through support of reforestation, fuelwood, and other sustainable forestry projects and practices, making sure that local people are involved at all stages of project design and implementation.

(7) To the fullest extent feasible, support projects and other activities to conserve forested watersheds and rehabilitate those which have been deforested, making sure that local people are involved at all stages of project design and implementation.

(8) To the fullest extent feasible, support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing, including reforestation, soil conservation, and other activities to rehabilitate degraded forest lands.

(9) To the fullest extent feasible, support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation, including research in agroforestry, sustainable management of natural forests, small-scale farms and gardens, small-scale animal husbandry, wider application of adopted traditional practices, and suitable crops and crop combinations.

(10) To the fullest extent feasible, conserve biological diversity in forest areas by--

(A) supporting and cooperating with United States Government agencies, other donors (both bilateral and multilateral), and other appropriate governmental, intergovernmental, and nongovernmental organizations in efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis;

(B) whenever appropriate, making the establishment of protected areas a condition of support for activities involving forest clearance or degradation; and

(C) helping developing countries identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas.

(11) To the fullest extent feasible, engage in efforts to increase the awareness of United States Government agencies and other donors, both bilateral and multilateral, of the immediate and long-term value of tropical forests.

(12) To the fullest extent feasible, utilize the resources and abilities of all relevant United States Government agencies.

(13) Require that any program or project under this chapter significantly affecting tropical forests (including projects involving the planting of exotic plant species)--

(A) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land, and

(B) take full account of the environmental impacts of the proposed activities on biological diversity, as provided for in the environmental procedures of the Agency for International Development.

(14) Deny assistance under this chapter for--

(A) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner which minimizes forest destruction and that the proposed activity will produce positive economic benefits and sustainable forest management systems; and

(B) actions which significantly degrade national parks or similar protected areas which contain tropical forests or introduce exotic plants or animals into such areas.

(15) Deny assistance under this chapter for the following activities unless an environmental assessment indicates that the proposed activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development:

(A) Activities which would result in the conversion of forest lands to the rearing of livestock.

(B) The construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undegraded forest lands.

(C) The colonization of forest lands.

(D) The construction of dams or other water control structures which flood relatively undegraded forest lands.

(d) PVOs and Other Nongovernmental Organizations.--Whenever feasible, the President shall accomplish the objectives of this section through projects managed by private and voluntary organizations or international, regional, or national nongovernmental organizations which are active in the region or country where the project is located.

(e) Country Analysis Requirements.--Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of-

(1) the actions necessary in that country to achieve conservation and sustainable management of tropical forests, and

(2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

(f) Annual Report.--Each annual report required by section 634(a) of this Act shall include a report on the implementation of this section.

Part I, Section 119\75\ - Endangered Species

(a) The Congress finds the survival of many animal and plant species is endangered by overhunting, by the presence of toxic chemicals in water, air and soil, and by the destruction of habitats. The Congress further finds that the extinction of animal and plant species is an irreparable loss with potentially serious environmental and economic consequences for developing and developed countries alike. Accordingly, the preservation of animal and plant species through the regulation of the hunting and trade in endangered species, through limitations on the pollution of natural ecosystems, and through the protection of wildlife habitats should be an important objective of the United States development assistance.

\75\ 22 U.S.C. 2151q. Sec. 119, pars. (a) and (b) were added by sec. 702 of the International Environment Protection Act of 1983 (title VII of the Department of State Authorization Act, Fiscal Years 1984 and 1985, Public Law 98-164; 97 Stat. 1045).

(b) \75\ In order to preserve biological diversity, the President is authorized to furnish assistance under this part, notwithstanding section 660,\76\ to assist countries in protecting and maintaining wildlife habitats and in developing sound wildlife management and plant conservation programs. Special efforts should be made to establish and maintain wildlife sanctuaries, reserves, and parks; to enact and enforce anti-poaching measures; and to identify, study, and catalog animal and plant species, especially in tropical environments.

\76\ Section 533(d)(4)(A) of the Foreign Operations, Export Financing, and Related Programs Appropriations Act, 1990 (Public Law 101-167; 103 Stat. 1227), added ``notwithstanding section 660" at this point.

(c) \77\ Funding Level.--For fiscal year 1987, not less than \$2,500,000 of the funds available to carry out this part (excluding funds made available to carry out section 104(c)(2), relating to the Child Survival Fund) shall be allocated for assistance pursuant to subsection (b) for activities which were not funded prior to fiscal year 1987. In addition, the Agency for International Development shall, to the fullest extent possible, continue and increase assistance pursuant to subsection (b) for activities for which assistance was provided in fiscal years prior to fiscal year 1987.

\77\ Pars. (c) through (h) were added by sec. 302 of Public Law 99- 529 (100 Stat. 3017).

(d) \77\ Country Analysis Requirements.--Each country development strategy statement or other country plan prepared by the Agency for International Development shall include an analysis of-

(1) the actions necessary in that country to conserve biological diversity, and

(2) the extent to which the actions proposed for support by the Agency meet the needs thus identified.

(e) \77\ Local Involvement.--To the fullest extent possible, projects supported under this section shall include close consultation with and involvement of local people at all stages of design and implementation.

(f) \77\ PVOs and Other Nongovernmental Organizations.-- Whenever feasible, the objectives of this section shall be accomplished through projects managed by appropriate private and voluntary organizations, or international, regional, or national nongovernmental organizations, which are active in the region or country where the project is located.

(g) \77\ Actions by AID.--The Administrator of the Agency for International Development shall--(1) cooperate with appropriate international organizations, both governmental and nongovernmental;

(2) look to the World Conservation Strategy as an overall guide for actions to conserve biological diversity;

(3) engage in dialogues and exchanges of information with recipient countries which stress the importance of conserving biological diversity for the long-term economic benefit of those countries and which identify and focus on policies of those countries which directly or indirectly contribute to loss of biological diversity;

(4) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity;

(5) whenever possible, enter into long-term agreements in which the recipient country agrees to protect ecosystems or other wildlife habitats recommended for protection by relevant governmental or nongovernmental organizations or as a result of activities undertaken pursuant to paragraph

(6), and the United States agrees to provide, subject to obtaining the necessary appropriations, additional assistance necessary for the establishment and maintenance of such protected areas;

(6) support, as necessary and in cooperation with the appropriate governmental and nongovernmental organizations, efforts to identify and survey ecosystems in recipient countries worthy of protection;

(7) cooperate with and support the relevant efforts of other agencies of the United States Government, including the United States Fish and Wildlife Service, the National Park Service, the Forest Service, and the Peace Corps;

(8) review the Agency's environmental regulations and revise them as necessary to ensure that ongoing and proposed actions by the Agency do not inadvertently endanger wildlife species or their critical habitats, harm protected areas, or have other adverse impacts on biological diversity (and shall report to the Congress within a year after the date of enactment of this paragraph on the actions taken pursuant to this paragraph);

(9) ensure that environmental profiles sponsored by the Agency include information needed for conservation of biological diversity; and

(10) deny any direct or indirect assistance under this chapter for actions which significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas.

(h) \77\ Annual Reports.--Each annual report required by section 634(a) of this Act shall include, in a separate volume, a report on the implementation of this section.

Annex B – ECODIT’s Scope of Work

The contractor shall perform the following activities while undertaking the biodiversity assessment:

- A) Undertake meetings with the Mission Director and Mission Environmental Officer (MEO) in Beirut, Lebanon to ensure full understanding of the mission’s program, USAID environmental procedures, and the goals and purpose of this assignment.
- B) Present brief work plan including clear schedule following one week of project start up.
- C) Field a team to conduct an overview and general analysis of Lebanon’s forest resources and biodiversity conservation efforts and the current status of these resources. The analysis should include a review of current policy and governance systems affecting forests and biodiversity conservation and management. The documentation should include descriptions of:
 - a. Major ecosystem types highlighting important, unique aspects of the country’s
 - b. Biodiversity, including important endemic species and their habitats.
 - c. Natural areas of particular importance to biodiversity conservation, such as key Wetlands, remaining old-growth forests or coastal areas critical for species reproduction, feeding or migration, if relevant.
 - d. Plant and animal species which are endangered or threatened with extinction. Endangered species of particular social, economic or environmental importance should be highlighted and described, as should their habitats. An updated list, such as the International Union for the Conservancy of Nature (IUCN) red list should be included as an annex.
 - e. Current and potential future threats to biodiversity and forest conservation, including a general assessment of overall health of ecosystems, and major factors affecting ecosystem health, such as land use, pests, and/or contamination, etc. or major institutional or policy failures or trans-boundary issues as appropriate.
 - f. Conservation efforts including national policies and strategies, the status of financing for conservation, the status of country participation in major international treaties, the country’s protected area system, and botanical gardens/gene banks (if relevant) and their status, and monitoring systems. This section should also include recent, current and planned activities by donor organizations which support biodiversity conservation, an identification of NGO’s, universities, and other local organizations involved in conservation, and a general description of responsible government agencies.
 - g. A general assessment of the effectiveness of these policies, institutions and activities to achieve biodiversity conservation should be included. Priority conservation needs which lack donor or local support should be highlighted. USAID/Lebanon’s program in general and, if relevant, 1) any perceived potential areas of concern related to biodiversity impacts with current or planned program activities, or 2) any potential opportunities for USAID/Lebanon to support biodiversity conservation consistent with mission program objectives.
- D) Prepare a report, which incorporates the points above, on the status of biodiversity and conservation efforts and implications for USAID/Lebanon programming as required under FAA Section 119 (and, as appropriate, Section 118).

Annex C – Biographical Sketches of the Assessment Team

A. Key Personnel

Team Leader / Forest Specialist – Steven Dennison

Dr. Steven Dennison is a natural resource specialist with excellent leadership and communication skills who has extensive experience leading teams in the design, management, and evaluation of natural resources and environmental activities. Dr. Dennison's professional career spans 30 years and includes long-term and short-term assignments in Central and Eastern Europe, Asia, Africa, the US, the Caribbean, and North America. He has served as Team Leader for **five** Environmental Threats and Opportunities Analyses / FAA Sections 118 and 119 Assessments, and has contributed to numerous others. Dr. Dennison has also successfully led teams in conducting large program/project evaluations and assessments for USAID. In addition, he has worked on a variety of USAID-funded biodiversity conservation, natural resource management, and economic growth activities. He is very well-organized, possesses excellent oral and written communication skills, and is a highly effective team leader. He is fluent in French.

Natural Resources, Institutional / Policy Specialist – Karim El-Jisr

Mr. El-Jisr is an agricultural engineer and environmental management specialist with 12 years of experience in environmental assessment, natural resources management, environmental monitoring and evaluation, and local development. He was the Deputy COP of the 27-month, \$3.3 Million USAID-funded Lebanon Mountain Trail project. He managed several environmental projects in the Middle East and North Africa, and has provided long-term institutional strengthening support to Lebanon's Ministry of Environment since 2000. In particular, he managed the preparation of the Lebanon 2001 State of the Environment Report (published in 2002) and the National Action Plan for Protected Areas in Lebanon (completed in 2005); participated in the design of a National Land Use Master Plan for Lebanon in the areas of nature conservation and protected areas; and conducted several EIAs of tourism development, post-war reconstruction and fisheries in Lebanon. Mr. El-Jisr also participated in the preparation of the last 118/119 report for USAID Lebanon. He is intimately familiar with Lebanon's institutions, government agencies and donors, and has a thorough understanding of national and local policies affecting land use, natural resources and biodiversity. Mr. El-Jisr joined ECODIT Liban in 2000 and is now its Director; he is fluent in Arabic, English and French.

B. Other Technical Expertise

Faisal Abu-Izzeddin – Biodiversity Specialist

Mr. Abu-Izzeddin has more than 25 years of experience with a number of international organizations such as UNDP, GEF, UNEP, UNESCO, UNOPS, FAO, ESCWA, IUCN, USAID, and ECODIT. He has worked in more than a dozen countries, mostly in the Middle East where his experience has focused on a range of conservation and biodiversity issues in the form of consultancy services, project management, and field work. He helped establish and manage several protected areas in the Middle East and developed protected area management plans and training programs in Lebanon, Syria, Bahrain, and Qatar. In particular, he was the driving force behind the GEF/UNDP Protected Areas Project in Lebanon, for which he researched and wrote the project document, and then managed the project from 1996-2000. Mr. Abu-Izzeddin was also responsible for the preparation of several National Biodiversity Strategies and Action Plans in Lebanon, Syria, Qatar, Saudi Arabia and Libya. Most recently he served as the Chief of Party of the Lebanon Mountain Trail project, implemented by ECODIT and funded by USAID.

Ghassan Jaradi – Ornithologist and Wetland Specialist

Mr. Jaradi is one of Lebanon's most respected bird specialists with more than 35 years of applied research and experience in Lebanon and the Arab region, and more than 25 publications related to ornithology and bird habitats. He is currently member of the World Conservation Union (IUCN), Member of the CBD Inter-Government Committee for Biosafety (since 2000), Vice President of the Ornithological Society for the Middle East (London, since 2002), Member of Ramsar Wetland Expert Database (since 1997), Member of the International Advisory Committee for Biosphere Reserves (UNESCO, since 2006), and President of Palm Islands Nature Reserve's Committee (GAC, since 2002). Mr. Jaradi holds a Diploma in Natural Sciences from the Lebanese University (Lebanon, 1973), a Diplôme d'Etudes Approfondies in Applied Biology (1974), a PhD in Applied Biology and Ecology (1975), and a post-doctoral degree in the avifauna of the United Arab Emirates (1984); all three from Aix-Marseille, France.

Mounir Abi Said – Fauna Specialist

Mr. Abi Said is a fauna specialist by profession with almost 20 years of applied research and field work in animal husbandry, wildlife management, and ecological monitoring. He has conducted dozens of baseline surveys of mammals and other wildlife in Lebanon and the region using proven best-practices (e.g., motion detectors, tagging, GPS tracking). His work on hyenas and their interaction with human populations has profoundly changed people's perception in favor of conserving the species and has been heralded as a model for applied research and conservation management. Mr. Abi Said is also the founder of the *Animal Encounter*, a small educational center for treating injured animals and reintroducing them into nature. Mr. Abi Said holds a PhD in Biodiversity Management / Mammalogist from Durrell Institute of Conservation and Ecology (DICE), University of Kent at Canterbury (UK, November 2006); a MS in Animal Sciences from the Faculty of Agricultural and Food Sciences, American University of Beirut (Lebanon, February 1991) and a BS/BE in Agriculture also from the American University of Beirut (February 1989).

Chadi Mhanna – Coastal / Marine Resource Specialist

Mr. Mhanna has almost 10 years of project and research experience in aquaculture and marine sciences. During his service as the Director of the "Institute of Oceanography and Fisheries" in Batroun (Ministry of Agriculture), he piloted several projects in marine aquaculture. He participated in the FAO commissioned survey of fisheries and fishing vessels in Lebanon (2003-04) and in the formulation of a joint law on fisheries between Lebanon and Syria (draft law not passed yet). Mr. Mhanna also taught marine biology at Notre Dame University (2005-06). He holds a diploma in Fishery Science and Technology from Shimonoeki University (Japan, 1999), a PhD in Animal Sciences from ENSAR (France, 1998), a DEA in Animal Production also from ENSAR (1995) and a Diploma in Agriculture Engineering from the Lebanese University (1993).

Joy Jadam – Mapping & GIS Specialist

Ms. Jadam is an agricultural engineer with a graduate degree in environmental management. During her six-year professional record with Dar Al-Handasah (Shair & Partners), she applied and perfected her GIS skills in multidisciplinary applications. For example, she prepared maps and geographic databases for a national atlas as part of the Schéma Directeur d'Aménagement du Territoire Libanais (SDATL); identified 388 potential locations for building small dams and/or hill lakes for the National Program for Small Dams in Algeria; developed a database of water infrastructure for the city of Luanda in Angola (covering 93,000 ha and a population of 4.6 million); and assessed the environmental and social impacts related to ecotourism development in Ras al-Hadd and Ras Junayz coastal area in Oman (250 km²). In Lebanon, she also used her GIS skillset to develop a spatial database for the Tannourine Cedar Nature Reserve, including data on biodiversity, soil types, trails, insect infestation, in addition to producing visitor maps (as part of a regional program for the Integrated Management of the Cedar Forests of Lebanon). Ms. Jadam joined ECODIT Liban as an Associate in September 2008.

Annex D – Persons Consulted/Interviewed

The Assessment team met with and consulted more than two dozen stakeholders representing government agencies, USAID contractors, other donors, members of the research community, and non-governmental organizations (see complete list in Exhibit D1).

Exhibit D1 – List of Meetings and Consultations

<i>Date</i>	<i>Contact</i>	<i>Position / Organization</i>	<i>Discussion Points</i>
Sep 28	Denise Herbol Christine Sayegh Sana Saliba	USAID Mission Director COTR MEO	TO objectives; mission program and environmental procedures
Sept 30	Lara Samaha L.Samaha@moe.gov.lb Nabil Assaf N.Assaf@moe.gov.lb	Head of Department, Conservation of Natural Wealth, Ministry of Environment	Fourth National Report to the CBD; MOE reforestation program; perceived threats
	Sawsan Bou Fakhreddine Sawsan@afdc.org.lb	General Director, AFDC	Forest stations; fire fighting strategy; awareness campaigns
Oct 1	Patricia Sfeir agridp@ymca-leb.org.lb	Agricultural Department Manager, YMCA	Management of <i>Pinus brutia</i> forests; socio-economic assessment
	Elsa Sattout e.j.sattout@lnpas.org	Program Manager, AFD	Lebanese Network of Protected Areas, a program funded by FFEM
Oct 2*	Lamia Mansour lmansour@cdr.gov.lb	Team Leader, Environmental Fund for Lebanon, GTZ	Funding mechanism, eligibility requirements, impact on forests
	Hassan Istaytiyyah hstaytiyyah@acdivoca-lb.org	Country Director, Farmer to Farmer (USAID program)	Potential impact of FtF program on agro-biodiversity
	Steven Orr s.orr@lbli.org	Managing Director, LBLI (USAID program)	Business linkages related to ecotourism and agro-industry
	Chadi Mhanna iopgov@cyberia.net.lb	Head of Directorate of Forest Resources, Ministry of Agric.	Steps needed for a national forest strategy; perceived threats to forests

<i>Date</i>	<i>Contact</i>	<i>Position / Organization</i>	<i>Discussion Points</i>
	Lebanon Civic Initiative: Oriana Wuerth owuerth@OTILebanon.com Lynda Arakelian larakelian@OTILebanon.com Ruba Freij	Chief of Party Communications & Monitoring Specialist	Potential impact of grants on forests and biodiversity; new program areas
Oct 5	Natasha Marashlian nmarashlian@chflebanon.org Talal Haj Dib Cynthia Dagher	Senior Program Coordinator, Tamkin, CHF COP, Tamkin Program Senior Coordinator, LEAD	Role of municipalities in land management; impact of local governance on natural resources
	Isabelle Peillen isabelle@mada.org.lb Carla Khater carla_ext@yahoo.com	Mada Association (NGO)	National Park project in North Lebanon; progress to date; future plans; perceived threats to biodiversity
Oct 6	Salma Talhouk ntsalma@aub.edu.lb Khaled Sleem ibsarplt@aub.edu.lb Arbi Sarkission	IBSAR Director / Professor IBSAR Field Coordinator IBSAR Information Coord.	IBSAR programs (seeds of hope, “plant a heritage” auction), Orchid research, sources of funding
Oct 7	Nizar Hani nizar@shoufcedar.org	Scientific Coordinator, Al Shouf Cedar Society	Forest management inside the Al Shouf Cedar Biosphere Reserve
	Fadi Bahboul	Manager of Dibbieh forest nursery, Ministry of Agriculture	Production capacity; distribution protocol; management issues
	Raed Al Kamand Ayoub Tarabay	AFDC Forest Center -Dmit: -Site Manager -Logistical Coordinator	Activities of the forest center and services provided
Oct 11	Sandra Saba Sandra@horshehden.org	Head of Management Team, Horsh Ehden Nature Reserve	Status of management plan; institutional and operational challenges; visitor number
Oct 12	Youssef Tawk info@ecoclub-lb.org	The Conservation of Environment Committee Bcharre (NGO)	Reforestation activities in Bcharre; resources
	Vienna Fakhoury cedarfriends@cedarfriends.org	Director, Friends of the Cedars Committee (NGO)	Forest nursery; reforestation activities in Bcharre; infrastructure requirements and survival rate
	Kozhaya Hanna kozhaya_hanna@wvi.org	Member, Friends of the Cedars Committee (NGO)	

<i>Date</i>	<i>Contact</i>	<i>Position / Organization</i>	<i>Discussion Points</i>
Oct 13	Adnan Melky adnanm@unops.org	National Coordinator, UNDP/GEF Small Grants Program	Impact of small grants on forests and biodiversity, funding level and mechanism
Oct 15	Mathew Antill antillmp@cdm.com Issam Deeb	Deputy COP, Small Village WWT systems Technical Assistant	WWT operation; sludge collection; national ordnances
	Ramy Sarkis globex@idm.net.lb	Managing Director, Zahle Solid Waste Sorting Plant	Facility operation; composting; sorting and landfilling
Oct 23	John Kairouz johnk@lebanontrail.org	Executive Director of the Lebanon Mountain Trail Association	Nature-based education; conservation near the trail; building local ownership

* In addition, the Team Leader contacted Ms. Jennifer Peterson by email requesting information regarding USFS's past performance in Lebanon and future plans. Ms. Peterson responded on October 13 and shared a copy of the USFS activity report for Lebanon in 2009.

The Assessment team also visited a number of sites during this reporting period including sites related to USAID programs (Lebanon Mountain Trail, Wastewater Treatment Plants in Aitanit, and Solid Waste Sorting Plant in Zahle), several nature/biosphere reserves, as well as reforestation sites (see list in Exhibit D2).

Exhibit D2 - List of Site Visits (September 28 – October 15)

<i>Date</i>	<i>Site Visit</i>	<i>Description / Relevance</i>
Sep 27	Lebanon Mountain Trail (Section 20)	USAID-funded program (ECODIT)
Oct 8	Al Shouf Cedar Nature Reserve MOA Forest Nursery in Dibbieh AFDC Forest Station in Dmit	The largest reserve in Lebanon Sponsored by the Principauté de Monaco One of three such stations in the country
Oct 11	Horsh Ehden Nature Reserve	A biodiversity hotspot
Oct 12	Bcharre Cedar Forest Grove Reforestation sites in Bcharre area Forest nursery in Bcharre	World Heritage Site / UNESCO One of the largest initiatives in the country Sponsored by a Lebanese-Mexican expat
Oct 15	Ammiq Wetland Qaroun Wastewater Treatment Plant Zahle Solid Waste Sorting Plant	Largest wetland in Lebanon (private land) USAID-funded program (CDM) USAID-funded program (CHF)
Oct 17	Animal Encounter	Only nature-based education facility in Lebanon

Annex E – Selected Forest Cover Details

1. FAO 2005 Forest Resources Assessment – Miscellaneous Information

[Source: Food and Agriculture Organization of the United Nations (FAO). 2005. Global Forest Resources Assessment Country Report – Lebanon. FRA2005/059. Rome. FAO. 34p.

Exhibit E1 - FRA 2005 Categories and definitions

Category	Definition
Forest	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds <i>in situ</i> . It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not classified as “Forest”, spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds <i>in situ</i> ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
Other land	All land that is not classified as “Forest” or “Other wooded land”.
Other land with tree cover (Subordinated to “Other land”)	Land classified as “Other land”, spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity.
Inland water bodies	Inland water bodies generally include major rivers, lakes and water Reservoirs.

Exhibit E2 - Extent of forests and other wooded lands and their estimated growth.

Land Use	Area (ha)	Volume (m ³ /ha)
Forest	139,736	35.6
Other Wooded Land	108 378	5.1
Other Land ... of which with trees (olives and fruit trees)	116,210	3.7
Inland Water	294	--
TOTAL	1,045,200	--

Exhibit E3 - List of native tree species in Lebanon (FAO, 2005)

<i>Abies cilicica</i>	<i>Juglans regia</i>	<i>Pyrus syriaca</i>
<i>Acer monspessulanum</i> var.	<i>Juniperus drupacea</i>	<i>Pyrus syriaca</i> var. <i>boveri</i>
<i>Hermoneum</i>	<i>Juniperus excelsa</i>	<i>Quercus brantii</i> ssp. <i>Look</i>
<i>Acer syriaca</i>	<i>Laurus nobilis</i>	<i>Quercus calliprinos</i>
<i>Acer tauriculm</i>	<i>Malus trilobata</i>	<i>Quercus cedrorum</i>

<i>Alnus orientalis</i>	<i>Ostrya carpinifolia</i>	<i>Quercus cerris</i> var. <i>pseudocerris</i>
<i>Arbutus andrachne</i>	<i>Pinus brutia</i>	<i>Quercus infectoria</i>
<i>Cedrus libani</i>	<i>Pinus halepensis</i>	<i>Quercus ithaburensis ungeri</i>
<i>Celtis australis</i>	<i>Pinus pinea</i>	<i>Quercus microphylla</i>
<i>Ceratonia siliqua</i>	<i>Platanus orientalis</i>	<i>Quercus pinnatifida</i>
<i>Cercis siliquastrum</i>	<i>Populus alba</i>	<i>Sorbus flabellifolia</i>
<i>Cupressus sempervirens</i>	<i>Populus nigra</i>	<i>Sorbus torminalis</i> var. <i>pinnatifida</i>
<i>Ficus sycomorus</i>	<i>Populus tremula</i>	<i>Styrax officinalis</i>
<i>Fraxinus ornus</i>	<i>Prunus ursina</i>	<i>Fraxinus syriacum</i>

Exhibit E4 - The estimated volume of growing stock of the 10 most common species

Species	Volume (million m ³)
<i>Quercus cerris</i>	0.960
<i>Pinus pinea</i>	1.550
<i>Pinus brutia</i>	1.300
<i>Cedrus libani</i>	0.310
<i>Juniperus excelsa</i>	0.290
<i>Juniperus drupacea</i>	0.090
<i>Quercus infectoria</i>	0.186
<i>Quercus calliprinos</i>	0.177
<i>Ostrya caprinifolia</i>	0.016
<i>Platanus orientalis</i>	0.019
Other species	0.060
Total	4.967

Exhibit E5 - Ownership of forested and other wooded lands in Lebanon, 2004.

Ownership type	Forest (ha)	OWL (ha)
Private	84,183	86,702
Public	53,799	14,956
State	38,189	
Municipal	13,938	
Commune	1,672	
Unknown	1,394	6,720
Total	139,376	108,378

2. Forest Types

Cedar, Fir and Juniper forests

These three forest types are found together as mixed evergreen forests in some parts of the country, but pure, or nearly pure, stands of each are also found. Both cedar (*Cedrus libani*) and fir (*Abies cilicica*) are generally found between 1,300 and 2,000 meters. Junipers (*Juniperus excelsa* and *Juniperus oxycedrus*) are found growing with fir and cedar starting at about 1,500 meters. Occasionally, between 2,000 meters and the timberline (about 2400 meters), pure stands of junipers are found becoming increasingly scrubby as altitude increases.

The remaining cedar forests, which once covered the mountainous Oro-mediterranean zone (see Vegetation Zones, Section 2.2.2), are now found only as mosaic patches, occupying approximately 2,200 hectares on the western slopes of the Mount Lebanon chain. These forests are located on the western slopes of the Mount Lebanon range, in the following localities from north to south: Qamou'a, Dinnieh, Bsharre, Ehden, Sweisse, Hadeth-tannourine, Jaj, Bmohray, Ain-Zhalta, Barouk and Maasser al-Shouf.⁸

Mixed forests of fir and cedar are found in Qamou'a, and in Ehden, its southernmost limit, where it grows at a lower density mixed with cedar and other tree species. Sparse Grecian Juniper forests, covering an area of 9,000 ha,⁹ grow in patches on the eastern slopes of the Mount Lebanon chain and in the Caza of Hermel. All these forests have suffered from deforestation and severely eroded soils since biblical times leading to severe deterioration in their natural habitats and invasion by degraded guarrigue.¹⁰

Pine forests

Stone pine (*Pinus pinea*) forests occupy an area of 17,000 ha. with nearly half of this managed for the production of pine nuts. These forests are found at altitudes ranging from 800 m. to 1500 m. above seal level, on the sandy soils of Metn and Jezzine on the western slopes of the Mountain Lebanon chain. The area covered by these forests has decreased primarily as a result of war, forest fires, and urban development. The other pine forests types - Calabrian pine (*Pinus brutia*) and Aleppo pine (*Pinus halepensis*) - grow between 500 m. and 1,300/1,500 m. on the western slopes of the Mount Lebanon chain. Calabrian pine forests occupy a large area in the North, while Aleppo pines cover an area of 400-500 ha in the southern part of the country in the Cazas of Marjaoun and Hasbaya.¹¹

Oak forests

The kermes oak (*Quercus calliprinos*) forests cover 10 percent (40,000 ha) of the land area, and their dominance in the lower altitude of the western slopes of the Mount Lebanon range is an indicator of habitat degradation. The oak coppices found on the eastern slopes of Mount Lebanon extend in a very discontinuous manner in the low elevation zone between Yammouneh and Hermel and on the slopes of Jabal Barouk/Niha. On the western slopes of the Anti-Lebanon chain, only a few diminutive oak stands persist, mainly east of Baalbeck, Masnaa and around Rachaya.¹² In the South, a few degraded and overgrazed oak coppices can be found on the hills of Jabal Amel. These forests have been subject to severe cutting for charcoal production and to overgrazing, which has led to their deterioration and their replacement by highly degraded garrigue.

Additionally, sporadic trees of Turkey oak (*Q. cerris*) are found in Qamou'a and Ehden, Cedar Oak (*Q. cedrorum*) and Lebanon oak (*Q. libani*) in Ehden, pennatifid oak (*Q. pinnatifida*) in Ehden, Hadeth-Tannourine

⁸ Chouchani, et al., 1974

⁹ Baltaxe, 1965

¹⁰ METAP, 1995

¹¹ MoA/UNEP, 1996

¹² METAP, 1995

and Bsharre, and brant's oak (*Q. brantii* ssp. *looki*) in Ain Zhalta and Barouk. Cyprus oak (*Q. infectoria*) is found in cedar and fir forests.

Evergreen Cypress

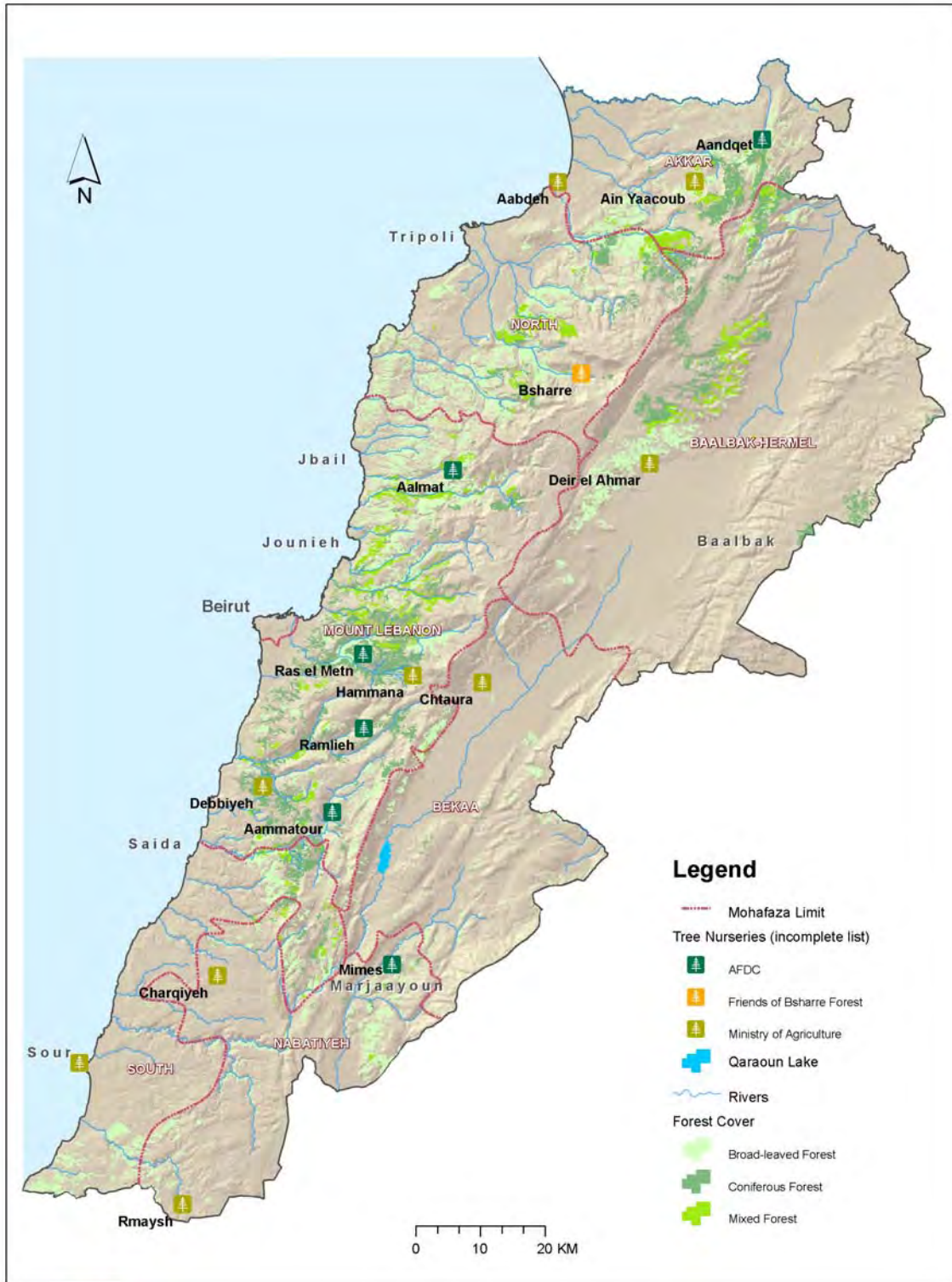
The only remaining forest patch of cypress (*Cupressus sempervirens*) is found in Akkar on hard limestone. Other species in this patch include Mediterranean buckhorn, Kermes oak (*Q. infectoria* var. *boissieri*), and the oriental strawberry tree (*Arbutus andrachne*). The mesic nature of this patch is indicated by the presence in this association of Maple (*Acer* spp), whitethorn (*Crataegus monogyna*), false senna (*Coronilla emeroides*), hop-hornbeam (*Ostrya carpinifolia*) and others.¹³ In the Northern part of the Mount Lebanon chain, sporadic cypress tree populations are found in Calabrian pine forests, in Karm-Sadet and Aito villages.¹⁴

¹³ Zohary, 1973

¹⁴ Chouchani et al., 1974

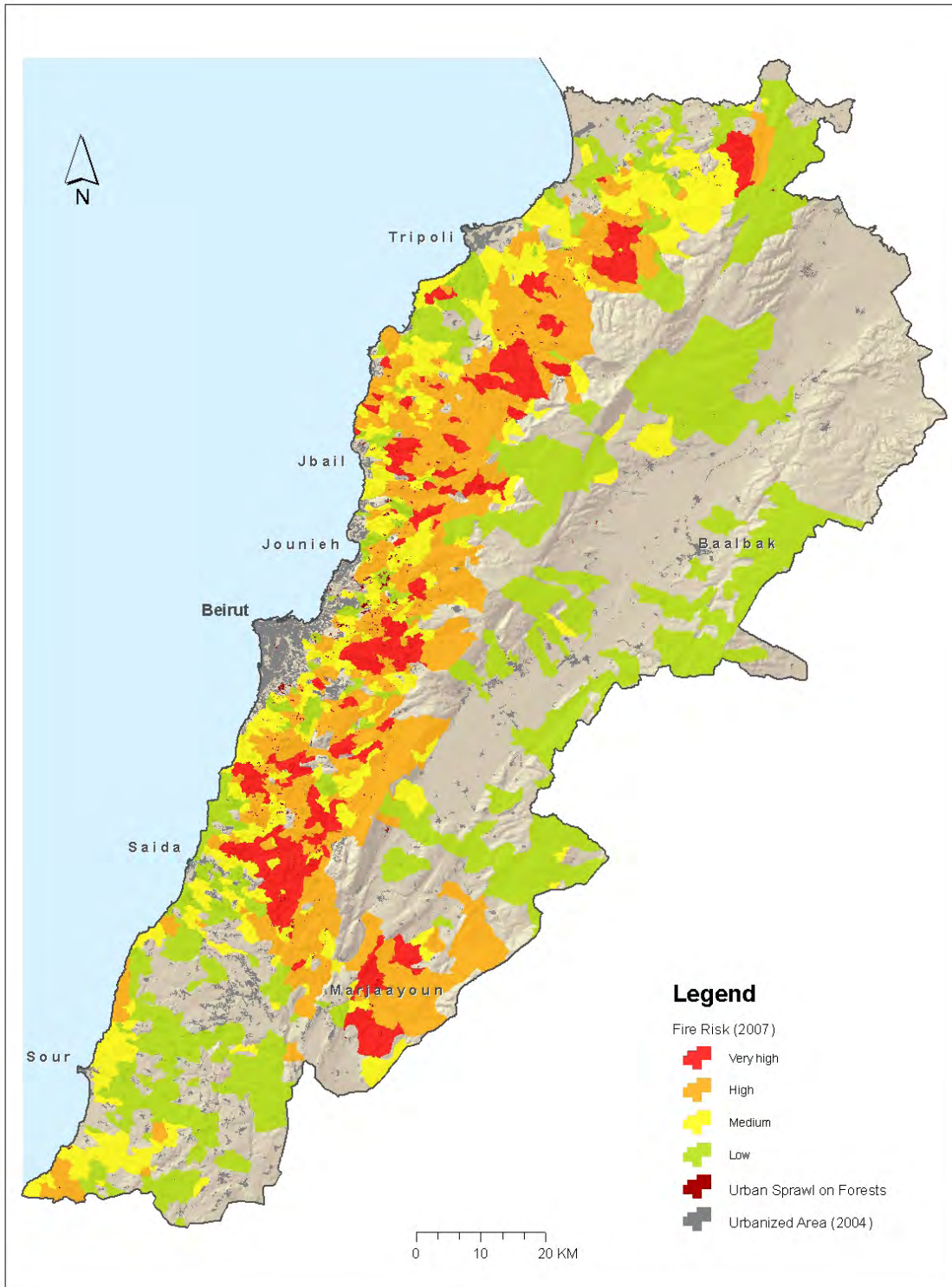
Annex F – Maps

Exhibit F1 – Map Showing Locations of Forest Tree Nurseries on Forest Cover



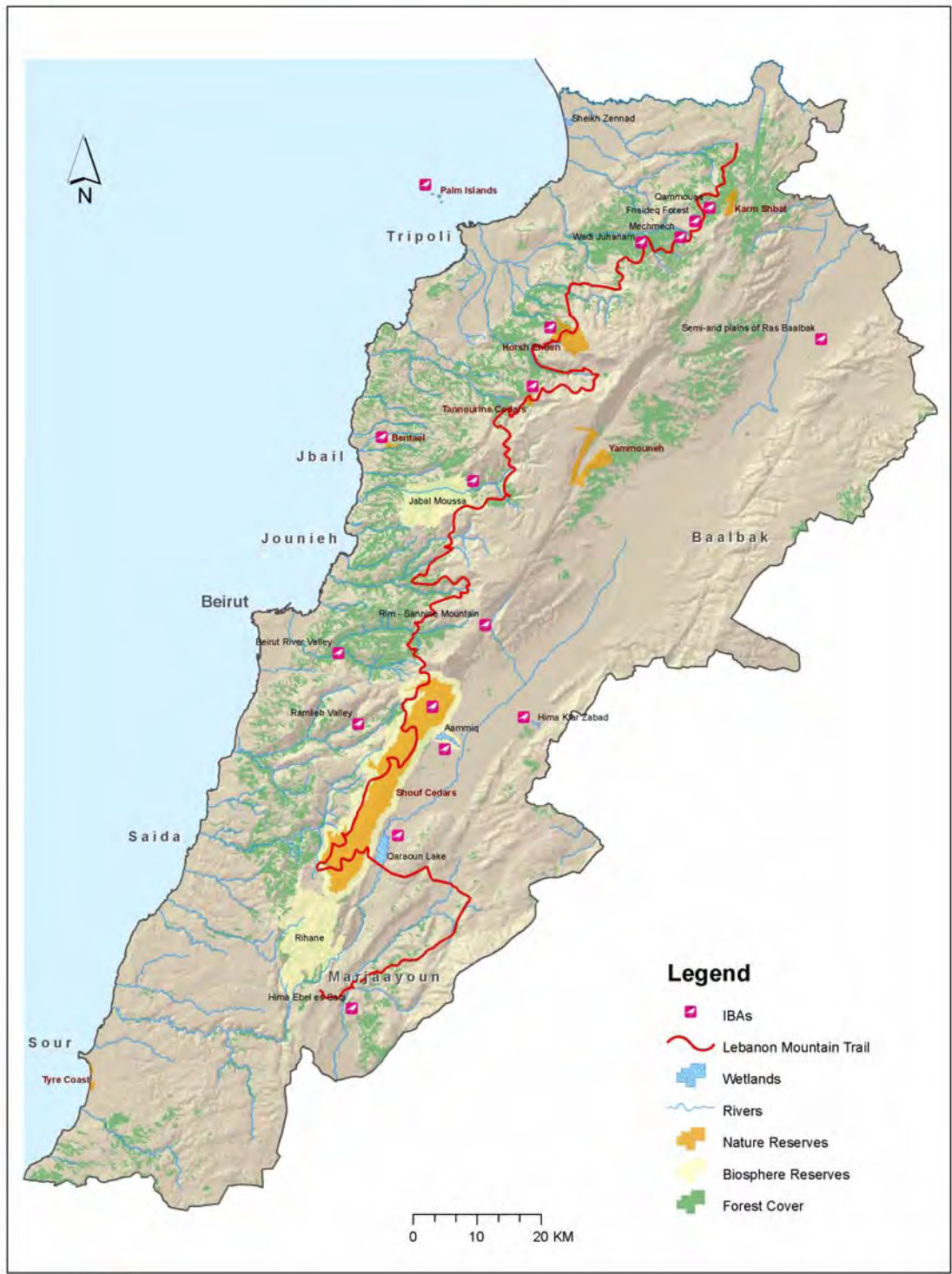
This map was produced for review by the United States Agency for International Development. It was prepared by ECODIT for the "Lebanon Forest and Biodiversity Conservation Assessment" task Order no.86

Exhibit F2 – Forest Fire Risk in Lebanon



This map was produced for review by the United States Agency for International Development. It was prepared by ECODIT for the "Lebanon Forest and Biodiversity Conservation Assessment" task Order no.86

Exhibit F3 – Forest Cover with Protected Areas, Wetlands and the Lebanon Mountain Trail



This map was produced for review by the United States Agency for International Development. It was prepared by ECODIT for the "Lebanon Forest and Biodiversity Conservation Assessment" task Order no.86

Annex G – IUCN Lists for Threatened and Endangered Species

The following species of Globally Threatened Bird Species is based on the 2007 IUCN Red List. After the scientific name, the following abbreviations denote threatened species as per the IUCN Red List categories for 2009. (CR): Critically Endangered. (EN): Endangered. (VU): Vulnerable. (NT): Near Threatened. Note: The Yelkouan Shearwater and the Eurasian Curlew were added in 2009 only.

1. *Marmaronetta angustirostris* (VU) Marbled Duck v
2. *Aythya nyroca* (NT) Ferruginous Duck pm, wv, s
3. *Puffinus griseus* (NT) Sooty Shearwater v
4. *Puffinus yelkouan* Yelkouan Shearwater PM, wv (2009)
5. *Pelecanus crispus* (VU) Dalmatian Pelican pm
6. *Falco naumanni* (VU) Lesser Kestrel sb, pm, s
7. *Falco vespertinus* (NT) Red-footed Falcon pm
8. *Falco cherrug* (EN) Saker Falcon pm, wv
9. *Milvus milvus* (NT) Red Kite FB, pm
10. *Neophron percnopterus* (EN) Egyptian Vulture FB, PM
11. *Aegypius monachus* (NT) Cinereous Vulture pm
12. *Circus macrourus* (NT) Pallid Harrier pm, wv
13. *Aquila clanga* (VU) Greater Spotted Eagle pm, ?wv
14. *Aquila heliaca* (VU) Eastern Imperial Eagle ?FB, pm, ?wv
15. *Otis tarda* (VU) Great Bustard v
16. *Chlamydotis macqueenii* (VU) Macqueen's Bustard v
17. *Tetrax tetrax* (NT) Little Bustard v
18. *Crex crex* (NT) Corncrake pm
19. *Vanellus gregarius* (CR) Sociable Lapwing v
20. *Gallinago media* (NT) Great Snipe pm
21. *Limosa limosa* (NT) Black-tailed Godwit pm
22. *Numenius arquata* Eurasian Curlew v, ?pm (2009)
23. *Glareola nordmanni* (NT) Black-winged Pratincole pm
24. *Larus audouinii* (NT) Audouin's Gull FB, pm
25. *Coracias garrulus* (NT) European Roller ?FB, PM, ?sb
26. *Ficedula semitorquata* (NT) Semi-collared Flycatcher pm
27. *Serinus syriacus* (VU) Syrian Serin SB, pm, wv
28. *Emberiza cineracea* (NT) Cinereous Bunting pm

Source: Ghassan Ramadan Jaradi, Ph.D

Key: Abbreviations are used to indicate the species status, a question mark (?) indicates uncertain status. Lower case abbreviations (eg r, sb, s, wv and pm) indicate that the species is uncommon or rare at the relevant season.

R Resident with definite breeding records; **SB** Breeding summer visitor; **S** Non-breeding summer visitor; **WV** Winter visitor; **PM** Passage migrant; **FB** Formerly bred (no breeding records since 1987); **v** Vagrant

Status of Mammal Species in Lebanon*

Scientific Name Common Name –Status: Remarks

<i>Acomys dimidiatus dimidiatus</i>	The Spiny Mouse	–Insufficient Data
<i>Allactaga eupharetica</i>	The Jarboa	--Insufficient Data (recently discovered in Lebanon)
<i>Apodemus mystacinus mystacinus</i>	The Broad Toothed Field Mouse	--Common
<i>Apodemus sylvaticus</i>	The Common Field Mouse	--Common
<i>Canis aureus syriacus</i>	The Jackal	–Common: Opportunistic animals
<i>Canis lupus pallipes</i>	The Wolf	–Endangered: Killing and poisoning
<i>Caracal caracal</i>	The Caracal	–Extinct
<i>Cricetulus migratorius cinerascens</i>	The Grey Hamster	--Insufficient Data
<i>Dama dama</i>	The Fallow deer	--Extinct
<i>Delphinus delphis</i>	The Dolphin	-- Insufficient Data
<i>Eliomys melanurus</i>	The Black Tailed Mouse	–Insufficient Data
<i>Erinaceus europaeus concolor</i>	The Hedgehog	--Critically Endangered: Excessive use of pesticides
Family Chiroptera	20 species of bats	–Endangered: Excessive use of pesticides, killing, and habitat destruction
Family Soricidae	5 species of shrews	–Threatened: Excessive use of pesticides, killing and poisoning by people who mistaken them for rodents
<i>Felis chaus</i>	The Jungle Cat	–Endangered: Killing and poisoning
<i>Felis silvestris tristrami</i>	The Wild Cat	–Threatened: Cross breeding with domestic cats, killing
<i>Gazella gazella arabica</i>	The Gazelles	--Extinct
<i>Gerbillus dasyrus</i>	The Wagner's Gerbil	--Insufficient Data (recently discovered in Lebanon)
<i>Herpestes ichneumon</i>	The Mongoose	–Endangered: Poisoning and hunting
<i>Hyaena hyaena syriaca</i>	The Striped Hyaena	–Threatened: Killing and poisoning
<i>Hysterix indica indica</i>	The Porcupine	--Common
<i>Lepus capensis syriacus</i>	The Hare	–Threatened: Hunting
<i>Lutra lutra seistanica</i>	The Otter	–Endangered: Water pollution, poisoning, hunting, habitat destruction
<i>Martes fiona syriaca</i>	The Stone Marten	–Common: Opportunistic animals
<i>Meles meles canescens</i>	The Badger	–Vulnerable: Poisoning and hunting
<i>Meriones tristrami tristrami</i>	The B8Jird	-- Insufficient Data
<i>Microtus guentheri guentheri</i>	The Levant Vole	-- Insufficient Data
<i>Microtus nivalis hermonis</i>	The Snow Vole	–Endangered: Climate change
<i>Mus musculus praetextus</i>	The House Rat	--Common
<i>Mustela nivalis</i>	The Weasel	–Endangered: Killing and poisoning
<i>Procavia capensis syriaca</i>	The Rock Hyrax	–Vulnerable: Habitat destruction and killing
<i>Rattus norvegicus norvegicus</i>	The Brown Rat	--Common
<i>Rattus rattus frugivores</i>	The Black Rat	--Common
<i>Sciurus anomalus syriacus</i>	The Red Squirrel	–Threatened: Habitat destruction and killing
<i>Spalax leucodon ebrenberji</i>	The Mole Rat	--Common
<i>Sus scrofa hybicus</i>	The Wild Boar	–Common: Absence of predators
<i>Ursus arctos syriacus</i>	The Syrian Brown Bear	--Extinct
<i>Vormela peregusna syriaca</i>	The Marbled Polecat	–insufficient data
<i>Vulpes vulpes palaestina</i>	The Red Fox	–Common: Opportunistic animals

* List was prepared and compiled by Mr. Mounir Abi Said (PhD in Biodiversity Management / Mammalogist).

Annex H – Status of Lebanon’s Wastewater Treatment Plants in the Coastal Zone

<i>Location</i>	<i>*People-Equivalent</i>	<i>Source of Funding</i>	<i>Status</i>	<i>Treatment</i>	<i>Year of Operation</i>
El Aabdeh	80,000	Not secured	Site identified but not yet expropriated	Secondary	NA
Tripoli	1,200,000	EIB (€78 million)	Completed	Secondary	2009
Chekka	80,000	French Protocol / AFD (€10.1 million)	Completed	Secondary	2009
Batroun	80,000	French Protocol / AFD (€7.6 million)	Completed	Secondary	2009
Jbail	80,000	French Protocol (€9.4 million)	Completed	Secondary	2009
Kerouan	600,000	EIB (\$84 million)	Tendering phase	Secondary	NA
Dora	1,800,000	EIB (€60 million)	Tendering phase	Secondary	NA
Ghadir	1,500,000	KFW (partial) IDB, OFID (\$52 million)	Operational since 2005 Design phase	Preliminary Secondary	NA
Nabi Younes	200,000	French Protocol (€14.4 million)	Completed	Secondary	2009
Saida	300,000	JBIC	Operational, power supply lacking	Preliminary	2005
Sarafand	NA	Not secured	Planning stage	Secondary	NA
Tyre	200,000	EIB	Tendering stage	Secondary	NA
Naqoura	100,000	Not secured	Planning stage	Secondary	NA

Annex I – Conventions, Treaties and Protocols Signed by Lebanon

<i>Year</i>	<i>Convention, Treaty and Protocol</i>	<i>Signature / Accession Date</i>
2001	Stockholm Convention on Persistent Organic pollutants for adoption by the conference of plenipotentiaries	Signature: 22/5/2001
1999	Convention on Wetlands of International Importance especially as Waterfowl Habitat –Ramsar	Accession: 1/3/1999 Law No. 23
1995	Agreement on the Conservation of African-Eurasian Migratory Waterbirds -The Hague	Signature: June 2002 Law No. 360
1994	United Nations Convention to Combat Desertification -Paris	Ratification: 21/12/1994 Law No. 469
1992	United Nations Framework Convention on Climate Change --Rio de Janeiro	Ratification: 11/8/1994 Law No. 359
1992	Convention on Biological Diversity --Rio de Janeiro	Ratification: 11/8/1994 Law No. 360
1992	Amendment to the Montreal Protocol on Substances that deplete the Ozone Layer –Copenhagen	Accession: 3/11/1999 by the law number 120
1990	Amendment to the Montreal Protocol on Substances that deplete the Ozone Layer –London	Accession: 31/3/1993 Law No. 253
1989	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal --Basel	Ratification: 21/12/1994 Law No. 387
1987	Montreal Protocol on Substances that deplete the Ozone Layer --Montreal	Accession: 31/3/1993 Law No. 253
1985	Vienna Convention for the Protection of the Ozone Layer –Vienna	Accession: 30/3/1993 Law No. 253
1982	Protocol Concerning Mediterranean Specially Protected Areas	Accession: 27/12/1994
1980	Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources --Athens	Signature: 17/5/1980 Accession: 27/12/1994
1976	Convention on the Prohibition of Military or any other hostile use of Environmental Modification Techniques --Geneva	Signature: 18/5/1977
1976	Protocol Concerning Co-operation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency –Barcelona	Signature: 16/2/1976 Accession: 30/6/1977, Law No.126

1976	Convention for the Protection of the Mediterranean Sea against Pollution –Barcelona	Signature: 16/2/1976 Accession: 30/6/1977, Decree-law No. 126
1976	Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft – Barcelona	Signature: 16/2/1976 Accession: 30/6/1977, Decree-law No. 126
1973	International Convention for the Prevention of Pollution from Ships –London	Accession: 24/11/1993
1972	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.-London-Mexico city-Moscow-Washington.	Signature: 15/5/1973
1971	Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction on the Seabed and the Ocean floor & in the Subsoil –London, Moscow, W/DC	Ratification: 7/10/1974 Decree No. 9133
1969	International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties –Brussels	Ratification:12/10/1974 Decree No. 9226

Annex J – Donor and NGO-funded Projects Related to Forests and Biodiversity

Project	Donor	Funding Level	Duration	Geographic Focus	Comments
Lebanese Network of Protected Areas www.lnpas.org	AFD / FFEM	€1.4 million (€3.0 million incl. cost-share)	Aug 08 – Jul 11	Seven sites: - Five Nature Reserves: Horsh Ehden, Tannourine Cedars, Bentael, Al Shouf Cedars, Tyre Coast - Jabal Moussa Biosphere Reserve - Hema Kfarzabad	The project is providing technical and financial support to each site independently, on four levels: (1) strengthening the administrative structure of the reserve, (2) conservation and management of biodiversity, (3) awareness and visitor management, and (4) socio-economic activities and local development. There is also one cross-cutting component benefiting all seven sites: building a network of protected areas.
Mainstreaming Biodiversity Management into Medicinal and Aromatic Plants Production Processes in Lebanon	UNDP/GEF	\$1.13 million	Jun 08 – Jun 2012	National	NA
GEF Small Grants Program	GEF/UNDP	About \$500K/year	2005 – Present	National	SGP has to date approved 33 projects including 27 related to biodiversity and land degradation; total funding cannot exceed \$50K per NGO.
Environment Fund for Lebanon	GTZ / CDR	Phase 1: \$5 million Phase 2: \$4 million (anticipated replenishment)	Feb 2008 – Present Expected start date: 2010	National	During Phase 1, EFL received 100 proposals and selected 18 projects divided into two sectors (green and brown); grant amount ranged from \$30K-\$200K. In Phase 2, grants will be \$200K-\$400K.

Project	Donor	Funding Level	Duration	Geographic Focus	Comments
Reforestation in Bcharre	Private funding (Friends of the Cedars of Bcharre)	Miscellaneous incl. \$800K from a single Lebanese-Mexican donor	1995 – Present (no time limit)	Upper slopes of Mount Lebanon above Bcharre	The program has been building momentum since 1995; survival rates have reportedly increased from 20% to 90% today (improved germination and irrigation; better site selection; fencing; species mixing). Total forested area to date is 375ha.
Development of Skills and Tools for the Sustainable Management and Preservation of Forestry Resources and the Revitalization of Rural Communities In Syria and Lebanon	Spanish Agency for development (AECI)	€185,000 (Phase 1) €200,000 (Phase 2)	Phase 1 (18 mo) ended in January 2009; Phase 2 started already	All the Calibrian pine forests in Lebanon (<i>Pinus brutia</i>) with three pilot areas: Dinnieh, Akkar and Zgharta	Spanish Partner: Forest Technology Centre of Catalonia (Spain). In Lebanon, the project is being implemented by YMCA and the Ministry of Agriculture.
National Reforestation Plan – Ministry of Environment	Government of Lebanon	LBP25 billion (\$16.7 million)	2002-2007 (interrupted by the war in 2006)	Nationwide	MOE contracted private sector nurseries to reforest sites on (mostly) municipal lands. In total, 305ha were replanted using indigenous forest species (e.g., cedar, pine, oak, wild almond and carob).
Lebanon Civic Initiative	USAID W/DC (through Chemonics/ OTI)	\$20 million	NA	Nationwide, focus on socially marginalized and/or conflict areas.	The program has to date funded about 120 projects (max value per project is \$200K) including 7 related to urban reforestation and setting up public gardens (\$18K total)
Mainstreaming conservation of migratory soaring birds into key productive sectors along the Rift Valley/Red Sea flyway	UNDP / GEF	\$1.324 million (Lebanon only)	Jun 08- Dec 2012	A dozen countries including Lebanon (Djibouti, Egypt, Eritrea, Ethiopia, Jordan, Palestinian Authority, Saudi Arabia, Sudan, Syria, Yemen)	The project will seek to promote “flyway maintenance” by I mainstreaming the conservation of Migratory Soaring Birds (MSB) into productive sectors (agriculture, energy, water management and hunting while promoting ecotourism). In Lebanon, the project will be implemented by UNDP and MOE.

Project	Donor	Funding Level	Duration	Geographic Focus	Comments
Trees for Lebanon www.trees4lebanon.com (Under construction)	Rotary Club of Baabda World Vision Lebanon is a Strategic Partner	\$3 million funding goal)	July 2008 – present (10 years)	Nationwide	Project is providing <i>forest trees</i> (to municipalities and community organizations) and <i>fruit trees</i> (to farmers). So far, 27,000 trees were planted since the project started. Goal is to reach 1 million trees in 10 years. Unit cost is about \$12/tree (covered by Rotary and local beneficiary). Technical guidance is provided by World Vision Lebanon and the Lebanese Army is providing transportation for seedlings.
Restoration and Conservation of Sensitive Forest Areas in Lebanon	WWF Italy and the Italian Cooperation (ROSS I)	€499K	2006 – May 2008	Nine villages in South Lebanon including Jezzine and Arkoub	The project was implemented by AFDC in partnership with WWF Italy. It provided monitoring equipment to forest guards, civil defense centers and the Lebanese Army; designed and implemented a training program on forest fire fighting and control; raised awareness of the local communities about forest fire-fighting and prevention issues; and updated the national database for forest fires.
Management & Sustainable Development of Forest Areas in Andkit, North Lebanon	WWF Italy and the Italian Cooperation (ROSS II)	500,000 Euros	Mar-Dec 2009	Andket (Akkar)	The project is implemented by AFDC in partnership with WWF Italy. Project activities include the establishment of a multipurpose forestry centre, the construction of a fire-pond for use during fire fighting, the establishment of fire breaks, and restoration of the burnt forest land.
Towards a national strategy to Combat Forest Fires	EU	€350K	June 2008 – Oct 09	National level	The project was implemented by AFDC through the MoU with the Ministry of Environment. The project includes the development of Lebanon's National Strategy for Forest Fire Management, capacity building, and provision of fire fighting equipment

Project	Donor	Funding Level	Duration	Geographic Focus	Comments
Local action plans for fire fighting	EU through OMSAR	€350K	Nov 09 – Nov 10	Five clusters of municipalities: Jezzine, High Maten, High Shouf, Aley and Shouf Sweijjan	Implemented by AFDC through the MoU with the Ministry of Environment. It includes developing and putting in place local action plans for forest fire management in line with the national strategy developed in the national scale project and approved by the Government.
Toward a National Plan for Forest Fire Management in Lebanon	Lebanon Recovery Fund through FAO	\$2.6 Million	June 08 – June 10	National level	The project is implemented in partnership between AFDC, FAO and the Ministry of Environment. Major components: reforestation, rehabilitation of infrastructure for forest fires, small grants for NGOs, demining of forest areas, revision of forest laws and legislations, capacity building, provision of equipment, establishment of tree nursery and raising awareness at the national level
Developing a National Mascot for Forest Conservation	USAID	\$50K	June 09 – June 10	National level	Implemented by AFDC. The project is inspired by “Smoky the Bear” in the US to raise awareness at the national level about forest fires.

Annex K – Selected Priority Actions Needed to Address Key Threats to Forest and Biodiversity Conservation

Exhibit K1 – Addressing Threats due to Habitat Conversion/Loss

Cause/Driver	Actions Needed	Actors	Geographic Focus
<p><u>Political/institutional</u></p> <ul style="list-style-type: none"> Limited application of forestry and land use law, regulations & standards (and disincentives for habitat conversion) 	<ul style="list-style-type: none"> Develop effective mechanisms for applying existing laws, policies & standards Strengthen inter-institutional communication of MoA, MoE, NGOs and municipalities and social organizations Establish a framework and standards at caza and municipal levels and strengthen technical capacity 	<ul style="list-style-type: none"> MoA, MoE, NGOs 	<ul style="list-style-type: none"> In areas of reforestation, forest fires, especially the oak-pine zone
<p><u>Political/Institutional:</u></p> <ul style="list-style-type: none"> Very little capacity to monitor development projects, land use change (e.g., real estate development) and conservation actions to provide timely information, lessons learned for decision-makers 	<ul style="list-style-type: none"> Support applied research institutes & information management for analysis of municipal development, conservation climate change, etc. scenarios Strengthen capacity of NGOs to monitor & track large infrastructure projects in mountain areas 	<ul style="list-style-type: none"> MoA, MoE, caza and municipal governments working with institutes, universities, and NGOs 	<ul style="list-style-type: none"> In areas of reforestation, forest fires, especially the oak-pine zone
<p><u>Economic:</u></p> <ul style="list-style-type: none"> Insufficient economic incentives for forest management, avoided deforestation, conservation especially on private lands 	<ul style="list-style-type: none"> Revise national laws & policies to include economic incentives for conservation & sustainable use especially on private lands Promote sustainable economic use of forests & biodiversity in local communities/municipalities Work with municipalities to support programming 	<ul style="list-style-type: none"> MoE, MoA, cazas and municipalities in conjunction with research institutes, universities, NGOs and private sector (through public private alliances) 	<ul style="list-style-type: none"> In areas of reforestation, forest fires, especially the oak-pine zone

	of their resources towards national resources		
<u>External/global:</u> <ul style="list-style-type: none"> Climate change 	<ul style="list-style-type: none"> Utilize past experiences to develop new reforestation programs & applicability for carbon credit schemes Promote/participate in REDD mechanism 	<ul style="list-style-type: none"> MoE, MoA, NGOs 	<ul style="list-style-type: none"> Selected sites for extensive reforestation & potential forested areas for REDD participation
<u>Social:</u> <ul style="list-style-type: none"> Limited awareness of role of private sector land clearing/forest fragmentation on forest and biodiversity degradation Limited awareness of forests and OWLs in providing ecosystem services 	<ul style="list-style-type: none"> Continue campaigns and encourage public participation in national forest fire management strategy Raise awareness of the role of forests & OWLs in providing ecosystem services & importance of continuity of forest cover 	<ul style="list-style-type: none"> MoE, MoA, cazas and municipal governments, NGOs 	<ul style="list-style-type: none"> In areas of reforestation, forest fires, especially the oak-pine zone as well as riverbeds and watersheds

Exhibit K2 – Addressing Threats from Overharvesting of Selected Species

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/institutional</u> <ul style="list-style-type: none"> Illegal hunting 	<ul style="list-style-type: none"> Application and enforcement of the new hunting law with consensus on species Defined open and closed seasons for hunting and harvests 	<ul style="list-style-type: none"> MoE, HCH, MoI and municipalities 	<ul style="list-style-type: none"> Country-wide
<u>Political/institutional</u> <ul style="list-style-type: none"> Illegal harvesting of plants and marine species 	<ul style="list-style-type: none"> Development of a strategy to address issues, seasons, limits, markets Update existing laws, build capacity and patrol more 	<ul style="list-style-type: none"> MoA, MoT and municipalities 	<ul style="list-style-type: none"> Habitats of endangered species
<u>Economic:</u> <ul style="list-style-type: none"> Insufficient management of hunters 	<ul style="list-style-type: none"> Levying and transparent enforcement of fines Mandatory licenses and 	<ul style="list-style-type: none"> MoE, HCH, MoI and municipalities 	<ul style="list-style-type: none"> Country-wide

	hunting insurance		
<u>Economic:</u> <ul style="list-style-type: none"> • Insufficient sustainable use and management plans • Fishing waters are very limited 	<ul style="list-style-type: none"> • Develop and enforce more sustainable use management plans for economically valuable species • Enforcement of fines for economic disincentives • Larger & better equipped fleet for enforcement in no-catch zones and deep sea fishing 	<ul style="list-style-type: none"> • MoA, MoT and municipalities; Lebanese Navy 	<ul style="list-style-type: none"> • Habitats of economically valuable species
<u>Social:</u> <ul style="list-style-type: none"> • Lack of public awareness and understanding of endangered species and overhunting/harvesting 	<ul style="list-style-type: none"> • A hunter-friendly law and guidebook • High powered awareness campaigns for areas where they are killed/harvested 	<ul style="list-style-type: none"> • MoE, HCH, MoI and municipalities, NGOs • MoA, MoT Lebanese Army for overfishing and NTFP harvesting, NGOs 	<ul style="list-style-type: none"> • Country-wide with targeted sites where overharvesting occurs

Exhibit K3 – Addressing Threats Arising from Exotic Invasive Species

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/institutional</u> <ul style="list-style-type: none"> • Lack of national strategy and monitoring framework 	<ul style="list-style-type: none"> • Develop a national strategy on exotic invasive species • Develop a monitoring network • Become a signatory party to CITES 	<ul style="list-style-type: none"> • MoA, MoE 	<ul style="list-style-type: none"> • Habitats at risk to be identified
<u>Economic:</u> <ul style="list-style-type: none"> • Reduced economic value of species impacted by exotics 	<ul style="list-style-type: none"> • Develop strategies for combating invasive species 	<ul style="list-style-type: none"> • MoA, NGOs and private sector 	<ul style="list-style-type: none"> • Habitats at risk to be identified

<u>Social:</u> <ul style="list-style-type: none"> Lack of public awareness and understanding of invasive species and their potential impact to forests and biodiversity resources 	<ul style="list-style-type: none"> Public awareness and information campaigns targeting specific species in areas where they are found and are causing harm 	<ul style="list-style-type: none"> MoA, NGOs and private sector 	<ul style="list-style-type: none"> Habitats at risk to be identified
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Exhibit K4 – Addressing Threats due to Pollution of Aquatic Ecosystems

Cause/Driver	Actions Needed	Actors	Geographic Focus
<u>Political/institutional</u> <ul style="list-style-type: none"> Gaps in pollution laws, standards and regulations Lack of baseline scientific knowledge of aquatic species against which to measure effects of pollution 	<ul style="list-style-type: none"> Development of community standards & agreements for controlling pollution Development of environmental units in municipalities for monitoring & enforcement; Specific ordinances & standards to control pollution 	<ul style="list-style-type: none"> MoE&W, MoE, and municipalities 	<ul style="list-style-type: none"> Bekaa Valley and population centers upstream of known water sources
<u>Economic:</u> <ul style="list-style-type: none"> Increased costs to control and clean up pollution 	<ul style="list-style-type: none"> Enforcement of fines to provide economic disincentives Clean production & pollution prevention approaches to minimize contamination of surface & ground-water resources 	<ul style="list-style-type: none"> MoE&W, MoE, and municipalities 	<ul style="list-style-type: none"> See above
<u>Social:</u> <ul style="list-style-type: none"> Lack of public awareness on extent of pollution and effects on aquatic ecosystems 	<ul style="list-style-type: none"> Awareness and information campaigns targeting specific types of pollution perhaps on a watershed by watershed basis 	<ul style="list-style-type: none"> MoE&W, MoE, MoPH and municipalities, NGOs 	<ul style="list-style-type: none"> See above

Annex L – Current USAID Program Relationships to Forests and Biodiversity

Program/Project	End Date	Implementing Partner	Likely/Unlikely to Impact Biodiversity & Forests with Activities	Contacted during Assessment?
American Educational Institutions	On-going	American University of Beirut (AUB) Lebanese American University (LAU) International College (IC) American Community School of Beirut (ACS) Haigazian University (HU)	<i>Likely</i> , but small with opportunities to target specific scholarships for forest and biodiversity conservation foci; possible with students liking municipal conservation activities under the Center for Civic Engagement & community Service; Tree planting activities aimed at municipalities doing planting rather than NGOs; studies with medicinal and aromatic plant collection and use from a nutrition standpoint; some biodiversity monitoring linked to PhD dissertations	Yes
Rebuilding the Mudeirej Bridge	2009		<i>Unlikely</i> , Construction has environmental site and downstream impacts	No
Electoral Process in Lebanon	2009	IRI, NDI IFES	<i>Unlikely</i>	No
US Forest Service Partnership with USAID/Lebanon	On-going	USFS	<i>Likely</i> ; especially with USFS expressed interest in biodiversity; assistance with the National Strategy for Forest Fire Management	(Yes)
Lebanon Business Linkages Initiatives (LBLI)	2010	AED/ACDI-VOCA	<i>Likely</i> , Opportunities for SMEs to be linked with tourism; value chain standards; training linked to “green” Lebanon	Yes
Lebanon Education Assistance for Development (LEAD)	2010	CHF	<i>Unlikely</i> , but possible opportunities to link conservation awareness through extra-curricular field trips; youth environment clubs	Yes
Microenterprise Assistance/Lebanon Investment in Microfinance Program		VEGA/IESC	<i>Unlikely</i> , but does have indirect links via tourism and agribusiness enterprises and the opportunities exist for links to conservation	No

Program/Project	End Date	Implementing Partner	Likely/Unlikely to Impact Biodiversity & Forests with Activities	Contacted during Assessment?
Municipal Governance Assistance Program	2011	SUNY/Albany	<i>Unlikely</i> , but opportunities for partnerships through activities with local governments and planning/land use activities with large municipalities	No
Strengthen the Independence of the Judiciary and Citizen Access to Justice	2010	NCSC	<i>Unlikely</i>	No
Professional Training Program	2011	AMIDEAST	<i>Unlikely</i>	No
Solid Waste Management		CDM	<i>Unlikely</i> , but indirect downstream impacts possible related to freshwater ecosystems; use of composted materials on habitats; opportunities to address these	Yes
Towards Inclusive Development in Lebanon	2010	Mercy Corps	<i>Unlikely</i>	No
Wastewater Systems for Small Villages	2011	CDM	<i>Likely</i> , downstream impacts on environmental ecosystems & habitats will not decrease until domestic, industrial & agricultural waster water is successfully treated	Yes
Expanding Economic Opportunities for Survivors of Landmines and Victims of War	2012	WRF	<i>Unlikely</i>	No
Telecommunications Regulatory Authority (TRA)	2010	TRA	<i>Unlikely</i>	No
Transparency and Accountability Grants	2011	AMIDEAST	<i>Unlikely</i> , although civic actions with a forest and biodiversity, and/or conservation focus are an opportunity	No
Lebanon Agriculture Product Quality Control and Certification	2012	ACDI/VOCA	<i>Unlikely</i> , with exception of application of pesticide and organic certifications standards that will result in less pollution to groundwater and downstream freshwater ecosystems	Yes

Program/Project	End Date	Implementing Partner	Likely/Unlikely to Impact Biodiversity & Forests with Activities	Contacted during Assessment?
OTI Lebanon Project	2010	Chemonics	<i>Likely</i> , with the small grants linked to forest tree planting campaigns in municipalities	Yes
Municipal Capacity Building and Service Delivery Program	2011	CHF RI	<i>Likely</i> , with opportunities for municipalities to work with rural tourism, forest conservation and biodiversity awareness; reduction of pesticide use	Yes