

Hakgala Under Threat

A Review of Conservation Status and Management Needs



Environmental Foundation Ltd
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Abbreviations

ADB	Asian Development Bank
CR	Critically endangered
DS	Divisional Secretariat
DWLC	Department of Wildlife Conservation
EN	Endangered
FD	Forest Department
FFPO	Fauna and Flora Protection Ordinance
FR	Forest Reserve
GN	Grama Niladari
HSNR	Hakgala Strict Natural Reserve
IUCN	The World Conservation Union
PA	Protected Area
SNR	Strict Natural Reserve
VU	Vulnerable

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Background: setting the scene

Sri Lanka's forests: precious and threatened ecosystems

Sri Lanka has been named as one of the world's 34 biodiversity hotspots¹. Almost a fifth of the country's 850 or so known vertebrate animal species and more than a quarter of its 3,300 plant species are endemic. This means that they are native to the island and are not found naturally anywhere else.

Forest ecosystems, and the plant and animal species that are found in them, are of particular importance to Sri Lanka's biodiversity. The country has a striking variety of forest types due to the spatial variation in rainfall, altitude and soil. Seven forest ecozones have been defined for Sri Lanka²: wet montane, wet sub-montane, tropical wet lowland evergreen, tropical moist evergreen, tropical dry mixed, riverine and mangrove.

The categorisation of Sri Lanka as a global biodiversity hotspot not only indicates that the country contains an exceptionally high number of unique plant and animal species, but also that at least 70% of the natural habitats that these species inhabit have already been lost. In particular, the rate of habitat loss due to deforestation and land degradation gives cause for grave concern.

Sri Lanka's natural forest cover has dwindled from 80% to less than 16% over the last 100 years. At the end of the 19th century, more than 80% of the country was covered by forest; by the beginning of the twentieth century this had been reduced to 70%; in 1950 only half of the land area was forested; and by the beginning of the 1990s forests covered less than a quarter of the country³. According to the government, forest cover has shrunk a further 5% over the 1990s⁴. As we move into the 21st century, the threats to natural forests persist unabated and the national forest estate continues to be rapidly eroded.

In order to safeguard sites and species which are considered to be of overriding importance to the nation and the world in terms of their natural and cultural heritage, Protected Areas (PAs) have been set up by the Governments of Sri Lanka over the past 120 years. The different categories of PA in Sri Lanka include those which are strictly protected (and allow few or no human uses) as well as those which allow some level of human activity and use. Strict Natural Reserves (SNRs) represent the most protective PA management regime. SNRs are protected as pure natural systems where fauna and flora are preserved in their natural state, and no extractive land or resource uses are allowed in them. There exist just three Strict Natural Reserves in Sri Lanka: Hakgala, Ritigala and Yala Central, covering a combined area of only 316 km² or 3% of natural PAs in the country

Hakgala Strict Natural Reserve: a critical watershed and biodiversity hotspot

Hakgala Strict Natural Reserve (HSNR) is one of the nation's most important Protected Areas. It is the only SNR in the country at high altitude, and provides exceptional goods and services. Not only does HSNR contain unique and endangered biodiversity, it is also the critical watershed for the Uva Basin, which is one of the poorest areas in the country. In addition, the downstream Uma Oya river supplies Mahaweli systems B, C and E. Hakgala represents an extremely valuable combination of natural resources and ecological services that benefit local, regional, national and even international populations.

Despite being accorded the strictest protection by the State, HSNR has been progressively degraded over time, especially over the past 3 decades. Little decisive action has been taken by the Department of Wildlife Conservation (DWLC) or other relevant authorities to address the causes of environmental degradation and the resultant loss of vital goods and services. Rampant illegal encroachment (both within and outside the SNR boundaries) encouraged by powerful political groups, lies at the root of this environmental degradation. In many cases there



appears also to have been a deliberate attempt on the part of DWLC and other agencies to withhold information from the public, and to circulate misinformation which is designed to confuse the general public. The 'redrawing' of HSNR's boundaries on most of the maps available today, which show significant areas covered under the original gazette as now lying outside the boundaries of the protected area (when in reality no such degazettment has taken place), presents a clear example of such misinformation.



Photo 1: Hakgala Strict Natural Reserve – a global biodiversity hotspot

Taking action to conserve Hakgala

In 1988, EFL first filed action regarding illegal encroachment into Hakgala Strict Natural Reserve against the government department mandated to manage it – the Department of Wildlife Conservation. At this time, the DWLC claimed that they had been authorised to allow encroachments via a letter sent by the Secretary to the Ministry of State (this letter is presented in Annex 1: Documents relating to cases filed by EFL on HSNR). The Court duly ruled that this attempt to by-pass the legal provisions that afford HSNR the highest protection should be disregarded completely, and that all squatters within the boundaries specified in the gazette of 1938 should be evicted (also presented in Annex 1). Despite DWLC giving an undertaking in court to evict all squatters, they have subsequently taken no action.

During the period 1988 to 2002, the prevailing political uncertainty and security concerns in Sri Lanka were used as an excuse to undermine the Rule of Law in general, and scant regard was paid to PAs such as HSNR. Little progress was made in observing the earlier court decision. After the 2002 ceasefire agreement, these excuses could no longer be upheld. Although the general public had for a long time been aware of the rapid degradation of the Strict Natural Reserve, concerned citizens had until recently not been able to voice their worries or to seek redress for the environmental damage caused.



Early in 2005, EFL was once again in a position to respond to complaints received. Members of the communities who live around Hakgala and those dependent on its goods and services objected that the Strict Natural Reserve had been encroached and that local politicians and government decision-makers were either directly involved in these illegal acts or were allowing them to happen. EFL sent a small team from its Legal and Science Divisions to investigate these complaints and found that there was, indeed, a serious problem.

EFL, in July 2005, organised a national open forum on Hakgala Strict Natural Reserve and the problems it faces. This aimed to take these local concerns to the national level, and to bring them to the attention of key decision-makers and members of the conservation community. A policy paper was subsequently published by EFL in English, Sinhala and Tamil that outlined in detail the status, problems, consequences and required responses to the illegal encroachment of Hakgala and other protected watershed forests⁵. These actions received wide coverage in the national media, as well as stimulating an unprecedented response from the general public.

In response to the public calls for action, EFL has for the past two years been undertaking a programme of research, awareness-building and advocacy on the problems besetting Hakgala. A series of policy briefs and technical documents have been published, open forums have been convened, legal and mediation support has been provided, and court cases have been instigated which aim to halt illegal activities and bring offenders to book.

On the 23rd March 2006, a landmark national case citing the Department of Wildlife Conservation, Divisional Secretaries and other government institutions was filed in the Court of Appeal. This asked for further encroachments in HSNR to be halted immediately, and for the present encroachers in the HSNR as originally gazetted to be evicted. This case was successful, in that the respondents agreed by means of an undertaking in court to halt encroachments and evict the squatters.

However, despite escalating public concern about the state of Hakgala, and the court judgments in its favour, HSNR and the lands surrounding it continue to be encroached, deforested and degraded. This report is the first attempt ever to present a comprehensive technical and policy document on the value of Hakgala and the threats it faces, and to set out the management conclusions and recommendations as to the actions that are necessary to safeguard the SNR.

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¹ Conservation International. 2007. Western Ghats and Sri Lanka [Online]. Available from:

<http://www.biodiversityhotspots.org/xp/hotspots/ghats/Pages/default.aspx> [Accessed 8/10/2007]

² Ministry of Forestry and Environment. 1999. Biodiversity Conservation in Sri Lanka: A Framework for Action. Ministry of Forestry and Environment, Colombo.

³ Bogahawatte, C., 1999, Sri Lanka - Forestry Policy, Non-Timber Forest Products and The Rural Economy In The Wet Zone Forests. Environment and Economics Programme for Southeast Asia (EEPSEA) Research Report, IDRC, Ottawa.

⁴ NPPD, 2002, National Physical Planning Policy. National Physical Planning Department, Ministry of Western Region, Colombo.

⁵ EFL, 2005, Hakgala Strict Natural Reserve: is forest loss drying up our water? Environmental Foundation Ltd, Colombo



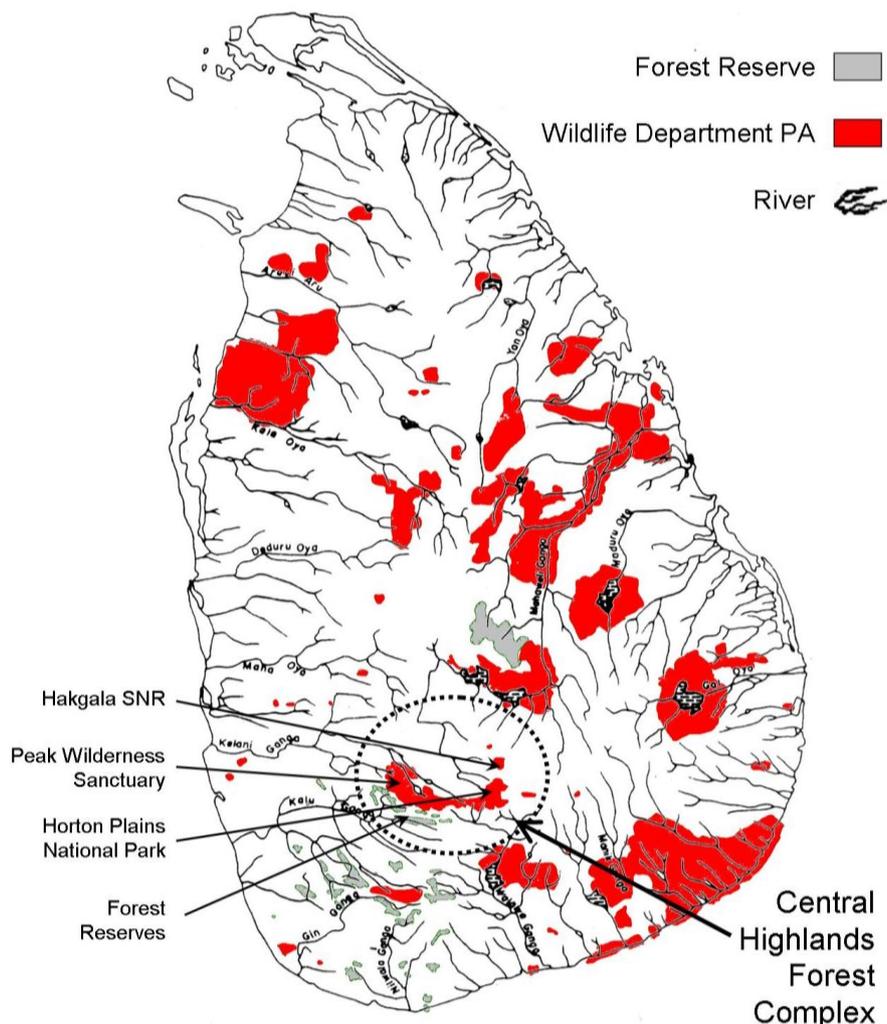
Biophysical and socio-economic conditions

Location

Gazetted in 1938, Hakgala was the first Strict Natural Reserve to be established in Sri Lanka. Hakgala Strict Natural Reserve is located in the Central Highlands Forest Complex in the south-central part of the country. HSNR is situated just southeast of Nuwara Eliya Town, in the administrative Districts of Nuwara Eliya and Badulla in Central and Uva Provinces respectively. The gazetted Strict Natural Reserve covers an area of 1,142 ha and extends between an altitude of 1,650 and 2,178 metres (or 5,400 - 7,150 feet).

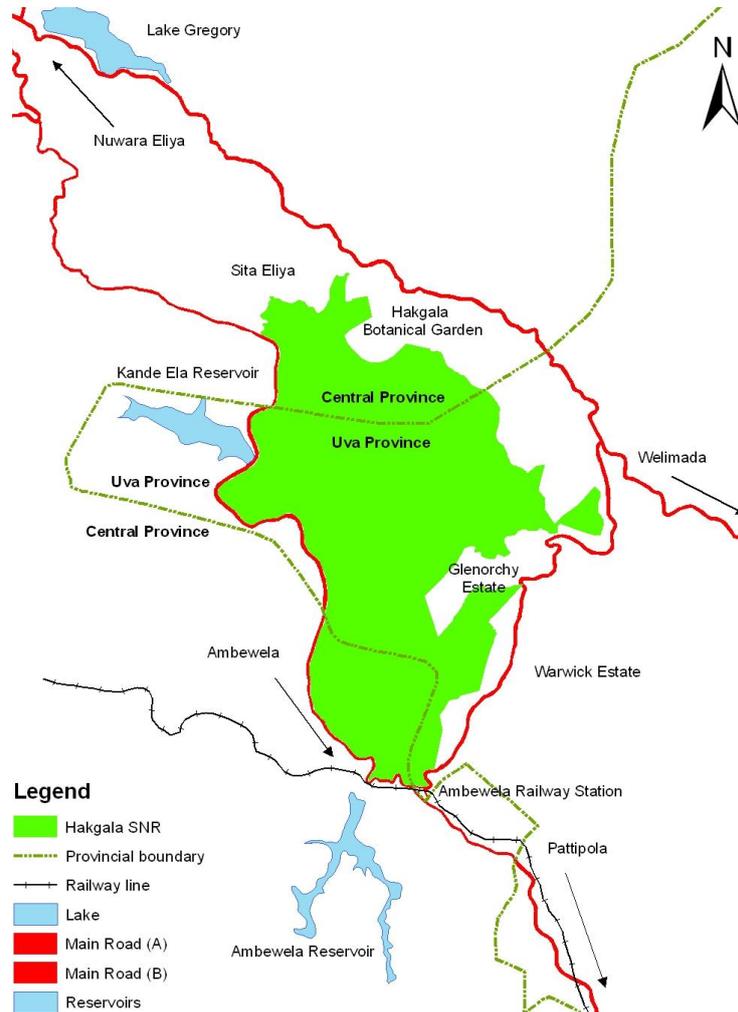
HSNR once formed part of a much larger contiguous forest block, which included the present-day Horton Plains National Park, Peak Wilderness Sanctuary and Knuckles Conservation Area. As shown on the map below, several PAs (including HSNR) have been established in the highland areas where the nation's rivers originate, or are located so as to protect key rivers and streams. The National Conservation Review, carried out in the mid-1990s, identified Hakgala (as part of the Central Highlands) to be of the highest national importance in terms of watershed protection¹.

Figure 1: Watersheds of Sri Lanka, showing HSNR and associated Central Highlands PAs



Mapped by EFL (2007). Source data: rivers from Ministry of Environment, protected area boundaries from DWLC and Forest Department data

Figure 2: Major landmarks around HSNR



Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Landuse data from UDA GIS Centre

Rainfall and climate

The average annual rainfall recorded in HSNR is 2,169 mm, spread over 213 days of the year. HSNR receives rain from both the south-west (June-September) and north-east (December-February) monsoons, during which periods – and especially between December and January – it is covered in thick mist for most of the day. This occurs even when there is no rain or mist recorded in Nuwara Eliya or Keppetipola (Palugama), two towns situated less than 10 km from Hakgala.

The rainfall in the south-west monsoon period is markedly higher than that of the north-east monsoon, possibly due to its topography and the relative proximity of HSNR to the line of the south-west monsoonal winds. The area experiences its heaviest rainfall in June and the lowest in February².

A cool climate prevails in the area due to its high altitude. The mean annual temperature recorded is 15.5°C, without marked seasonal fluctuations. However, there is a considerable diurnal temperature fluctuation, which is least during June-August because of the prevalence of clouds at this time of year.



Although night temperatures are very low at the beginning of the year, frost is a very rare occurrence at Hakgala. The driest period is February-March, when day temperatures are comparatively high and relative humidity and rainfall are low. This dry spell at the beginning of the year is strikingly illustrated in climatic diagrams drawn for the area.

Wind is one of the major climatic factors at Hakgala and is most prevalent during June/July, toward the end of the south-west monsoon. These desiccating winds may be responsible for the general appearance of the forest such as the abundance of short-statured, small-leaved trees with twisted and gnarled branches.

Topography, geology and soils

HSNR consists almost entirely of the Hakgala massif with its three prominent peaks which are among the highest in the country. The area belongs to the Highland Series of the Pre-Cambrian complex of Sri Lanka. The area consists of precambrian Archaic rock masses, composed mainly of charnockites and kondolites. The quartzites form prominent escarpments and ridges. Dark grey charnockitic gneiss occurs in great quantities. The charnockites are either metamorphosed sediments, metamorphosed basic volcanic rocks or both. The kondolite group is made up of metamorphosed sediments. Of the two groups, charnockites are the most resistant to weathering and erosion and stand in bold relief above the other rock types in most areas³.

The soils in the Hakgala SNR are reported⁴ to belong to the red yellow podzolic group with a dark 'A horizon'. Although red yellow podzolic soils are the dominant soils in the entire wet zone of Sri Lanka, this sub group of soils (those with a dark 'A horizon') appear to be confined to the Nuwara Eliya District at elevations above 1800m. The major characteristic of the group is the 6-10cm thick (sometimes more) dark A horizon, whose colour is a result of humus infiltration from above. These soils have a good crumb structure. Their pH values are generally below 6 (and often below 5.5), while their cation exchange capacity may be less than 10m per 100g of clay, and their base saturation values even lower.

Population

Hakgala SNR overlaps and is surrounded by nine Grama Niladari (GN) Divisions, in two Administrative Districts in two separate Provinces: Ambewala, Gorandihela, Meepilimana, Pattipola and Sita Eliya Divisions in the District of Nuwara Eliya in Central Province, and Alakolagala, Hulankapolla, Silmiyapura and Ambewela Divisions in the District of Badulla in Uva Province. The total population in these GN Divisions is almost 16,000 (Table 1). Of this population, about 1,200 people in 200 households are estimated to be living inside HSNR's boundaries (see below: Encroachment).

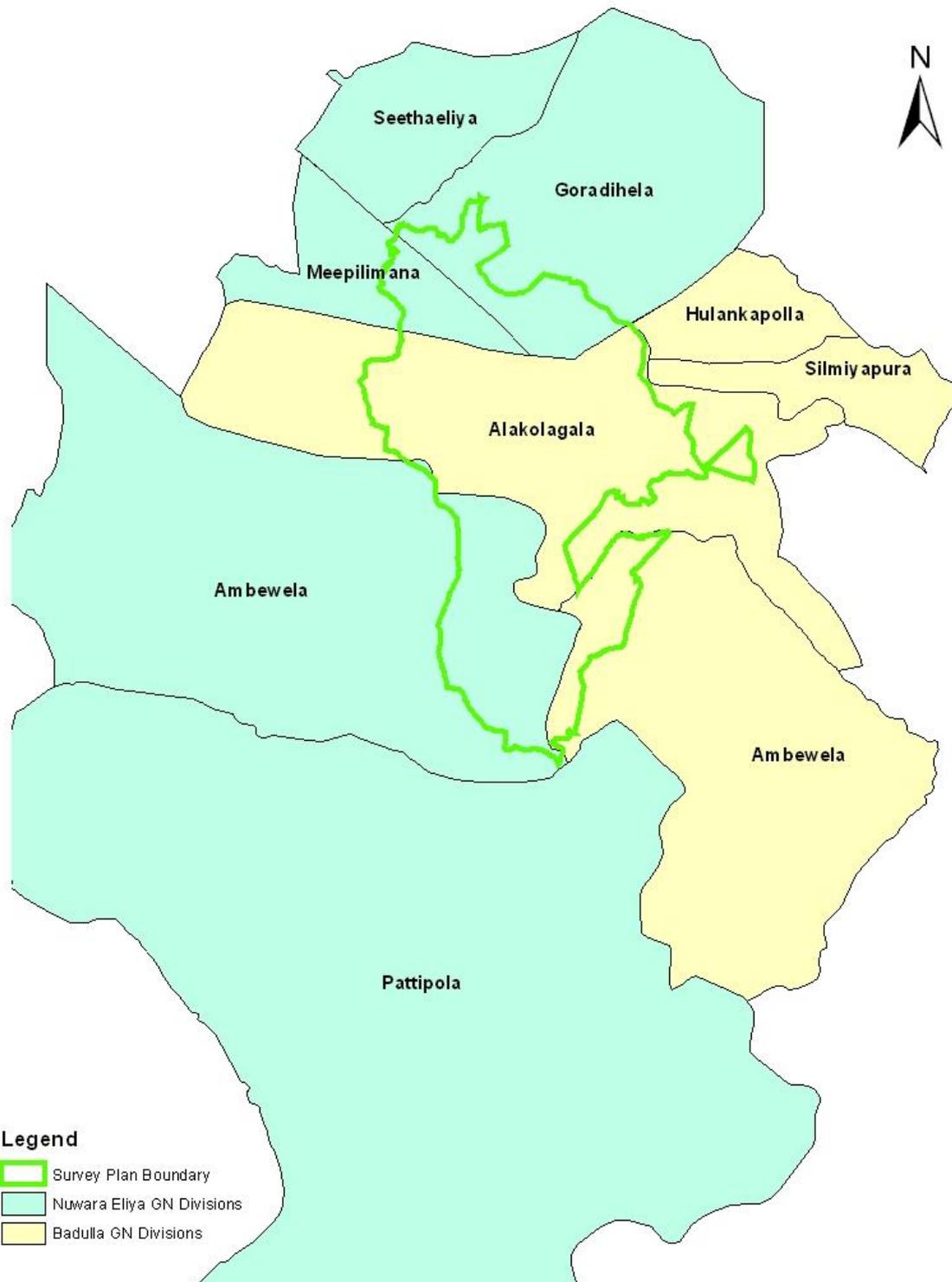
Table 1: Population in GN Divisions surrounding HSNR

District	DS Division	GN Division	Population	Households
Nuwara Eliya	Nuwara Eliya	Ambewela	763	206
		Gorandihela	1,409	376
		Meepilimana	1,895	467
		Sita Eliya	1,534	469
		Pattipola	1,615	367
Badulla	Welimada	Alakolagala	2,383	541
		Ambewela	2,200	504
		Hulankapolla	2,071	452
		Silmiyapura	1,771	372
TOTAL			15,641	3,754

Census of Population and Housing 2001a, Badulla District Final Results (CD). 2001. Department of Census and Statistics. Colombo; Census of Population and Housing 2001b, Nuwara Eliya District Final Results (CD). 2001. Department of Census and Statistics. Colombo



Figure 3: HSNR administrative boundaries



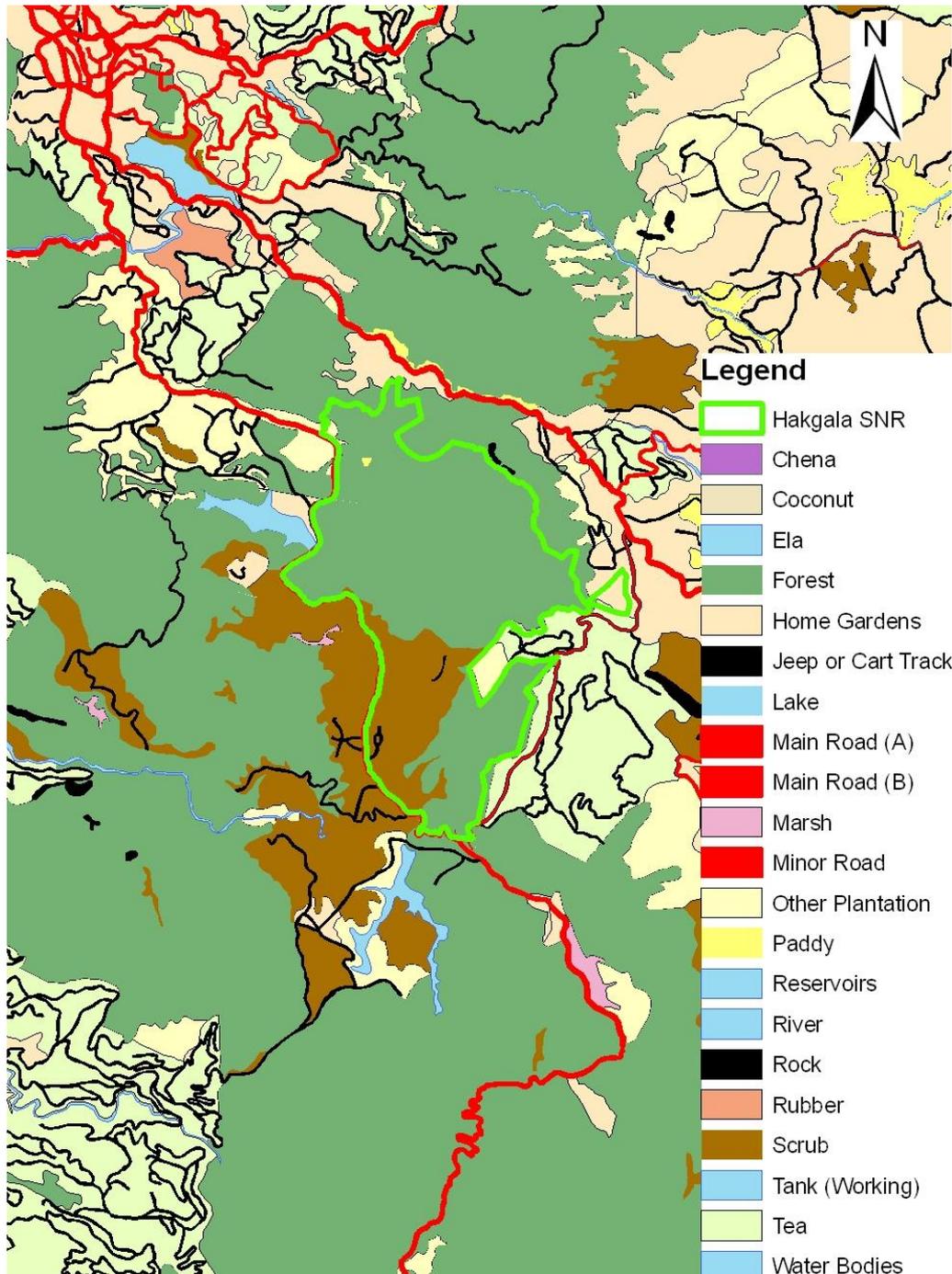
Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Landuse data from UDA GIS Centre



Land use

The land use in the area surrounding HSNR consists of forests, home gardens, Ambewela cattle farm, tea estates and other plantations, scrub and the Kande Ela reservoir (Figure 4). Various Forest Department reserves are located in the vicinity, including Meepilimana and Sita Eliya. Land owned by the Agricultural Department in Gorandihela, Hulankapolla, Silmiyapura and Alakolagala, among others, continues into the SNR forest.

Figure 4: Land use in and around HSNR



Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Landuse data from UDA GIS Centre



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¹ IUCN/WCMC. 1997. Designing an optimum protected areas system for Sri Lanka's natural forests, Vol: 1. IUCN and FAO.

² Wijesundara, D. S. A. 1991. Phytosociology of Hakgala Strict Natural Reserve. Faculty of Science, University of Peradeniya.

³ Wijesundara 1991 *op cit*

⁴ The description of soils and geology in the Hakgala area are taken from Wijesundara. 1991. *op cit*.

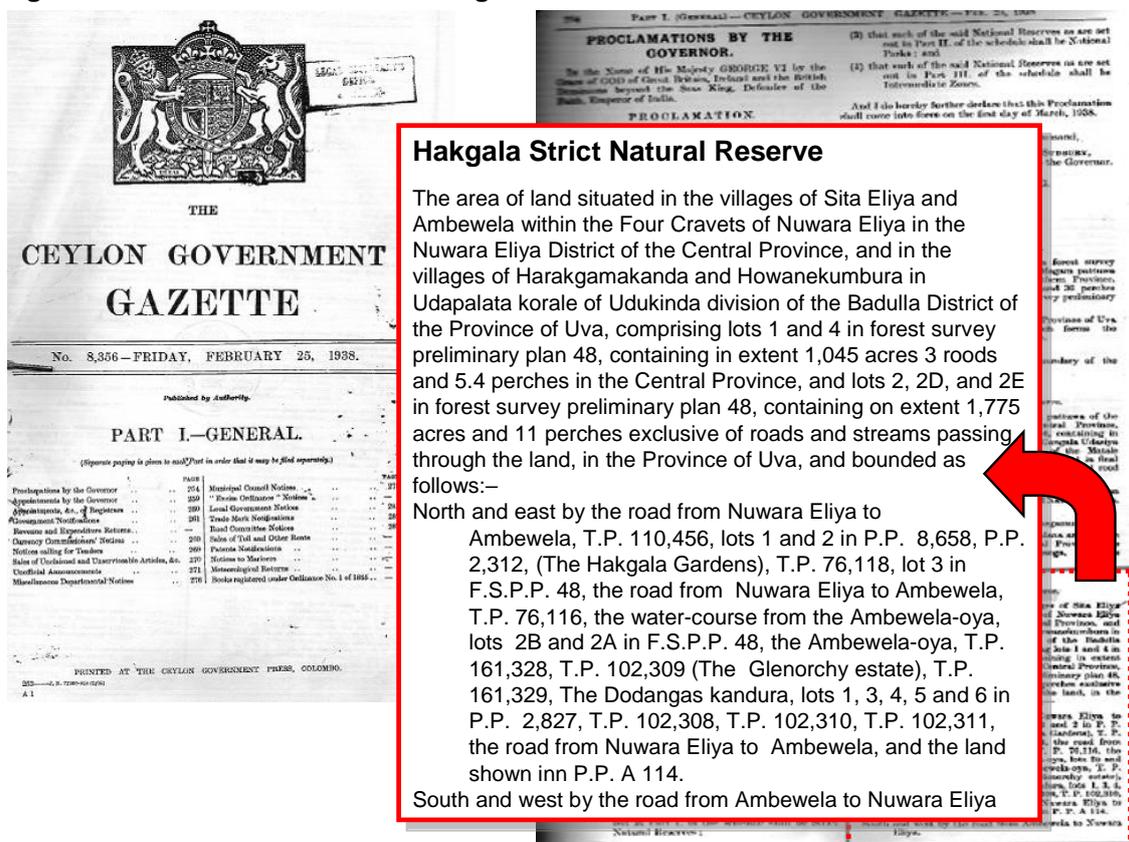


Management and regulations

National laws pertaining to HSNR and its surroundings

Hakgala is legally designated a Strict Natural Reserve under the Fauna and Flora Protection Ordinance No 2 of 1937 as amended, via Gazette Notification of 25 February 1938 (Figure 5). SNRs (of which there are only three in the country) are the most protected among the PA management category in Sri Lanka. They fall within Category I of IUCN's Global Protected Area Categories as "PAs managed mainly for science or wilderness protection (Strict Nature Reserves and Wilderness Areas)". No extractive land or resource use activities are allowed in SNRs, which are protected as pure natural systems where fauna and flora are preserved in their natural state.

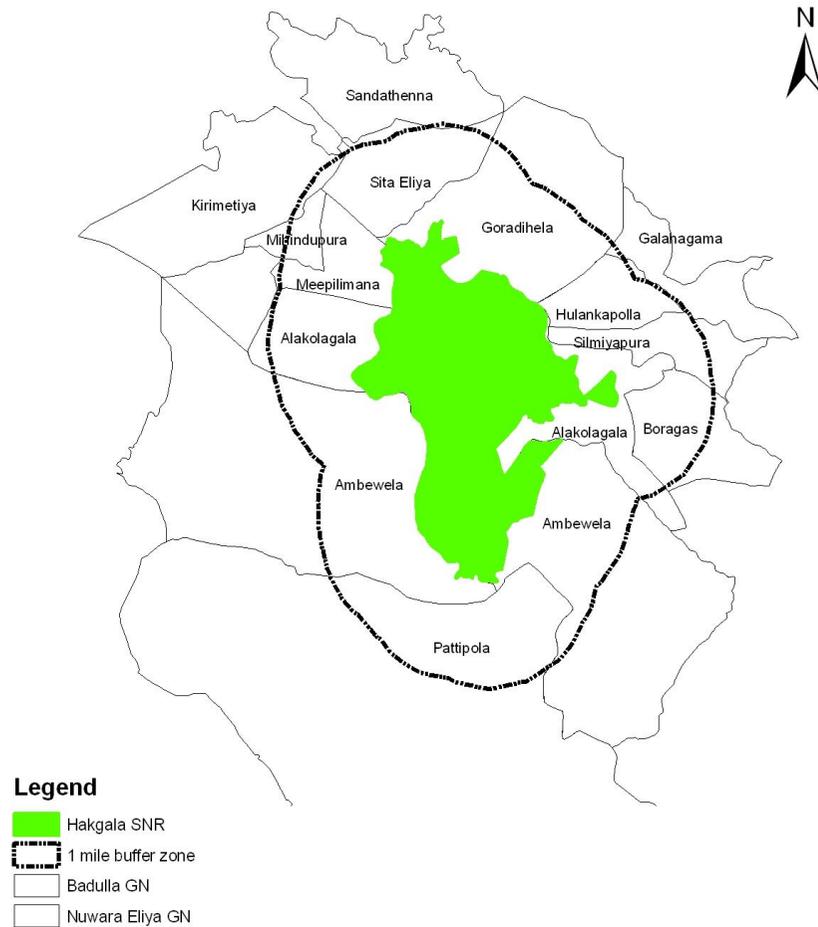
Figure 5: Gazette Notification for Hakgala Strict Natural Reserve



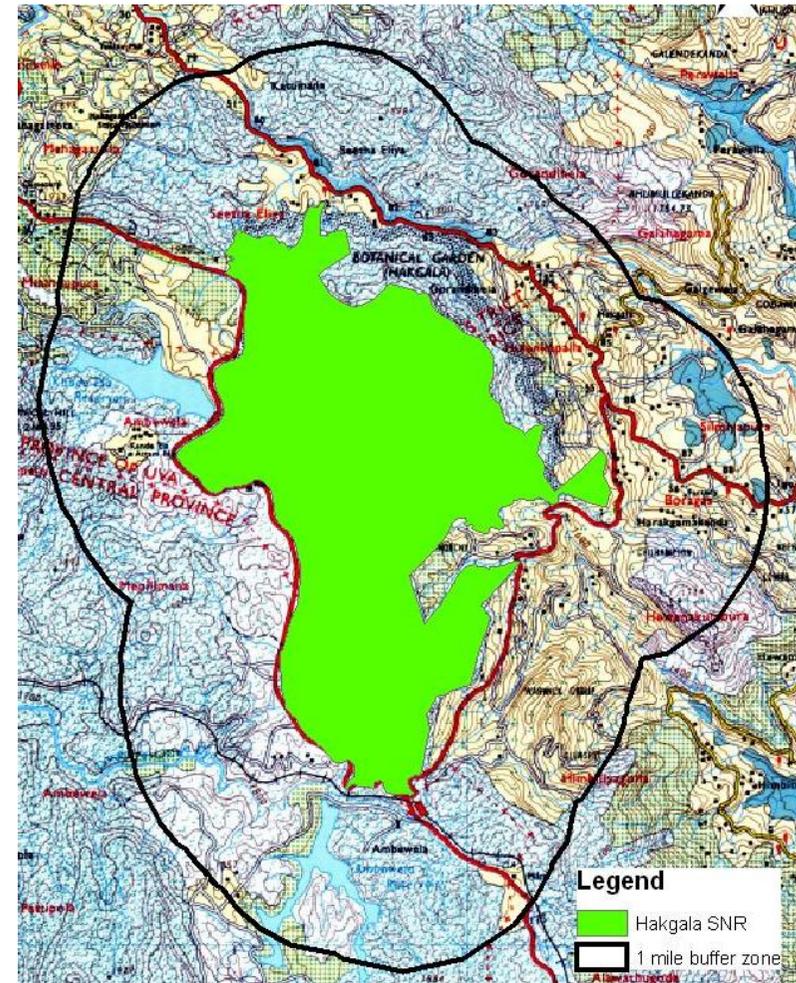
The Fauna and Flora Protection Ordinance No 2 of 1937 as amended prohibits any person from entering into any SNR, except with the written permission of the Director General of the Department of Wildlife Conservation, for the purpose of discharging any official duty or for authorised scientific research. It further states that no person can enter any SNR to disturb the fauna and flora therein or hunt, kill or take any animal or damage, remove, collect or destroy any plant in a SNR, kindle or carry any fire, make any fresh clearing, and clear or break up any land for cultivation or mining or any other purposes that are strictly prohibited within a SNR. Thus all human activities within a SNR are prohibited and are punishable offences under the Fauna and Flora Protection Ordinance. Similarly, constructing a hotel within a 1 mile radius of the boundary of any National Reserve (including SNRs) is strictly prohibited. Engaging in any other development activity within this 1 mile radius without permission from the DWLC is an offence under the Ordinance. Figure 6 shows the 1 mile radius around HSNR.



Figure 6: The one mile radius around HSNR



Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Buffer zone mapped using GIS (by EFL); Landuse data from UDA GIS Centre



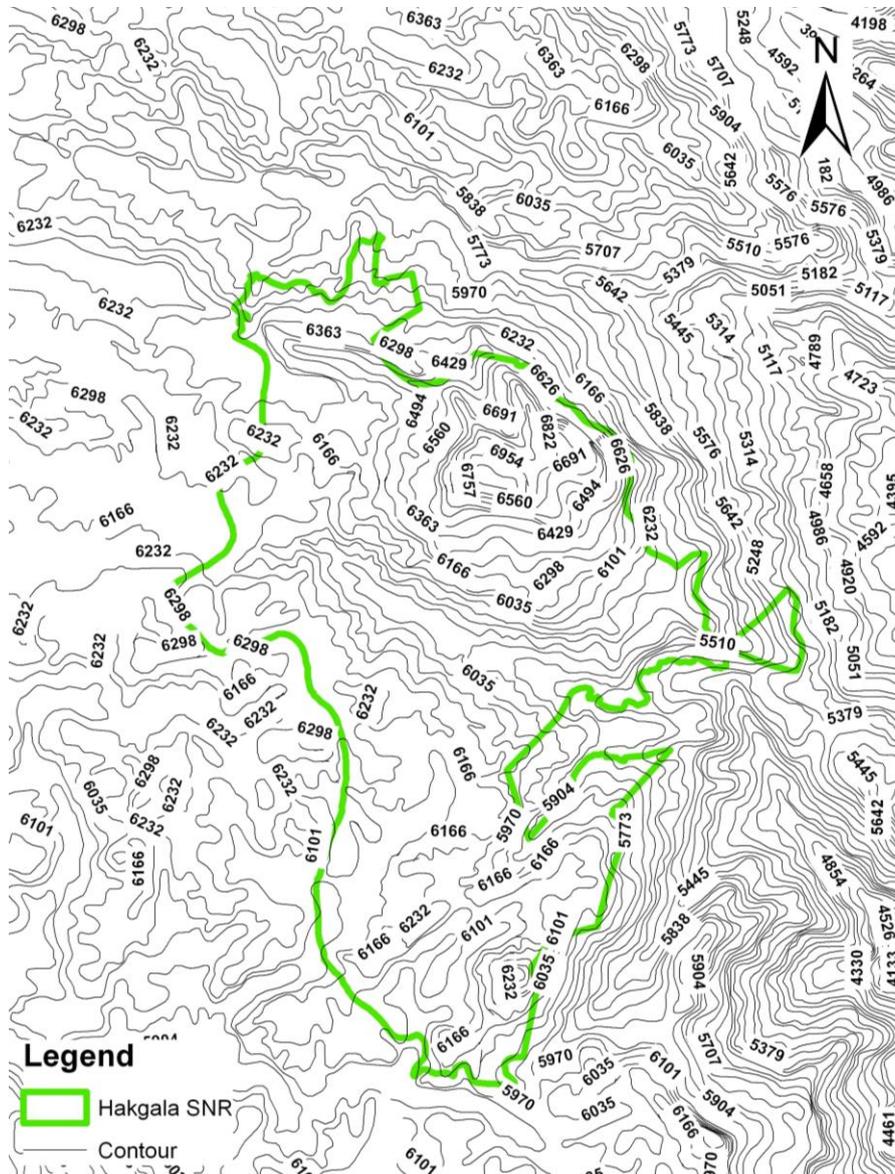
Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Buffer zone mapped using GIS (by EFL); Landuse data from UDA GIS Centre



Various other legal provisions also govern HSNR, and the land surrounding it, and are described briefly below:

The **Crown Lands Ordinance** of 1840 as amended (now the State Lands Ordinance No 8 of 1947) makes provision for the grant and disposition of State lands (such as land around HSNR) in Sri Lanka, for the management and control of such lands and the foreshore and for the regulation of the use of the water of lakes and public streams. Under the law, it is prohibited to grant, lease or otherwise dispose of State Lands above 5,000 feet in elevation — which includes the entire area of HSNR, and a large part of the surrounding Divisions (Figure 7). The law also provides for the Minister to declare any state land as a State Reservation for the prevention of soil erosion. It further says that the State is not liable to pay compensation for improvements effected on Reservations after commencement of the Ordinance. Any person who has been convicted for any offence committed on or upon State Reservation is in occupation or possession of that reservation, the Magistrate can make an order to eject the offenders in unlawful possession of State reservations under this Law.

Figure 7: Elevation in and around HSNR: all the land lies above the 5,000 foot contour



Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Landuse data from UDA GIS Centre



The **Forest Ordinance** No 16 of 1907 as amended defines as forests “all land at the disposal of the State”, by which lands which are not already under the jurisdiction of a specific State agency are governed by the provisions of the Forest Ordinance and under the purview of the Forest Department. Thus critical watershed areas all around HSNR are already forest land, and are additionally subject to the provisions of the Forest Ordinance as well as those of the Fauna and Flora Protection Ordinance under which the HNSR was declared. The Forest Ordinance too prohibits the clearance or breaking up of any forest land for cultivation, mining or any other purposes.

The **National Environmental Act** No. 47 of 1980 as amended specifically imposes a duty on the Central Environmental Authority to identify and protect critical watershed areas. This mandate includes HSNR.

The **Soil Conservation Act** No. 25 of 1951 as amended provides for the prohibition of exploitation and the control of forests and grasslands and the restriction of the use of other land in erodible areas. In general it is a law to provide for the conservation of soil resources, for the prevention or mitigation of soil erosion and for the protection of land against damage by floods and drought. The Minister has the power to make rules to be applicable either generally in all erodible areas or specially in any specified erodible area including requiring landholders to take measures to prevent or control erosion, restrict agricultural land use, and prohibit and control the exploitation of forest and grass resources.

The **State Land Encroachments Ordinance** No.12 of 1840 as amended furthermore makes provisions for the prevention of encroachments upon State Lands. Section 2 states that any person who enters into or takes possession of any land which belongs to the State without the permission of the Government, is guilty of an offence. Section 7 says that all forests, wastelands, unoccupied or uncultivated lands shall be presumed to be the property of the State until the contrary is proved.

Under the **Land Development Ordinance** No 19 of 1935 as amended, any person who clears or breaks up for cultivation, cultivates, erects any building or structure, fells or destroys trees, or otherwise encroaches on State Land shall be guilty of an offence.

The **Police Ordinance** No 16 of 1865 as amended establishes the Police Force for the protection of persons and property. It is the duty of a police officer to use his or her best endeavours and ability to prevent all crimes, offences and public nuisance, apprehend disorderly and suspicious characters, and to detect and bring offenders to justice.

On-the-ground management by DWLC

As a Strict Natural Reserve, HSNR is under the jurisdiction of the Department of Wildlife Conservation. A management plan for the period 1999-2003 was published by the DWLC in 1999¹. This states that the overall management goal for HSNR is to preserve its biodiversity. The plan hopes to achieve this long-term goal through the following objectives:

- Maintain the integrity of the SNR and to prevent further encroachments on the SNR land
- Reduce the pressures of fuelwood collection, poaching and other illegal activities
- Promote limited nature tourism to make people aware of the scenic beauty and other natural resources of the SNR.

The DWLC has 7 staff members whose duty it is to protect HSNR. These include a wildlife ranger, 2 assistant wildlife rangers and 4 guards. Approximately Rs 1.8 million was spent in 2006 for staffing, while Rs. 200,000 was allocated for educational programmes for school children, government officials and local communities – figures which vary annually. Staff are



reimbursed for travel expenses in addition to being given an allowance for travelling. In addition to this, a pickup truck and driver, and a motorcycle, are also allocated. Approximately 220 litres of fuel is usually allocated for the vehicles translating to approximately Rs. 360,000. The budget of the SNR varies annually, and approximately Rs. 0.8 million is allocated for upkeep and maintenance of the SNR, excluding staff costs. The total budget allocated by the DWLC for conserving and securing the SNR thus translates to approximately Rs. 3 million annually or SLRs 2,600 per hectare per year, based on 2006 figures.



Photo 2: View of HSNR from a nearby tea estate

References and notes to this chapter

¹ Pabla, H. S and Mathur, V. B. 1999. Management Plan: Hakgala Strict Natural Reserve. Department of Wildlife Conservation, Colombo.

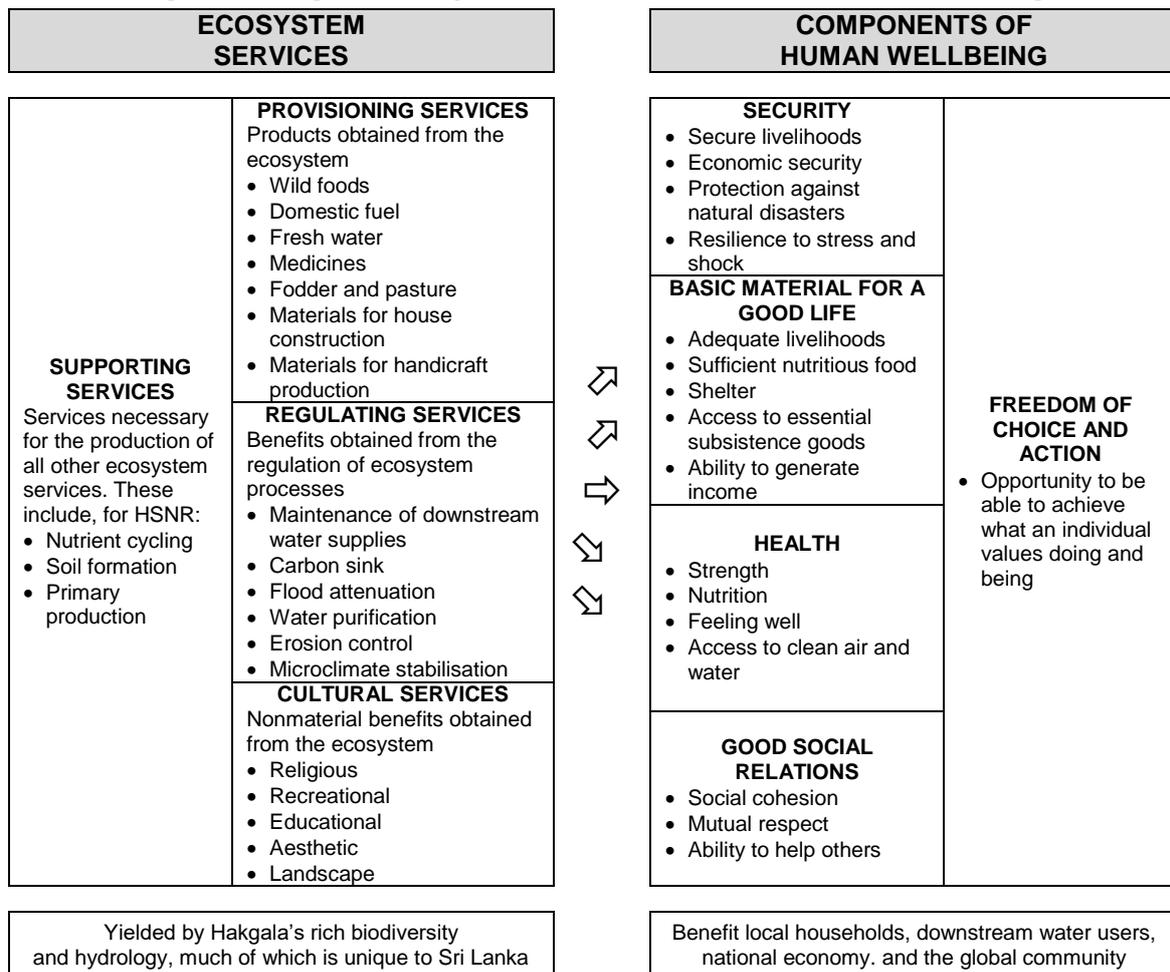


The value of Hakgala

Ecosystem services and their links to human well-being

Hakgala’s rich diversity of fauna and flora yields a wide range of valuable ecosystem services to local, national and even global populations. Ecosystem services are linked directly to human wellbeing, as described in the recent Millennium Ecosystem Assessment¹. It is possible to identify a wide range of supporting, provisioning, regulating and cultural services which contribute to human wellbeing. These services depend on the presence, and continued conservation, of Hakgala Strict Natural Reserve and surrounding areas (Figure 8). The value of the ecosystem services associated with Hakgala’s biodiversity are described below.

Figure 8: Hakgala’s ecosystem services: their links to human wellbeing



Biodiversity

HSNR is a unique and species-rich forest with a very high conservation value. It lies in the wet montane forest ecozone of Sri Lanka, and is classified as a Ceylonese Monsoon Forest. Wet zone forests such as Hakgala are exceptionally rich in biodiversity and high in endemism. At a national level, all of the endemic genera and over 90% of woody endemic species occur in these forests, as well as about three quarters of the endemic animals found in Sri Lanka² and over a third of endemic trees, shrubs and herbs. Many of the endemic vertebrate species in Hakgala are also ‘geographic relicts’, and reflect ancient environments which prevailed in Sri Lanka — further emphasising the evolutionary significance of HSNR. New and ongoing surveys



have revealed a plethora of additional new species limited to the montane forests³, demonstrating that this area's biodiversity is even more important globally than previously thought.

The WorldWide Fund for Nature (WWF) refers to Sri Lanka's montane rainforests (categorised as an important component of the Tropical & Subtropical Moist Broadleaf Forests Ecoregion) as "super hotspots", on a global scale, in terms of their endemism. The National Conservation Review, carried out by the Forest Department and IUCN in the mid 1990s, has identified the Central Highland Region, including HSNR, as one of eight units of contiguous forest that harbour much of the species diversity in the island. Hakgala, together with the adjacent Meepilimana Forest Reserve has also been categorised as one of the 70 Important Bird Areas in Sri Lanka, classified in accordance with international criteria formulated by BirdLife International. The classification recognises that this area contains globally threatened species, restricted-range species and biome-restricted species⁴. The Sri Lanka Steering Committee set up to identify Important Plant Areas has identified Hakgala as one of the 30 sites in the country suitable to be classified under the programme.

Review of faunal diversity

Table 2: Vertebrate fauna of HSNR and their conservation status⁵

	Total Species	Endemic Species		Extinct		Endangered (EN)		Vulnerable (VU)		EN+VU	
		Total	%	Total	%	Total	%	Total	%	Total	%
Amphibians	13	11	84.62	3	23.08	5	38.46	0	0.00	5	38.46
Reptiles	13	12	92.31	0	0.00	2	15.38	1	7.69	3	23.08
Birds	72	13	18.06	0	0.00	4	5.56	7	9.72	11	15.28
Mammals	25	7	28.00	0	0.00	8	32.00	6	24.00	14	56.00
Total	123	43	35	3	2	19	15	14	11	33	27

Data from EFL's species database (a collection of published information already cited).

EFL's review of literature (updating earlier lists produced by UNEP-WCMC) covered available scientific papers, books, management plans and databases to ensure that all recorded species were noted. Among the literature reviewed included a comprehensive study on the faunal diversity of HSNR by Bambaradeniya and Ranawana in 1998, NCR Database⁶, the IUCN Directory of South Asian Protected Areas⁷ and the Hakgala SNR Management Plan⁸. The levels of threat to all species have been updated using the latest IUCN Red List 2007⁹. There is little or no information about the freshwater fishes and invertebrates in HSNR, and therefore these are not included in this section.

The EFL literature review identified a total of 123 vertebrate species found in HSNR, which include 13 amphibians (of which 38% are threatened), 13 reptiles (23%), 72 birds (17%) and 25 mammals (56%). Of equal significance is the fact that HSNR hosts a total of 39 endemic vertebrate species, including 8 endemic amphibian species (62% of all amphibian species found in HSNR), 12 endemic reptile species (92%), 12 endemic bird species (17%) and 7 endemic mammal species (28%). A complete species list, including both fauna and flora, is in Annex 3: Species lists.

Fauna found in HSNR include a variety of endemics such as the Sri Lanka Toque Monkey *Macaca sinica*, Sri Lanka Purple-faced Leaf Monkey *Trachypithecus vetulus*, Spiny Mouse *Mus mayori* (VU, relict¹⁰), Nillu Rat *Rattus montanus* (EN), Bicoloured Rat *Srilankamys ohiensis* (EN, relict) Long-tailed Shrew *Crociodura miya* (EN) and Pearson's Long-clawed Shrew *Solisorex pearsoni* (EN, relict), of which all except the toque monkey is threatened. Other threatened mammals include the leopard *Panthera pardus* (VU), Fishing Cat *Prionailurus viverrinus* (EN), Eurasian Otter *Lutra lutra* (EN), Sri Lanka Flamed-striped Jungle Squirrel *Funambulus layardi* (VU), Dusky-striped Jungle Squirrel *Funambulus sublineatus* (VU), Large Ceylon Flying Squirrel *Petaurista philippensis* (EN), Giant Squirrel *Ratufa macroura* (VU) and Kelaart's Long-clawed Shrew *Feroculus feroculus* (EN). In terms of conservation the Nillu Rat, Bicoloured Rat, Long



Tailed Shrew and Pearson's Long-clawed Shrew are vital as these species are both endemic and endangered.

Amphibian species include endemics such as Kelaart's Dwarf Toad *Adenomus kelaartii*, Sri Lankan Narrow-mouthed Frog *Microhyla zeylanica* (EN), Half-webbed Pug-snouted Frog *Ramanella palmate* (EN), Sri Lanka Paddy Field Frog *Fejervarya greenii*, Microtympanum Tree Frog *Philautus microtympanum* (EN), Common Hour-glass Tree Frog *Polypedates cruciger*, Saddled Tree Frog *Polypedates eques* (EN) and Conical Wart Pygmy Tree Frog *Philautus schmarda* (EN). It is noteworthy that Gunther's Shrub Frog *Philautus variabilis*, the White-nosed Tree Frog *Philautus leucorhinus* and the Pointed Snout Shrub Frog *Philautus nasutus* are all now classified as extinct in the 2007 IUCN Red List for Sri Lanka, even though there was inadequate surveying of the habitat in which they were most likely to be found.

Of the 13 reptiles found in HSNR, 12 (92%) are endemic. Endemic species include the Black-lipped Lizard *Calotes nigrilabris* (VU), Rhino-horned Lizard *Ceratophora stoddartii* (relict), Pygmy Lizard *Cophotis ceylanica* (EN), Boie's Roughside *Aspidura brachyrorrhos* (relict), Common Roughside *Aspidura trachyprocta* (relict), Sri Lanka Krait *Bungarus ceylonicus*, Smooth Lanka Skink *Lankascincus taprobanense*, *Sphenomorphus striatopunctatus*, Blyth's Earth Snake *Rhinophis blythi*, Black-bellied Shield Tail, *Uropeltis melanogaster*, Millard's Hump-nosed Viper *Hypnale nepa* (relict) and Gloyd's Hump-nosed Viper *Hypnale walli* (EN, relict). In terms of conservation the Pygmy Lizard and Gloyd's Hump-nosed Viper are vital as they are both endemic and endangered.

Avifauna is varied and of high endemism. Of the total 72 recorded in HSNR 12 (17%) are endemics. Noteworthy species include the endemics Sri Lanka Wood Pigeon *Columba torringtoni* (VU), Sri Lanka Blue Magpie *Urocissa ornate* (VU, relict), Sri Lanka Bush Warbler *Bradypterus palliseri* (relict), Sri Lanka Dull Blue Flycatcher *Eumyias sordida* (VU), Sri Lanka Whistling Thrush, *Myiophoneus blighi* (EN, relict), Scaly Thrush *Zoothera dauma* (EN), Spot-winged Thrush *Zoothera spiloptera* (relict), Sri Lanka Spurfowl *Galloperdix bicalcurata*, Sri Lanka Junglefowl *Gallus lafayetti*, Black-throated Munia *Lonchura kelaarti*, Yellow-eared Bulbul *Pycnonotus penicillatus* (VU, relict), Orange-billed Babbler *Turdoides rufescens* (VU) and Sri Lanka White-eye *Zosterops ceylonensis*. Of these species, the conservation of the Sri Lanka Whistling Thrush and the Scaly Thrush are vital as these species are both endemic and endangered. Other species that are of urgent conservation concern include the endangered Pacific Swallow *Hirundo tahitica domicola* and the Eurasian Blackbird *Turdus merula*.

Review of Floral Diversity

Table 3: Flora of HSNR and their conservation status

Total Species	Total Families	Endemic Species		Extinct		Critically Endangered (CR)		Endangered (EN)		Vulnerable (VU)		CR+EN+VU	
		%	Total	%	Total	%	Total	%	Total	%	Total	%	Total
163	61	57	34.97	2	1.23	4	2.45	2	1.23	13	7.98	21	12.88

Data from EFL's species database (a collection of published information already cited).

EFL's review of literature included consideration of a comprehensive study by Wijesundara¹¹, Rathnayake et al¹², Punyalal and Ranasinghe¹³, NCR Database¹⁴, the IUCN Directory of South Asian Protected Areas¹⁵ and the Hakgala SNR Management Plan¹⁶. It identified a total of 163 floral species, belonging to 61 families. Of these a minimum of 57 species (35%) are considered to be endemic, this figure is expected to be higher as the endemism of some species was not noted in some of the reviewed papers, and in some checklists. Of vital importance are the 4 endemics *Syzygium sclerophyllum*, *Hedyotis marginata*, *Lasianthus varians* and *Neurocalyx gardneri* that are critically threatened in Sri Lanka but still found in HSNR. A complete species list, including both fauna and flora, is in Annex 3: Species lists.

Several studies have been carried out on the flora of HSNR. The Management Plan for HSNR¹⁷ identified 7 categories of vegetation cover: dwarf forests in ridge tops, upper montane rain



forests (moderately disturbed), upper montane rain forests (severely disturbed), wet patana grass lands, shrub community, wetland flora (riverine forests and open vegetation community) and plant communities in specialised habitats (epiphytes, lithophytes, parasites etc).

According to the study by Wijesundara¹⁸ (the most comprehensive study to date on the floral species of HSNR), the most dominant species were *Syzygium revolutum*, *Psychotria bisculata* (*Psychotria zeylanica*), *Allophylus varians* (*Allophylus zeylanicus*), *Michelia nilagirika* and *Memocylon parvifolium*. The dominant species in the canopy were *Syzygium revolutum*, *Michelia nilagirika*, *Semecarpus coraceae* and *Canthium montanum* (*Canthium montanus*). In the sub-canopy the dominant species were *Memocylon parvifolium*, *Cinnamomum ovalifolium*, *Neolitsia fuscata* and *Symplocos loha* (*Symplocos cochinchinensis*). In the understorey *Psychotria bisculata* (*Psychotria zeylanica*), *Allophylus varians* (*Allophylus zeylanicus*) and *Eugenia mabaeoides* were dominant¹⁹.

Other studies have concentrated on certain habitats and species, finding different levels of diversity and endemism for various habitats. The pigmy forest (at an elevation of 2000m) of the SNR has 18 floral species (belonging to 13 genera and 8 families) in the overstorey, and 41 species (of 35 genera and 25 families) in the understorey. A total of 16 species are found in both. *Syzygium sclerophyllum* was the most dominant in both storeys. A total of 42 species were found in the pigmy forest. The understorey is floristically richer than the overstorey. The study also found that 12% of the identified species were medicinally important²⁰.

A study on the floristic diversity of woody perennials in HSNR has identified 88 woody plant species, belonging to 65 genera and 36 families. According to this study, there is no evidence of single species dominance in trees. The study also notes that no major tree communities were observed at the lower elevation, but a community of *Syzygium umbrosum*, *Eugenia mabaeoides* and *Callophyllum walkeri* is found at canopy level near the peak. There are four dominant species of saplings, *Psychotria zeylanica*, *Psychotria nigra*, *Maesa perrottetiana* and *Lasianthes liganthus*, of which *Psychotria zeylanica* appears sometimes to be a dominant single species²¹. The study on the pigmy forest near the summit of the Hakgala SNR has identified that 32% of the 43 identified species were endemic²², while the study on woody perennials of the SNR has identified that of 88 woody plant species, of which 44% are endemic²³.

Notable medicinal plants include *Semecarpus coriacea*, *Centella asiatica*, *Asparagus falcatus*, *Acronychia pedunculata*, *Evodia lunu-ankenda*, *Toddalia asiatica* and *Symplocos cochinchinensis*, while *Cinnamomum ovalifolium* is a crop wild relative.

Review of needs for further research

It should be noted that the EFL literature review revealed inconsistencies, questions and data gaps in publications on the fauna and flora of HSNR. For example, of the 163 floral species identified for Hakgala, the species *Sophora zeylanica* is now stated as being extinct by the IUCN 2007 Red List for Sri Lanka, despite having been noted to be present in 1991 (Wijesundara 1991). As mentioned above, the literature also raises questions as to the presence of three of the endemic amphibian species.

Other recent studies, although providing extremely useful information, focus on particular taxa, areas or conditions which are not necessarily representative of the biodiversity of HSNR as a whole. For example, the study of flora carried out by Wijesundara (1991) focuses only on undisturbed sites in the SNR; that undertaken by Bambaradeniya and Ranawana (1998) is specific to vertebrates, and is based on transect surveys around predetermined trails/footpaths.

Overall, there remains a severe lack of up-to-date information on the fauna and flora of Hakgala, with the last major studies having been carried out in the late 1990s. HSNR has undergone a variety of changes since then, including those resulting from anthropogenic influences. Given the high species diversity shown by work carried out in nearby areas by the Protected Area



Management project, there is no doubt that that additional species are also found in HSNR beyond those currently recorded.



Photo 3: A stream flowing from HSNR

Hydrology

Hakgala is a montane cloud forest²⁴. One of the special characteristics of cloud forests is the unique role that they play in 'adding' water to the hydrological cycle via fog deposition. Hakgala also provides other water supply services, including its contribution to downstream water quality, flow and precipitation. The National Conservation Review identified Hakgala (as part of the Central Highlands) to be of the highest national importance in terms of watershed protection²⁵. At least 5 major water courses rise in and around HSNR, which are tributaries of the Uma Oya. The Uma Oya is estimated to have a total catchment area of 740 km², and forms one of the main tributaries of the great Mahaweli Ganga²⁶. The Hakgala sub-catchment of 2,000 ha is the most significant of the 9 sub-catchment areas contributing to the Uma Oya catchment.

Precipitation

Hakgala Strict Natural Reserve receives rain through various processes. Orographic rain generation (mountain effect) is the most important source of rain to HSNR. The water that evaporates from land and sea is taken up as clouds high up to Hakgala, where the cooler temperatures associated with the high elevation causes condensation, resulting in rain. In the case of Hakgala, the maximum mountain effect takes place. These high mountains are also referred to as 'water towers' as they provide water to a large area, as explained below.

HSNR additionally receives rain from the south-west monsoon (May-September) and north-east (December-February) monsoons and also during the inter-monsoon period. Thunderstorms also provide water to HSNR but this can occur even without the presence of mountains.

Fog deposition

Hakgala is extremely important because of the role it plays in promoting fog deposition. Cloud forests capture or trap the many tiny fog droplets that condense on their vegetation through a



process called 'horizontal precipitation'. This increases gross precipitation, because of 'crown drip' and 'stem flow', adding 'extra' water to the hydrological cycle, which is not measured by standard rain gauges. The forest cover is rich in epiphytes with mosses and filmy ferns covering stems and branches and lichens hanging from twigs. All these tend to capture fog driven horizontally by the wind, which then falls onto the ground as water droplets (throughfall) thus complementing the moisture input by rainfall. In certain areas, particularly in the dry season, more water reaches the ground through this process than from rain.

This process continues throughout the year, and even in the absence of rain. Cloud forests play a particularly significant role in the regulation of streamflow over the year, and especially in the maintenance of dry season flows. Although no detailed studies specific to the hydrological aspects of the Hakgala SNR have been carried out so far, research in Horton Plains and other montane forests of the same elevation are used in this report and are believed by experts to be applicable to HSNR^{27, 28}. Hydrological studies carried out between 1993-1996 to understand and quantify the different hydrological processes in the montane forest areas established that well-distributed high intensity rainfall supplemented by frequent cloud deposition ensures that water is available and uniformly distributed throughout the year, thereby sustaining the most important tributaries of nearby rivers²⁹. Since the wetness of Hakgala throughout the year is apparent, and Hakgala not only peaks at a similar altitude to Horton Plains but also has a relief which is based on a series of steeply rising peaks that rise to a much higher elevation than surrounding areas, it can safely be assumed that fog deposition is even more significant here.

Fog deposition is critically dependent on the type of vegetation, and deforestation or other processes which denude natural vegetation will undermine this important process. Deforestation of montane cloud forests such as Hakgala has been shown to decrease streamflow during the dry season³⁰. For example, studies conducted in Horton Plains found that fog interception by high altitude forest accounted for almost half of total precipitation during dry months; there was "conclusive evidence that the increase in tree cover could positively contribute to the water yield in the catchments in addition to its protective role of the environment"³¹.

Hydrological importance

Hakgala, like the Horton Plains, serves as a watershed where all the hydrological processes occur³². Hakgala's topography consists of hills and valleys. As well as being a cloud forest, it also acts as a 'water tower' (Figure 9). Hakgala creates a rainshadow in the Uva basin for the south-western monsoon rains, which generally last from May-September. Its mountains capture all moisture from the south-west. On the other side of the Uva valley, the Namunukula range acts as a rainshadow, resulting in the prevalence of drier conditions in the Uva region. Hakgala is hydrologically important as it is critical to the supply of water to the Uva Basin in Badulla District. The water from HSNR is also drained to the Uma Oya, which supplies water to the Rantambe reservoir and systems B, C and E of the Mahaweli Scheme. In addition to the water tower effect, fog precipitation provides water throughout the year.

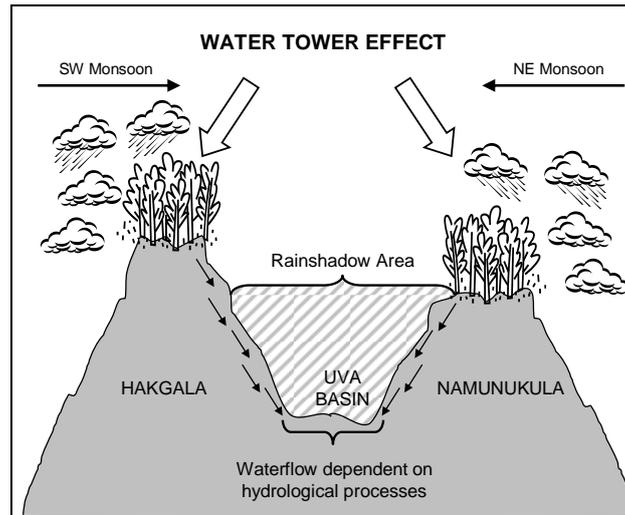
The steep slopes in Hakgala are covered with a thin layer of soil; probably not exceeding 2 meters in depth. This soil also contains much organic matter from the virgin forest. Soil profiles with high organic matter content have lower bulk density. Low bulk density together with sandy loam soil in the upper layers is responsible for high infiltration. Therefore the net rainfall (i.e., rainfall + cloud deposition – interception) reaching the soil goes directly into the soil rather than accumulating on the surface, thus reducing surface runoff. In other words, the soils under natural forest cover are being formed in such a way as to direct the water into the soil profile rather than sending it over the surface, thus preventing soil erosion.

The forest has the highest basic infiltration rate followed by natural grassland. The presence of clay in the subsurface layers results in low hydraulic conductivity of the soil at this level. Therefore water which enters vertically into the soil profile moves laterally over the layers with low hydraulic conductivity, and in this way any water that goes into the soil is thus stored in an 'underground reservoir' from which it is released gradually into nearby streams in the Uma Oya

area. Thus streamflow is maintained throughout the year, since there is considerable groundwater recharge and storage.

When natural vegetation and soil is removed, the water holding capacity decreases, resulting in more water flowing during a shorter period of time. In addition, the removal of natural vegetation will also reduce fog deposition and the total amount of water available downstream is reduced significantly. In downstream valleys the soil that is washed away from slopes collects and, together with the thick layer of organic matter accumulated there, the soil can hold quite a large quantity of water, with or without vegetation, tending to become waterlogged.

Figure 9: Hakgala: a critical watershed for the Uva Basin and the Uma Oya



Water quality

Studies of the water quality of rain and fog in Horton Plains³³ are likely to apply also to HSNR. They reveal that rain water is near neutral in pH. When the average values of fog and rainwater acidity were compared, acidity of fog was about 35 times higher than that of rain. This is due to the fact that rain drops have an average diameter of 0.5 mm in contrast to fog drips which have an average diameter of less than 0.05 mm. It is therefore surmised that relatively more chemicals adhere to the outer surface of fog droplets than raindrops since fog droplets have a higher surface area per volume than do raindrops. Hence risk of acid precipitation due to increased atmospheric pollution could have serious implications on biodiversity in the area. (Table 6 in in Annex 2: Data tables).

The results of these studies also show that the high acidity of fog is mainly due to high levels of SO₄-S. The highest concentrations of 7.32 and 9.04 mg/l of SO₄-S were recorded during the periods of March 20th-24th, 1996 and March 25th-April 2nd, 1996. In addition, there are high levels of acidity when heavy rains occurred after a relatively dry period. Wind direction is mainly from the north, northeast and east during April. Therefore it seems likely that winds blowing over the Indian subcontinent are transferring high levels of SO₄-S from the large number of coal power plants located in the eastern coast of India. The Hakgala area also receives winds blowing over the highly urbanised and industrialised western part of Sri Lanka during the period of May-September (south-west monsoon). Diesel powered plants and diesel powered heavy vehicles are possible sources of sulphur emissions.

Concentrations of all pollutants (except for NO₃-N) in throughfall are high compared with rain and cloud water. Possible reasons include the evaporation of water, and the high concentrations of pollutants on the vegetation due to dry depositions of gases and particulate matter. Hairy and granular plant surfaces (such as lichens) are known to trap suspended



particulates in the form of dry or wet aerosols. Rainfall washes down these trapped contaminants.

Notwithstanding this, the electrical conductivity and the total dissolved solids content are low in streamwater. A probable explanation of this phenomenon is the buffering action of the soils with high cation exchange capacity. With degradation of the forest, considerable deterioration in water quality is to be expected.

Socio-economic benefits from HSNR goods and services

From time immemorial the traditional socio-economic benefits of HSNR have been for those living in the Uva Basin and downstream of the Uma Oya, through the water tower and horizontal precipitation services described above. Due to the rainshadow effect, the Uva basin, which is downstream of HSNR, receives much less rainfall than other areas at similar altitudes in the country and its population is critically dependent on the hydrological services of Hakgala (see above: Hydrology) for their basic existence and livelihoods. Ongoing processes of desertification are of great relevance here. "Desertification", as defined by the UN Convention to Combat Desertification, is "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities". As a signatory to this Convention, the Government of Sri Lanka is bound to take action to combat desertification.

In contrast, the human population who now live in and adjacent to HSNR (comprised of small-scale farmers and large-scale commercial enterprises all of whom have encroached recently both within the gazetted boundaries of HSNR as well as the areas adjacent to it) benefit illegally, from the use of forest land and resources.

Downstream water users in the Uma Oya basin

Downstream populations that live in the Uma Oya catchment, and all the areas in systems B,C an E of the Mahaweli project, benefit from the watershed protection services provided by HSNR. This population comprises several hundred thousand people, about a quarter of whom are categorised as living below the national poverty line. If the users of electricity from the Rantambe scheme are included as beneficiaries, this figure rises to the millions.

Forest adjacent communities

All households both within and adjacent to HSNR gain from the environmental services it provides, including provisioning (such as food, fresh water, wood, fuel), regulating (such as climate and flood regulation and water purification), supporting (such as nutrient cycling, soil formation and primary production) and cultural (such as aesthetic, spiritual, educational and recreational) services.

The benefits gained from Hakgala by forest-adjacent communities are described in detail in the following chapter (see: Socio-economic benefits from HSNR goods and services). It is however worth highlighting some startling facts uncovered by the recent EFL survey, with respect to benefits gained from Hakgala, which serve to underline the way in which illegal forest and land use act to subsidise people's livelihoods.

- Households living inside the SNR boundaries have access to markedly larger land areas (average of 121 perches per household) than households outside the SNR boundaries (59 perches per household), and their farms are on average more than twice as large (31 perches as compared to 13 perches).
- On average, more than Rs 600,000 per household is gained from illegal cultivation on forest land (translating into more than Rs 120 million for all of the smallholdings that have encroached into the SNR).



- In addition to this (although unquantified in this survey), households living inside the SNR benefit economically from a range of forest products that are collected illegally. By comparison, households outside the forest boundaries reap fewer material gains from forest products – although benefiting from the broader environmental services (such as climate and watershed catchment protection) that HSNR yields.

Although already covered in detail in this report (see above: National laws pertaining to HSNR and its surroundings), it is worth re-emphasising that all of the land surrounding HSNR lies above the 5,000-foot contour, where it is prohibited to grant, lease or otherwise dispose of State Lands; in addition, all human activities are banned within HSNR itself.

What is shocking, is that the vast majority of households living inside the SNR are fully aware of the illegality of their actions, and that HSNR is an area which is protected by law within which farming and forest products collection is prohibited. For the most part, they appear to have successfully managed to evade arrest or other penalties for their illegal actions. A significant number state that they will continue to carry out, or even extend, these illegal actions in the future while continuing to occupy the land and clear additional areas in the forest.

Cultural and historical significance

The area that is now HSNR, and its surrounds, are connected intimately to the *Ramayana*, an epic legend. This legend involves the invasion of Lanka by Rama and his monkey general Hanuman, to retrieve Rama's wife Sita who had been taken to Lanka by Ravana, the much-revered king³⁴. The importance of myths and legends, particularly in a region such as South Asia where people rely heavily on them for their cultural identity, cannot be stressed too strongly. Whilst the area's physical survival is at risk due to human actions, Hakgala's cultural, historical and religious significance remains just as important as it was many thousand years ago.

The area around Hakgala and Bandarawela is believed to be the site of the vast pleasure gardens of Ravana known as the 'Asoka Aramaya', which is one of the many places where Sita was hidden during her captivity in Lanka. There is also a belief among the locals that the name Sita Eliya derives from the fact that it is where Ravana cured an eye condition that Sita had developed while held in captivity. Legend has it that that Ravana kept his flying machine the 'Dandumonara' hidden away high up on the Hakgala Peaks. It is also widely believed, after the rescue of Sita, that the final battle between Rama and Ravana took place in the Hakgala Mountain. The indentations and furrows found on the face of the Hakgala crag are said to have been made by Rama's mythical fire arrows³⁵.

Rama (as the reincarnation of Lord Vishnu, the Preserver, who is second in the Hindu Trinity of gods) is one of the most widely worshipped Hindu deities. As well having a broader mythical significance, the SNR and its surroundings are therefore particularly closely linked to religious and cultural beliefs. Hakgala is the site of the only Hindu temple (kovil) in the world dedicated to Sita alone, which is located close to the Botanical Gardens. It is said that this is where Sita prayed for Rama to rescue her from the clutches of Ravana. Thousands of pilgrims visit the kovil annually to pay homage to Rama's queen³⁶.

Mythology recounts that the Hakgala rock was carried by Hanuman in his jaw, all the way from what is now northern India. Legend relates that Hanuman was given the task of finding a rare medicinal herb from the Himalayas to cure Lakshman (Rama's brother), who was fatally wounded. However as Hanuman forgot its name, he broke off an entire chunk of the Himalayas and carried it in his jaw. It is said that as Hanuman flew over Lanka, pieces of the rock fell in various places in the island, including in Hakgala. Hence, the 'Rock' (*Gala*) carried in the 'Jaw' (*Hak*), and thus the name - Hakgala³⁷.



Photo 4: One of Hakgala's peaks

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² Ministry of Forestry and Environment 1999 *op cit*.

³ WWF. 2001. Sri Lanka montane rain forests (IM0155) [Online]. Available from: http://www.worldwildlife.org/wildworld/profiles/terrestrial/im/im0155_full.html [Accessed on 06/10/2007]

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⁶ Forest Department. 2006. National Conservation Review Database. Forest Department, Battaramulla.

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⁸ Pabla and Mathur. 1999 *op cit*

⁹ IUCN. 2007. Sri Lanka Red List.

¹⁰ Relict species - a species that has survived while other related ones have become extinct. A relict species may be one that had a wider range but is now found only in particular areas, or it may have survived relatively unchanged from an older period when other kinds of species went extinct.

¹¹ Wijesundara. 1991. *op cit*

¹² Rathnayake, R. M. W., Solangaarachchi, S. M., and Jayasekara, L. R. 1998. *A Quantitative study of Pigmy Forest at 2000 in Hakgala Strict Natural Reserve*. In: Proceedings of the Second Annual Forestry Symposium 1996: Management and Sustainable Utilization of Forest Resources, Sri Lanka (Eds. Amarasekera, H. S., Ranasinghe, D. M. S. H. K and Finlayson, W.). Department of Forestry and Environmental Science, University of Sri Jayawardenapura, Sri Lanka.

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A survey of the use of forest land and resources

A note on the difficulties faced in carrying out the socio-economic survey

This chapter presents data gathered by EFL in and around Hakgala during 2006 and 2007, via site visits, household surveys and other information-gathering exercises. It is notable that the EFL team, although acting with the full permission and knowledge of the Sri Lankan government and local administration, faced serious problems – in some cases degenerating into threats of physical violence – in gathering data. The difficulties faced by the EFL team merely serve to underline the massive corruption and atmosphere of fear and cover-up surrounding illicit land use, resource use and forest management in the Hakgala area.

The survey had originally been planned to cover a far larger area. However in the event, the survey team were confronted by well-organised groups of thugs who followed them in expensive four-wheel drive vehicles and threatened violence. The prompt appearance of armed gangs who threatened the EFL team with death, thereby preventing them from conducting their survey in areas where there is severe encroachment leads to the inescapable conclusion of a nexus between the thugs and some members of the local administration aware of the team's visit. For this reason, it was only possible to survey selected areas of the SNR.



Photo 5: Small-scale farm in the SNR



A note on the survey responses

It is likely that the responses and information gathered were influenced by the involvement of DWLC throughout the survey process. Since former DWLC officers are known to own land in this area, we feel their colleagues in the Department may have coached the householders to a great extent, leading to a surprising uniformity in several responses, especially ownership and rights to the land. We did not attempt to determine the validity of their claims, merely documenting their responses.

People believe falsely that documentation of extended periods of occupation within and around HSNR could help stake claims to prescriptive rights (see below: Spurious claims to prescriptive rights are used to avoid evicting encroachers). They are also aware that EFL's study could be used as evidence to evict them. Thus all those surveyed may have tended to over-state the length of occupation of their current landholdings. They are well aware that in order to stake a claim both to their land as well as the occupations they are now engaged in, it is in their interests to show a longer duration of occupation. This applies to those who have settled illegally inside the SNR as well as to those who are occupying land outside the SNR since HSNR and most of the area surrounding it are above the 5,000-foot contour, where the law does not allow any alienation of land, including for cultivation.

Furthermore it has also to be determined whether due process was followed in the alienation of any other lands. In addition, those occupying land outside the gazetted boundaries but within the 1-mile radius from the HSNR boundary, are required to obtain permission from the Department of Wildlife Conservation before activities such as the clearing of land, the construction of buildings and roads and the fixing of posts for the supply of electricity can be carried out, even if they are, in every other sense, legal occupants. Also significant is the evidence gathered that a number of public officials, including those in the DWLC, are occupying land in this area. The radius from the HSNR boundary contains permanent houses, tourist hotels, guest houses, commercial enterprises such as small-medium scale farms and shops and even several schools. According to reports from the field, some 'private' houses belong to those who are, or were, previously involved with the DWLC or their associates.

It should also be borne in mind that survey respondents were reticent in answering questions on particular topics — particularly those relating to illegal land and forest use. For this reason, the responses presented below on the level and types of forest utilisation are likely to underestimate the actual situation. Households' stated income from agriculture and other activities (see below) also does not translate into a per capita income which is reflected in their actual living conditions — especially when one considers that these estimates do not take into account the income generated from other illegal activities such as the trade in timber. This would infer a situation where many of the illegal occupants of Hakgala appear to be acting somewhat like tenant farmers, and passing on a significant amount of cash income earned to absentee landlords or other interests.

Scope and methods of the survey

The goal of the socio-economic survey was to investigate and document the socio-economic characteristics of the human populations who impact on, and are impacted by, the status of HSNR. It specifically aimed to study:

- The socio-economic profile of households living or farming inside the SNR boundaries;
- The economic benefits from encroachment.

The socio-economic survey covered 47 randomly-selected households located in and around the boundaries of HSNR, from 6 GN Divisions, of the total of 9 GN Divisions and 3,754 households that are located inside and beside Hakgala (Table 4). The vast majority of the survey sample was in Goredihela and Meepilimana Divisions, on the northern boundary of



HSNR. It should therefore be noted that the results of the survey cannot be taken as statistically representative of the broader population. They merely present indicative findings and conclusions based on the households surveyed.

Table 4: The survey sample

District	DS Division	GN Division	Total population		Survey sample		
			Population	Households	Inside SNR boundaries	Outside SNR boundaries	Total
Nuwara Eliya	Nuwara Eliya	Ambewela	763	206	0	0	0
		Gorandihela	1,409	376	1	13	14
		Meepilimana	1,895	467	17	1	18
		Sita Eliya	1,534	469	1	8	9
		Pattipola	1,615	367	0	0	0
Badulla	Welimada	Alakolagala	2,383	541	2	0	2
		Ambewela	2,200	504	0	0	0
		Hulankapolla	2,071	452	0	4	4
		Silmiyapura	1,771	372	0	0	0
TOTAL			15,641	3,754	21	26	47

The survey was carried out over a period of 5 days from 27-31 January 2007. It utilised a questionnaire to collect key data about household socio-economic status, occupancy, farm and off-farm activities, forest use and perceptions of HSNR. It covered both households located within the boundaries of HSNR as well as those sited outside the protected area boundaries. A GPS was used to distinguish those living or farming inside the SNR boundaries from those living or farming outside the SNR, according to boundaries indicated on the HSNR survey plan.

The questionnaire collected information on six general topics (Table 5), as listed in and analysed in the results below.

Table 5: Survey information collected

General topics	Specific information collected
Basic household characteristics	Household size
	Characteristics of household head
	Length of residence
	Place of origin
Household wealth status	Household wealth status
	Asset ownership
	Access to cash income
Land use and ownership	Land size
	Land use
	Land ownership and tenure
Livelihoods and production	Cultivation
	Livestock production
	Employment, occupation and off-farm income sources
Use of forest land and resources	Forest clearance for farming
	Type of encroachment
	Forest products utilisation
Perception of land, forest and conservation	Perceptions of changes in livelihoods and environmental status
	Perceptions of forest ownership and management

Detailed data tables from the socio-economic survey are presented in Annex 2: Data tables.

Basic household characteristics

The average household size in and around HSNR is 6 people, with households inside the SNR boundaries apparently slightly larger on average (6.1) than households outside the SNR boundaries (5.7). Although the vast majority of all households are male-headed, a markedly higher proportion of survey respondents in households within HSNR are male. This correlates with the finding that a much higher percentage of household heads within HSNR stated that their primary occupation was farming (71%) in comparison to households outside the SNR



boundaries (54%), meaning that the male household head was available on-farm to participate in the interview.

Whereas nearly three quarters of household heads among households inside the SNR boundaries listed their primary occupation as farming, only half of household heads among those outside are primarily engaged in farming; more than a quarter of the heads of households outside the boundaries are employed (compared to just 14% of households inside the SNR boundaries), 12% are engaged in business (none inside the SNR boundaries), and a lower proportion (8%, as compared to 14% of households inside the SNR boundaries) are primarily engaged as unskilled workers. This suggests that households inside the SNR boundaries are more engaged in farming than are households outside the SNR boundaries, and also that household heads among households inside the SNR boundaries participate less in business and skilled work. Although not shown in the data tables, it should be noted that there is no apparent difference in educational status between household heads within and those outside HSNR. The majority of household heads (just over half) had studied up to the primary level only, and around a third had completed O levels and/or A levels.



Photo 6: Hakgala with encroachments in the foreground

There appear to be few substantial differences in the stated length of residence in the area between households inside the SNR boundaries and those outside the SNR boundaries. The vast majority of families stated that they have lived in the area for between 10 and 50 years, about a fifth have been resident for more than 50 years, and under 5% have lived around HSNR for less than 3 years. There is however a notable variation in the length of time that respondents had been occupying and farming their current plot of land. A far higher proportion of households outside the SNR boundaries (38%, as compared to 5% of households inside the SNR boundaries) have been on their current land for more than 30 years, whereas a quarter of households inside the SNR boundaries (as compared to just 8% of households outside the SNR boundaries) have occupied their land for less than 10 years. This suggests a wave of encroachments inside the SNR boundaries, since the 1990s. What is clear is that, even according to the encroachers, nobody was farming in or around HSNR before the mid-1950s.

There seems also to be variation in the place of origin of householders between households inside the SNR boundaries and households outside the SNR boundaries. A far higher proportion of householders inside the SNR boundaries (86%, as compared to just over half of households outside the SNR boundaries) come from within Nuwara Eliya District in Central Province and Badulla District in Uva Province. A slightly higher proportion of householders



outside the SNR boundaries have come to the area from other Districts of these provinces (15%, as compared to 5% of households inside the SNR boundaries), and similar percentages of households originate outside the Provinces in which HSNR is situated (8-10%).

Household wealth status

The survey collected information on a range of wealth indicators. A clear finding is that households inside the SNR boundaries have access to markedly larger land areas (average of 121 perches per household) than households outside the SNR boundaries (59 perches per household), and that their farms are on average more than twice as large (31 perches as compared to 13 perches). This translates into an average crop income that is more than twice as high for households inside the SNR boundaries (Rs 336,500 a year as compared to Rs 151,500 per year). Very few households reported remittances of income from household members working elsewhere (no households outside the SNR boundaries and only one within). Households outside the SNR boundaries on average earn slightly more from paid employment than households inside the SNR boundaries (almost Rs 5,000 a month as compared to Rs 4,100). Households inside the SNR boundaries tend to have greater access to many other material assets than households outside the SNR boundaries (including vehicles and motorbikes), although more than twice as many households outside the SNR boundaries as households inside the SNR boundaries own bicycles.

Household wealth status is also reflected in different types of housing and sources of basic services. There are differences in types of house construction, with the majority of households inside the SNR boundaries living in houses with wooden walls and tin roofs, and the highest proportion of households outside the SNR boundaries living in brick or cement-block built houses with asbestos roofs. A smaller proportion of both groups have houses built out of clay. A small proportion of all households (10% or less) have an attached latrine, a slightly higher proportion of households outside the SNR boundaries (42% as compared to 34% of households inside the SNR boundaries) have access to piped water and rely on a shared water supply (31% as compared to 10%), while almost half of households inside the SNR boundaries (as compared to just 15% of households outside the SNR boundaries) source their water from wells. The vast majority of households inside the SNR boundaries (85%) rely on firewood as a primary domestic energy source, and a slightly higher proportion also make use of kerosene (67% as compared to 54%), and have access to mains electricity (62% as compared to 54%) than those outside the SNR.

In summary, the survey shows that although households within HSNR appear to have greater access to land and cash income, this is not reflected in their household wealth status.

Land use and ownership

As discussed above, land and farm size among households inside the SNR boundaries is markedly higher than for those outside it. The survey also showed that the area farmed by households inside the SNR boundaries is more than twice as high as for households outside the SNR boundaries (114 perches per household as compared to just under 50 perches). Many more households inside the SNR boundaries also have access to other land (29% as compared to just 4% of households outside the SNR boundaries) — on average 117 perches per household, in addition to the land they occupy and utilise close to HSNR. Patterns of land ownership show little variation, with about half of all households claiming to have a title deed to their land, more than 80% claiming to own the land, and around a tenth of occupants being workers for absentee landowners. The only substantial difference is that no households inside the SNR boundaries rent land, whereas 4% of households outside the SNR boundaries are tenants who rent their land from others.

In terms of land ownership, a slightly higher proportion of households outside the SNR boundaries claimed to have inherited their land (38% as compared to 24%), and those living



outside the SNR (14%) reported that they had been 'given' their land. It is notable that a far higher proportion of households inside the SNR boundaries (24% as compared to 10% of households outside the SNR boundaries) claimed to have bought the land that they currently occupy, or had been allocated it by the government (18% as compared to 5%). A surprising result of the survey was that a similar proportion (41-43%) of those households within and outside the boundaries of the SNR, had cleared their land themselves. Among households inside the SNR boundaries, just over a third (38%) stated that their land had already been cleared from the forest when they had acquired it, while just under half (48%) had cleared the land themselves after acquiring it. A tenth stated that they would continue to clear land within the forest in the future, as they required additional areas for cultivation. Of the households within the SNR covered by the survey, the vast majority (81%) were encroaching well within the Strict Natural Reserve boundaries, and just under a fifth of farms (19%) were located on its boundary.

Overall patterns in land use are similar, with the majority of the land being used for crop cultivation (72-85%, with the higher figure for households inside the SNR boundaries). Only households outside the SNR boundaries included a home garden or fallow land within their utilised land area.



Photo 7: Encroached areas occupied by farms and surrounded by patches of trees

Livelihoods and production

A far higher proportion of households inside the SNR boundaries (76% as compared to 54%) stated that farming was their primary means of livelihood. Farming (54%) and off-farm income (42%) were ranked as having similar importance in livelihood terms for households outside the SNR boundaries, and around 5% of all households stated that they relied on remittances as their primary form of livelihood. It is worth noting that this information on remittances from family members working away from home does not concur with other survey questions on the amount of remittances and proportion of households receiving remittances (where no households outside the SNR boundaries and only one encroacher stated income earned from remittances).



In overall terms, off-farm income is relatively more important to households outside the SNR boundaries than to those inside the SNR boundaries, which is consistent with the higher reliance of the latter on income from farming. Households outside the SNR boundaries have a higher number of members in the workforce, and also declare a higher off-farm income (Rs 11,700 a month as compared to Rs 8,600 for households inside the SNR boundaries). The incidence of samurdhi is almost twice as high (29%) among households outside the SNR boundaries as among households inside the SNR boundaries (15%).

In terms of cropping patterns, a similar range of crops is grown by all households, with primary crops including potato, carrot, leeks, cabbage and beetroot. Whereas households inside the SNR boundaries tend to focus on potato cultivation (86% of households as compared to 46% of households outside the SNR boundaries) and cabbages (24% as compared to 12%), a higher proportion of households outside the SNR boundaries grow carrot, leeks, beetroot and radish. Households outside the SNR boundaries also tend to cultivate a greater diversity of crops than households inside the SNR boundaries. In line with this, a higher number of households inside the SNR boundaries gain from more than one harvest of potatoes and cabbages each year, while more households outside the SNR boundaries have more than one harvest of carrot, leeks and beetroots.

Consistent with their larger farm sizes and higher reliance on farming for their livelihoods, households inside the SNR boundaries on average cultivate larger areas of all crops than households outside the SNR boundaries. They are able to gain higher yields for all crops except carrot, harvesting on average more than twice as many kilogram's per perch as households outside the SNR boundaries (for carrot the reverse holds true). The majority of all households produce crops primarily for sale.

Taking into account both production for sale and for home consumption, the annual value of crop production is more than twice as high for households inside the SNR boundaries (Rs 610,000) as for households outside the SNR boundaries (Rs 295,000), with the bulk contributed by sales of potato and cabbage.

Use of forest land and resources

A slightly higher proportion of households inside the SNR boundaries (67% as compared to 58% of households outside the SNR boundaries) stated that they collected products from the forest. Forest products are considered important by households both inside and outside the forest — over half of all respondents stated that these were very important to them, and none stated that they were not at all important. Perhaps unsurprisingly, due to the fact that they live within the forest and are thus better able to observe others using it, a higher proportion of households inside the SNR boundaries perceived that others from both within and outside the area also collected forest products.

Households inside the SNR boundaries carry out a broader range of forest activities than households outside the SNR boundaries, including firewood collection, hunting, grazing and wild food collection. Households outside the SNR boundaries listed only the collection of firewood, housing materials and compost among their forest activities. Whereas the highest incidence of forest use among all households is firewood collection, the proportion of households inside the SNR boundaries engaging in this activity is far higher (71% of households) than for households outside the SNR boundaries (42%).

Almost two thirds (65%) of households inside the SNR boundaries stated that forest-sourced products constituted their main source of fuel (as compared to 35% of households outside the SNR boundaries). Most other forest products are stated to be relatively unimportant to households inside the SNR boundaries (although 5% of respondents rely on the forest as their primary source of grazing and wild foods), and no other forest product constituted a primary source for non-encroaching households. All households stated that they collected forest products only for personal use and not for sale.



Perception of forest, livelihoods and conservation

Whereas around a half of all households perceive that levels of forest use have decreased over time, more households inside the SNR boundaries feel that forest use has stayed the same (24% as compared to 15% of households outside the SNR boundaries) or increased (10% as compared to 4%). Most households, both within and outside the boundaries of HSNR, felt that forest product availability had reduced (42% of households inside and 52% outside) or not changed (23% of households inside and 24% outside) over time.

The vast majority of all households (95% of households inside the SNR boundaries and 81% of households outside the SNR boundaries) perceive that the government owns the forest. A very small proportion of households inside the SNR boundaries (5%) perceive that the forest is owned by outsiders, and an equally small proportion of households outside the SNR boundaries (4%) perceive that the forest is owned by local farmers. All households inside the SNR boundaries and the vast majority of households outside the SNR boundaries (81%) are aware that HSNR is a protected area, although less than half (with a slightly higher proportion of households outside the SNR boundaries) state that either others or they themselves are aware of where the boundaries are located. All respondents are aware that farming is prohibited in the forest. Somewhat paradoxically, all households inside the SNR boundaries stated that they think the forest should be protected.

The incidence of penalties and punishments for illegal forest use is considered to be relatively low. Few respondents stated that they themselves had been fined or arrested for illegal forest use, and a slightly higher proportion stated that others were fined or arrested. Around a half of all households stated that they have frequent interactions with FD/DWLC, between a quarter and a third had infrequent interactions, and a fifth seldom interacted. There was consensus among all households that these government departments act to prevent forest use. It is notable, and not perhaps unsurprising, that the incidence of frequent interactions with FD/DWLC is similar among households inside the SNR boundaries and households outside the SNR boundaries.

A similar proportion, around two thirds of all households, perceives that local livelihoods have changed over time. There is however a lack of agreement on the nature of these changes — around a half of households inside the SNR boundaries and just under a third of households outside the SNR boundaries state that farming has become more important while a similar proportion state the opposite. Just under a half of households inside the SNR boundaries and a fifth of households outside the SNR boundaries state that their reliance on forest products has decreased over time.

More households inside the SNR boundaries (just under half, as compared to a quarter of households outside the SNR boundaries) state that they think their children will continue to farm in the area in the future, and that their farm will be big enough to hand on to the next generation (38% of households inside the SNR boundaries and 23% of households outside the SNR boundaries). Around a half of all households state that they will purchase more land for their children, while a fifth of households inside the SNR boundaries (and no households outside the SNR boundaries) would clear more forest land for them to farm.

Threats to HSNR

Encroachment

Encroachment constitutes by far the single largest threat to HSNR. Without carrying out detailed survey work it is almost impossible to gauge the full extent of illegal encroachment into HSNR, as well as the other State lands and land over 5,000 feet in altitude that lie around it (where it is also prohibited to grant, lease or otherwise dispose of State Lands). What is however incontrovertible is that encroachment represents a massive, and growing problem. It is also evident that its magnitude has been seriously (and possibly wilfully) underestimated up to now.

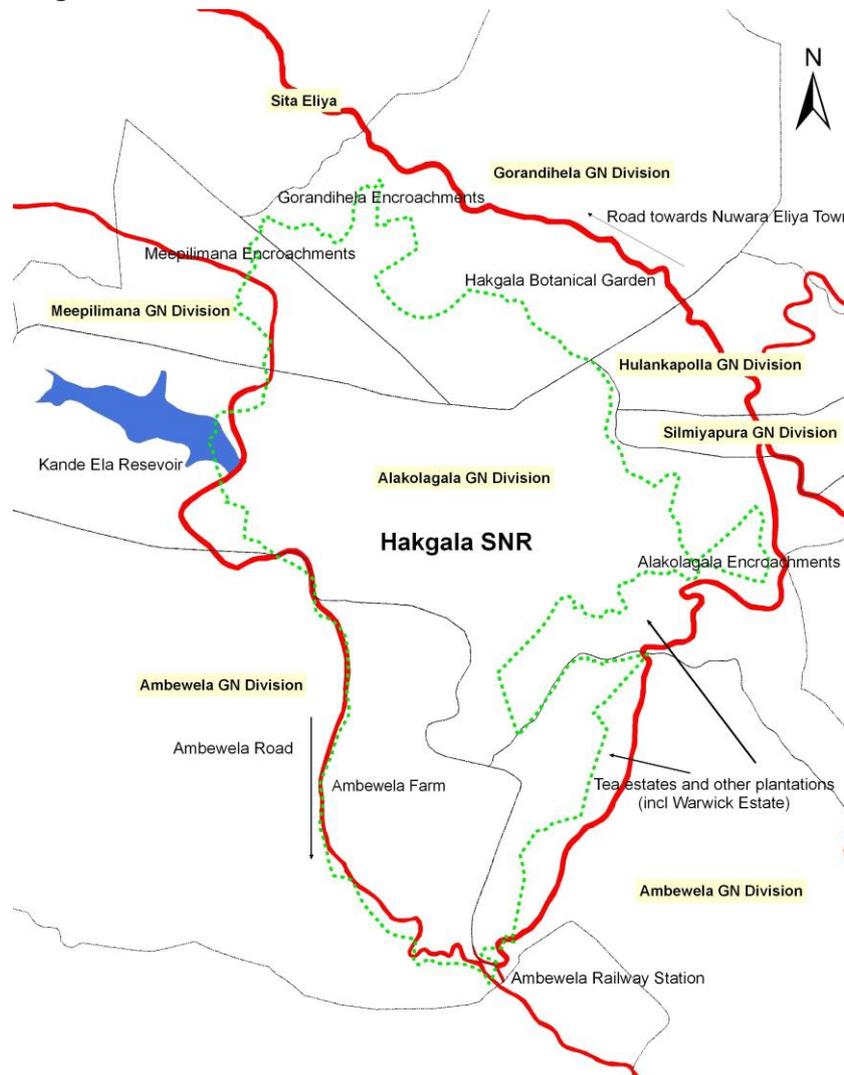
According to the management plan for HSNR drawn up by the DWLC in 1999, 182.88 ha (16% of the SNR) were claimed to be under encroachment in 1999. The majority of this figure is accounted for by Ambewela Cattle Farm, meaning that only 14.39 ha is recorded as being under encroachment by other landusers. During a subsequent survey carried out by the DWLC in 2006, a total of 152 encroachments (excluding the Ambewela farm) were identified, covering approximately 50 hectares. However, the boundaries used in this survey are not those of the original survey plan – they include a much smaller area for Hakgala than the original gazette denotes.

These figures, as cited by DWLC, constitute massive underestimates of the encroachment problem. On-the-ground surveys carried out by EFL indicate that the area encroached by smallholders covers at least 150 ha and involves at least 200 households; including Ambewela Farm more than doubles the earlier DWLC figure. The extent of encroachment is compounded when considering the legally mandated one-mile radius from the HSNR boundary. In the Alakolagala area, adjacent to the Kande Ela reservoir, land supplements belonging to the Irrigation Department and which were not included in the HSNR survey plan have also been encroached upon. The total extent of encroachment into State land above the 5,000-foot contour strictly protected by Law is even greater.



Photo 8: 'Official' figures massively understate the level of encroachment in and around HSNR

Figure 10: Siting of encroachments in and around HSNR



Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Landuse data from UDA GIS Centre

Small-scale cultivation

Many parts of the Strict Natural Reserve and the areas around it have been invaded by small-scale cultivators, whose combined area of encroachment far exceeds that of the Ambewela Farm. Figure 10 depicts where the areas referred to in the paragraphs below are located. These encroachers have cleared land for farms, and constructed permanent and semi-permanent dwellings within the boundaries of the PA. As a result, forest and steep slopes have been cleared to a distance of several kilometres inside the gazetted boundary, and roads have also been cut leading further into the SNR.

The situation is especially bad in Meepilimana, situated north-west of HSNR. Here, large areas of cultivation extend parallel to the boundary demarcated in the original gazette notification. The area above the Meepilimana Senananda Maha Vidyalya appears to be particularly heavily encroached, where clearings for cultivation extend well within the boundary of the forest. In this area, with its 30-40 degree gradient, recent clearing activities are evident. In certain parts of the forest, entire sections of hills have been cut out. Roads leading further into the SNR have also been cleared.



In the Ambewela area, situated to the south of HSNR, areas in front of the Ambewela Railway Station have been cleared for cultivation. This includes lands with a 20-25 degree gradient.

The Warwick Tea Estate, in the Ambewela/Alakolagala area has expanded illegally, now reportedly extending deep inside the SNR. In the area bordering the Warwick Estate, situated south east of HSNR, land spreading towards Nuwara Eliya and inside HSNR has been cleared for planting tea. The 45-50 degree angle, ideal for tea, has been used by the encroachers with little or no regard to the damage it may cause in terms of soil erosion. Large areas of abandoned land are found scattered in this area. They have been identified as land once used for cultivation but since abandoned. No remedial measures to regenerate the forest ecosystem have been taken to date and significant populations of potentially invasive species can be observed on these degraded lands.

In the Alakolagala area with its 45-50 degree slope, situated on the eastern border of HSNR, lands inwards from the border and parallel to it have been cleared for cultivation. In this area too, large sections of land have been abandoned and the invasive plant *Lantana camara* or *Gandapana* have taken over.

In Sita Eliya, situated on the north east of HSNR, significant areas inside the border and parallel to it have been cleared for cultivation. In this area with its 30-50 degree slope, there is evidence of recent disturbances to the mountain slopes as freshly cut soil and large gaping holes in the forest have been observed. Here, too, large areas of abandoned deforested land have been taken over by *Tithonia diversifolia*.

There are many paths leading into the SNR, from all settlement areas surrounding Hakgala, giving evidence that these paths are often used by households both inside and outside HSNR for illegally entering the forest. Several of these paths, leading from encroachments into the SNR can be easily observed in the Gorandihela, Sita Eliya and Meepilimana areas. Freshly cut and damaged trees, and dumped solid waste is visible when walking along these paths. Many encroachers extract water for irrigation by inserting pipes into natural springs arising from HSNR, preventing these waters from following their natural course.

Ambewela

The first large-scale encroachment into Hakgala occurred when an attempt was made to annex illegally part of the SNR. This happened during the establishment of a State-owned farm in the period immediately after the Second World War. The decision to establish this State-owned farm (Ambewela Cattle Farm) is recorded in the Sessional Papers on the proceedings of the Second State Council of Ceylon of February 10 1944. Ambewela Cattle Farm was located on, and expanded, a site originally occupied by Baker's Farm (a pre-existing cattle farm sited outside HSNR which at one time had been privately managed). The aim of establishing the new farm was to meet the demand for milk in then Ceylon, because there had been severe shortages during the Second World War. This had meant that the government resorted to rationing to ensure that people had adequate access to good nutrition.

In 1945, a survey of the area was carried out by the Surveyor General's Department (now the Survey Department), resulting in a survey plan. This survey plan illegally included sections of HSNR (Figure 11). It would appear that the grasslands within HSNR had been surveyed as part of the farm. The only official Government notification pertaining to this farm is mentioned in Gazette No. 9, 375 (Friday, March 2 1945) – which stated that managers had been appointed to run cattle farms managed by the Department of Agriculture. At no time was there any attempt to devolve ownership of any land to the farm, whether HSNR or Crown (State) land, by means of Gazette notification.

For the next thirty years, Ambewela Cattle Farm was run by the Department of Agriculture, before being brought under the management of the newly-established Department of Animal Production and Health in 1978. Shortly thereafter, in March 1981, the National Livestock



Development Board (NLDB) took over its management. Over the next two decades, the farm ran at a huge loss, and was subsidised by State funds. In 1999 a decision was made to sell off Ambewela Cattle Farm (and other loss-making state farms managed by the NLDB) through the Public Enterprise Reform Commission (PERC), as recorded in a Cabinet Memorandum signed May 1999. PERC called for Expressions of Interest to run the farm in June 1999. Consequently, in 2000, Ambewela Farm, was converted to a Limited Liability Company (the Ambewela Livestock Company) under the Conversion of Public Corporations or Government Owned Business Undertakings into Public Companies Act No. 23 of 1987, by gazette notification No. 1123/4 – 14/03/2000.

In response to the call for Expressions of Interest made by PERC, Lanka Milk Foods (LMF) was chosen to receive Ambewela Livestock Company. By letter dated August 13 2001 the Director General of PERC, Mano Tittawella, forwarded to the Lands Commissioner a 'Special Approvals' memo purportedly signed by President Kumaranatunge. This memo stated that lands, including land described as forest, deniya and patana should be leased to LMF. This 'memo' was written on plain paper, without any letterhead and carried no date.

Agreement was reached that 90% of the shares of ALC would be divested to LMF for the payment of Rs 46 million, of which the NLDB would receive Rs 30 million. All movable property belonging to ALC was also divested to LMF. An 'agreement to lease' was signed by the Government and LMF on September 21 2001. This specified a lease period of 50 years, during which rent would be paid on the following basis: rental for the first 5 years at Rs 7,073,900/- per annum (of which Rs 3.536 million would be paid for the first 6 months) and thereafter to be based on the previous years lease rental multiplied by the GDP deflator (as published by the Central bank of Sri Lanka) of the preceding year. The total extent of land to be to be leased was stated as 343.42 ha.

The privatisation of Ambewela Cattle Farm which took place between May 1999 (the date of the Cabinet Memorandum stating the decision to sell off Ambewela Cattle Farm through PERC) and September 2001 (the date that the agreement to lease was signed) was accompanied by a series of disputes and massive confusion over the ownership of the land that was included in the farm, as well as a spate of other illegal incursions into Hakgala. Throughout the process, the NLDB maintained that the land on which its livestock was grazing did not belong to them – and that therefore, although they had the use of it, it was not theirs to give away or divest.

Just prior to the signing of the 2001 agreement to lease, there was a wave of encroachment into part of the land utilised by the farm, led by the local organiser of the political party which at that time had a majority in Parliament. The President herself is reputed to have promised the encroachers title. Thus, the lands which had been utilised by NLDB and were to be handed over to LMF were set out in two schedules. Schedule I identified the land which was to be handed over to LMF, and Schedule II identified the land that was to be excluded from the lease.

In October 2001, one month after the agreement to lease was signed, the Director General of PERC wrote to the Lands Commissioner asking him to instruct the Divisional Secretary Nuwara Eliya to hand over the lands to the Ambewela Livestock Company (ALC), since the lease had been signed. This letter states that all the lands identified in Schedule I must be given to ALC, and the land in Schedule II must be handed over to the Nuwara Eliya Divisional Secretary – to be handed over to the landless as per President Kumaranatunge's wishes. In November 2001 an additional Secretary of the Ministry of Estate Infrastructure and Livestock Development (who subsequently joined LMF as a Director) wrote to the NLDB stating that the Ministry had approved the handing over of the land to the Nuwara Eliya Divisional Secretary.

Although directed to hand over the land to the Land Commissioner so that it could be passed on to the ALC, the NLDB claimed that they needed further clarification on its ownership. In November 2001 the Secretary to the Treasury too wrote to the Secretary of the Ministry of Estate Infrastructure and Livestock Development and asked him to instruct the NLDB to hand over the land to LMF through the Divisional Secretary. In April 2002 the Lands Commissioner again instructed the Divisional Secretary of Nuwara Eliya to take possession of this land from



the NLDB and to effect the lease to the ALC, as well as to handover any land that had not been properly handed over or taken possession of by the DWLC. By now, the Divisional Secretary of Nuwara Eliya had expressed some concern over the handing over of the land, as well as over the President's Order and the exact acreage to be passed on to the ALC. To add further confusion to an already convoluted process of claim and counter-claim, an additional sticking point arose because part of Ambewela Farm fell within the purview of the Welimada Divisional Secretariat, and was therefore not within the jurisdiction of the Divisional Secretary of Eliya.

The request to hand over the lands was reiterated several times, but the NLDB continued to claim that they had no legal right over the land. In November 2004, they wrote a letter to the Attorney General to this effect. In November 2004, in his handover letter, the Chairman of the NLDB stated that "in keeping with the President's orders" he handed over "possession of the land they had enjoyed" in the Nuwara Eliya District to the Nuwara Eliya Divisional Secretary. The Nuwara Eliya Divisional Secretary then handed over this land to LMF. The handover of land falling within the Badulla District was completed in 2005.

In summary, we can see that a series of ruses, cover-ups and and subterfuges were used in attempting to alienate public property strictly protected by Law: namely State land at an elevation of over 5000 ft and land Gazetted as a Strict Natural Reserve.

Figure 11: Current extent of Ambewela Cattle Farm within HSNR



Mapped by EFL (2007). Source data: Schematic drawing based on maps from Survey Department (1945 map) and NLDB (allocated for privatisation)

Resource exploitation

The plant and animal species in Hakgala are rare, unique and endangered. Many also have a high commercial value. For decades now, there has been systematic cutting of trees for timber, and extensive clearfelling has taken place in some areas. Other commercially valuable species have also been over-harvested, including medicinal and ornamental plants. Certain animals, particularly mammals, have shown a marked decline in populations as a result of illegal hunting.

As described in the preceding chapter (see: Socio-economic benefits from HSNR goods and services), many of the households who live beside and inside the boundaries of the SNR collect products illegally from the forest. Stated activities include firewood harvesting, hunting, grazing and the collection of wild foods.



Photo 9: Use of pesticides and other agrochemicals is impacting negatively on Hakgala's environment

Destructive land use practices

Clearance of land for agriculture is, in itself, highly destructive to Hakgala's forest and its rare and valuable species — no matter how, where or by whom it is carried out in the SNR. But these problems are exacerbated still further by the kinds of land management practices that are followed in creating and managing farms.

Perhaps most seriously, encroachers have deforested steep slopes and other ecologically sensitive areas in the Reserve. This has resulted in severe soil erosion. It has been estimated that erosion rates from smallholder mixed vegetable farming in the Uma Oya catchment range between 100-280 tonnes of soil loss per hectare per year, as compared with just 0.3 tonnes/ha/year for dense forest in Nuwara Eliya District¹. Setting of fires to clear land for farming and grazing has caused serious environmental damage. Besides reducing tree cover and



destroying biodiversity, fires spread easily into intact parts of the forest. These processes undermine the resilience of the ecosystem.

Farming practices, too, are unsustainable. High-intensity cropping and poor land use management is leading to topsoil loss, reducing soil fertility, and increasing run-off. Again, watershed protection services are being undermined, and downstream water supplies and quality are suffering. Meanwhile the artificial pesticides and fertilisers used in farming are leaching into the soil and into the water running off from the reserve area, polluting the rivers and streams that flow out of the SNR.

Invasive Alien Species

Opening up and clearing forest land leaves Hakgala vulnerable to the threat of invasion by alien species. Invasive plant species are usually fast growing and spread rapidly. They often take over and choke off natural vegetation. Invasive animals often compete over scarce resources with indigenous wildlife — or even, in some cases, prey on them. This can have devastating effects on biodiversity and the provision of ecosystem services.

EFL's literature review of HSNR's biodiversity records a total of 7 invasive plant species in Hakgala; however the total number of invasive species, or alien species which have the potential to become invasive, is in all likelihood higher than this. Several of these species originate from the Botanical Gardens adjacent to HSNR, including *Aristea ecklonii*, *Cestrum aurantiacum*, *Solanum hispidum* and *Eupatorium riparium*^{2,3}. A detailed study carried out to identify the threat to endemic species by alien species has identified that overstorey and understorey vegetations at the lower elevations of HSNR have been invaded (*Aristea ecklonii*, *Cestrum aurantiacum*, *Solanum hispidum* and *Eupatorium riparium*), which have spread through the lower elevation onto the higher elevation, seriously threatening the endemic vegetation of the upper montane rain forests⁴.

Another potential source of invasions is from the use of exotic seeds and plants in nearby agriculture, including the risks arising from the cultivation of genetically modified crops. These risks are amply illustrated by a recent right to information case filed by EFL in the Supreme Court in 2006. This case concerned the illegal importation of rye grass seeds which were subsequently planted in Ambewela Farm. These seeds, in addition to themselves being alien to the ecosystem, were also contaminated with another known invasive alien species *Bromus mollis* (a perennial grass). The case cited, amongst others, the company that imported the seeds and the Minister of Agriculture and Lands. Although initially permission to import these seeds had been refused by the Plant Protection Authority, this decision had been reversed by officials appointed by the Minister of Agriculture and Lands. The Supreme Court recognised EFL's right to file this case, and ordered that all the information be made available to Court. It requested EFL to monitor the environmental safeguards stated to have been put in place by the authorities and farm.

The introduction of domesticated animals such as cats, dogs and buffaloes has led to the entry of potentially invasive species into the SNR and its surrounds. Feral populations of all these animals are now found in Hakgala, competing with and threatening native biodiversity. There has also been an increase in the range of other invasive species associated with introduced livestock, for example slugs (including *Deroceras zeticulatum*, *Deroceras leave* and *Arion intermediates*).

Climate change

Changes in temperature, rainfall and other variables are stresses and strains faced by ecosystems in both the short term as well as over the longer term. Healthy and vibrant ecosystems are better able to adapt to such variables and to maintain their viability in the future.



It is also to be expected that cloud forests such as Hakgala will be affected by other manifestations of climate change, in particular changes in cloud formation.

Studies in other tropical montane areas show that human interference exacerbates the impacts of climate change on forests⁵. Research also indicates that anthropogenic influences such as fires, drought and invasions by invasive alien species are likely to increase the effects of any climate change⁶. If Hakgala is to maintain its resilience to climate change, and thus continue to provide valuable goods and services, it is vital that its status and integrity be enhanced without further delay.

Other threats

In addition to the degradation of HSNR due to direct causes such as forest over-harvesting, clearance and conversion, a plethora of other anthropogenic influences are also leading to biodiversity loss. These include effects of waste disposal from farms and other settlements. Of particular concern is the dumping of non-biodegradable wastes such as plastics and toxic chemicals.

The proximity of human settlements to the SNR (including encroachers) also translates into high levels of disturbance due to frequent entries into the forest by an increasing number of people, for the collection of fuelwood, cutting of timber, grazing of livestock, sightseeing and so on. This significantly alters the terrain by creating foot trails which soon turn into small roads.

These anthropogenic influences, as well as those dealt with in other sections of this chapter (including encroachment, unsustainable resource exploitation, climate change and invasive alien species) all serve to destroy biodiversity, lessen the provision of ecosystem services, and undermine the ecological resilience of Hakgala. This leaves it vulnerable and susceptible to many sources of further degradation, including climate change and invasive species (as described earlier). All of these factors may also be contributing to the serious phenomenon of 'forest die-back', which has already been observed adjacent to the Ambewela Farm.

References and notes to this chapter

¹ Ministry of Forestry and Environment 1999 *op cit*.

² Wijesundara 1991 *op cit*

³ Rathnayake, R.M.W. and Jayasekera, L.R. 1998. Threatened endemic vegetation in the upper montane rain forest in Hakgala Strict Nature Reserve. *The Sri Lanka Forester* 23 (1 & 2): 17-21.

⁴ Rathnayake and Jayasekera. 1998. *op cit*

⁵ CBD. 2007. Biodiversity and Climate Change [Online]. Available from: <http://www.cbd.int/doc/bioday/2007/ibd-2007-booklet-01-en.pdf> [Accessed 15/10/2007].

⁶ Foster, P. 2001. The potential negative impacts of global climate change on tropical montane cloud forests. *Earth-Science Reviews* Vol. 55 (1-2): 73.

Analysis of the evidence presented: why Hakgala is being degraded

Illegal encroachment is the major direct cause of forest loss

Rampant encroachment and illegal land grabbing are the single largest cause of deforestation in the Hakgala area. According to the calculations made by EFL in 2007, more than 37% of HSNR is currently encroached, and a far greater area of land outside the SNR which lies above 5,000 feet is being illegally occupied and farmed. There is no question at all as to whether these encroachments are justifiable under the law. Encroachment is by definition illegal: it is carried out in direct contradiction to the laws, statutes and regulations of Sri Lanka. In and around Hakgala a multiplicity of laws which safeguard watersheds and essential ecosystem services are being contravened (see: National laws pertaining to HSNR and its surroundings), and none other than a host of government agencies are involved in the resulting destruction.

The boundary issue is used as a lame excuse for encroachment

The siting and official recognition of Hakgala's boundaries has become a major issue in managing Hakgala effectively. Uncertainty about the limits of the SNR is also cited as a reason for the difficulty in ascertaining whether land is in fact being illegally occupied. In fact, these claims all amount to little more than subterfuge – the 1938 gazette of Hakgala as a SNR, and the Survey Plan prepared in 1930, leave no ambiguity whatsoever about the extent and boundaries of HSNR. Sadly, there have been repeated attempts, subsequently, to 'redefine' Hakgala's boundaries.



Photo 10: The fence marks the edge of farmland inside HSNR



After the establishment of the Ambewela Cattle Farm in 1940 by D. S. Senanayake, a survey plan¹ was prepared in 1945, with the boundaries being pointed out in person by the Manager of the Cattle Farm and by Koja Mudaliyar Wappu Abdul Latief, the village headman of Pattipola. The boundaries of the farm overlapped those of HSNR. It should be noted that the DWLC does not appear to have been consulted when these boundaries were laid down.

The 1-inch map² prepared by the Surveyor General's Department in 1965 and subsequent maps produced by the Department after the 1977 general election, namely the 1:10,000 (1st edition in 1985 although mapped in 1983) and the 1:50,000 (mapped in 1985, reprinted in 1993) exclude a major section of the SNR, as Gazetted in 1938, most notably the Ambewela Farm. In preparing its more recent maps the Survey Department appears to have relied on aerial/satellite photographs to simply map out HSNR boundaries according to the actual forest cover remaining, without considering the legal boundaries as represented in the original Survey Plan (which was carefully secured in the repositories of the very same Department). When the boundaries of HSNR were re-mapped in the 1980s, this resulted in a quite different representation of HSNR boundaries than was indicated by its original survey plan as well as a larger area being indicated for the Ambewela Farm (Figure 12).

Figure 12: Differences in the boundaries of Ambewela Cattle Farm according to the 1945 Survey Plan and the area actually allocated for privatisation



Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; Schematic drawing based on maps from Survey Department (1945 map) and NLDB (allocated for privatisation)

On the ground, this has resulted in some areas that were gazetted being left out and treated as non-encroachments. Despite the existence of a management plan, and a clear definition of boundaries when the SNR was originally gazetted, the failure of DWLC to clearly demarcate the boundaries of the SNR has (according to DWLC staff working in the field in Hakgala) been a major constraint. They state that the absence of clear boundaries makes management extremely difficult, as it is unclear which parts of the protected area have been encroached. The existence of Ambewela Farm has, furthermore, been used as an excuse by the DWLC not to take action against other encroachers. It is argued that, as Ambewela Farm represents by far the single largest incursion into the SNR, the boundaries of the SNR are now in dispute and therefore they are unable to evict or penalise other encroachers. This somewhat contradicts the view expressed simultaneously by DWLC that, since there are so many small scale encroachers in and around Hakgala, they are unable to take action against Ambewela Farm!



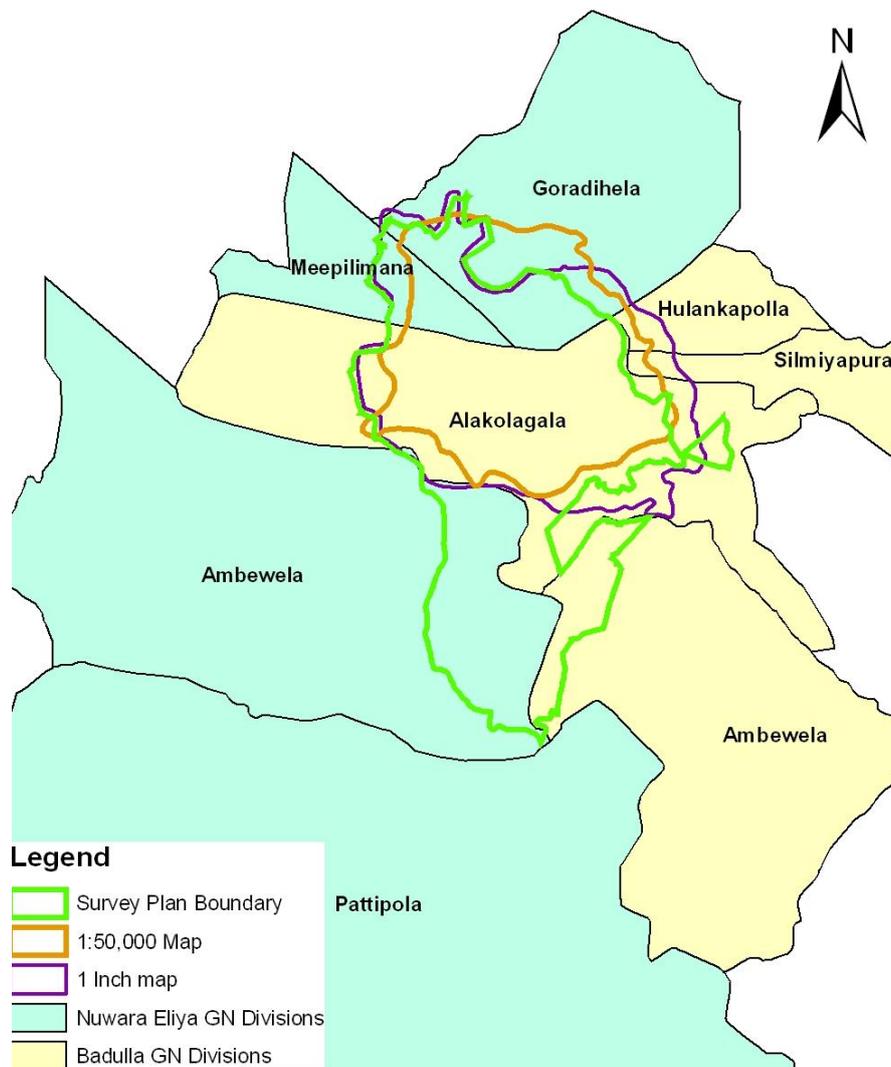
Photo 11: Boundary markers are being used for erosion control in the Hulankapolla area by encroachers

At a forum organised by EFL held at the DWLC auditorium on 27th July 2005, a number of prominent personalities including a former advisor to the Ministry of Environment (under which the DWLC is administered) stated that the demarcation of HSNR's boundaries could not be done as the Gazette was not specific. Nothing could be further from the truth. EFL, after many weeks of perseverance and thanks to the dedicated staff at the Survey Department, obtained the original survey plan which had been mapped in 1930, which gave the lie to these claims.

The Survey Plan prepared in 1930 shows unambiguously where the boundaries of the SNR lie. Rather, the problem appears to stem from a series of attempts to deliberately confuse, obscure and reposition these boundaries. During EFL's several visits to the SNR, Wildlife Officers stated that because the boundaries were unclear, it was difficult to control encroachments. The situation became even more absurd when these officers then pointed out what they considered to be the boundaries, which zig-zagged to ensure that certain encroachments were not included. Simple logic, as well as the original Survey Plan, suggests that the SNR could not have been gazetted in this manner in 1938. Even in 1988 the DWLC had agreed to use the boundaries of the original Gazette.

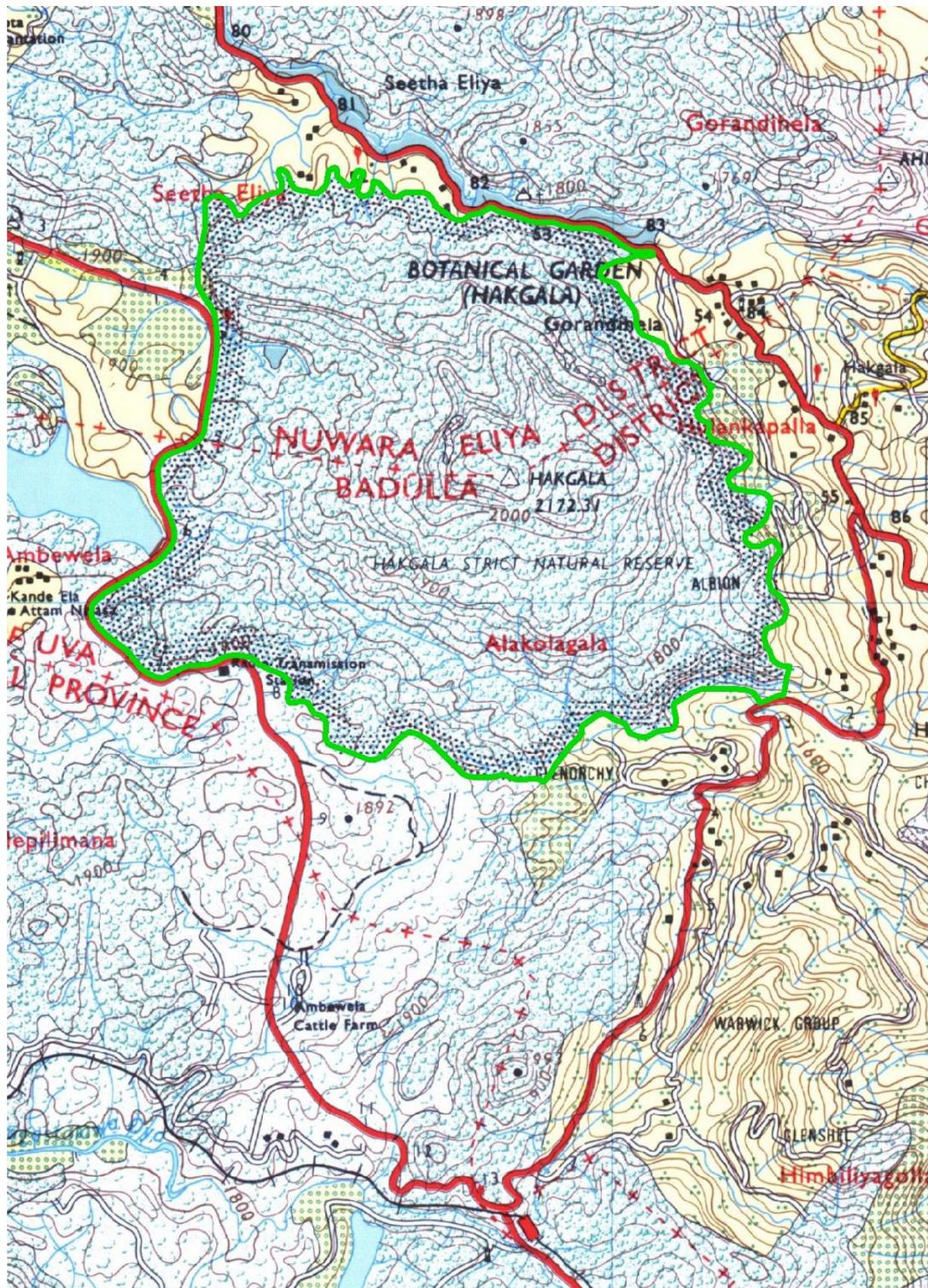
A look at the various maps claiming to denote HSNR's boundaries underline the way in which HSNR's true gazetted boundaries have been consistently misrepresented over time. Overlaying the varying claims on boundaries (including the Hakgala SNR boundary mapped by the Survey Department in 1985, the 1:50,000 map of 1985, and the 1 inch map of 1965) on the 1930 Survey Plan boundary shows very clearly the massive discrepancies that have somehow slipped into the official representation of HSNR (Figure 13). While it is inevitable that there will be very small differences in the exact delineation of the HSNR boundary because of slight inconsistencies and errors in the scales and projections used, it is clear that there are huge differences in the areas purported not to be under HSNR. Scrutiny of the various maps available (for instance that shown in Figure 14) also shows that these exclude large parts of the SNR according to the original survey plan (Figure 15). Yet the original Survey Plan of 1930 is still available (Figure 16), and has even been digitised by the Survey Department so that it can be displayed on a GIS map (Figure 15). What needs to be questioned is why this map has been ignored by almost every official representation of HSNR to date.

Figure 13: Discrepancies in the boundaries of HSNR according to maps produced at various times



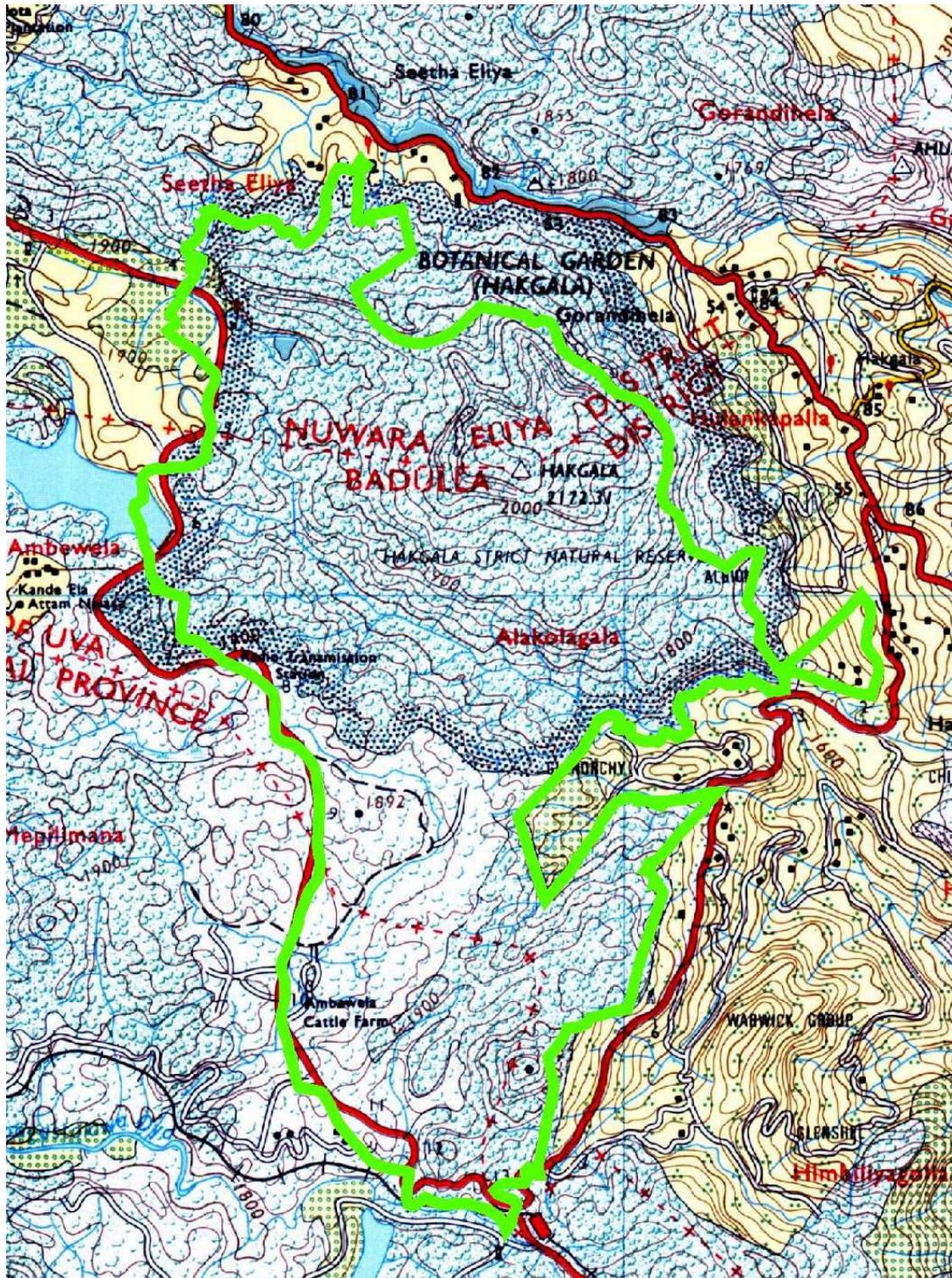
Mapped by EFL (2007). Source data: Hakgala SNR boundary mapped for EFL by the Survey Department; 1 Inch map (Hakgala boundary) – UDA GIS Centre; 1:50,000 map (Hakgala boundary) – UDA GIS Centre

Figure 14: Map of HSNR boundaries (in green) provided by the UDA, excluding large portions of the SNR as gazetted



Mapped by UDA GIS Centre (2006)

Figure 15: Map of HSNR boundaries (in green) according to the original Survey Plan



Mapped by: EFL (2007). Data from: Hakgala SNR boundary mapped for EFL by the Survey Department; Landuse data from UDA GIS Centre



Figure 16: The original HSNR survey plan



Source: Survey Department

Hakgala is largely excluded from national conservation efforts

Equally sinister is the resounding silence on the situation in Hakgala (and other protected areas that are similarly threatened by encroachment and illegal land grabbing) at the highest levels of government. This applies also to the foreign donors who for decades have worked ostensibly to support the conservation of biodiversity in the country. There has been deliberate, and persistent, exclusion of Hakgala from most major conservation initiatives in the country (including, most recently and notably, the ADB-funded Protected Area Management and Wildlife Conservation Project). Equally significant is the exclusion of HSNR from the proposed Central Highlands World Heritage Site. Nominations for these sites is via the National Man and Biosphere Committee on which the DWLC and the FD are represented.

These exclusions of Hakgala from serious consideration under ongoing conservation efforts merely underline the reach and power of the political forces that benefit from encroachment into



HSNR and other ecologically sensitive areas. It is hard to see these omissions as being anything other than wilful attempts to cover up and divert attention from the problems that are besetting Hakgala. The SNR contains some of the most important biodiversity in the country but is also seriously under-funded and poorly protected under existing arrangements. It therefore clearly requires prioritisation in national conservation programmes and projects.

Court judgements demanding a halt to encroachments are not enforced

Despite numerous calls for its immediate halt, illegal encroachment into Hakgala continues unabated – in direct contravention of the law and the decisions of the courts. As recently as May 2007, an undertaking was given in the Court of Appeal that there would be an immediate halt to any further encroachments into HSNR and that all squatters would be evicted (Annex 1).

EFL had filed similar action in the Court of Appeal (CA 431/88) on 6 May 1988 against the Director General of Wildlife Conservation and the Secretary of the Ministry of State, requesting the Court to issue a Writ of Mandamus on the Director General of Wild Life Conservation to enforce the provisions of the FFPO within the boundaries of HSNR. EFL also requested that the DWLC take steps to prosecute and evict all encroachers living within the said boundaries.

In an attempt to justify its inaction on the grounds that the Government had authorised the alienation of land, the DWLC produced as evidence a letter sent by the Secretary to the Ministry of State (Annex 1). It is notable that this letter had no legible signature and did not give the name of the signatory. The Court of Appeal, by a ruling issued on 28 October 1988, disregarded this letter and requested the parties to enforce the provisions of the FFPO, within the boundaries of HSNR and in particular to take steps to prosecute and evict encroachers from within the said boundaries (Annex 1). In view of this undertaking by the parties, EFL withdrew its application. It however remains a shocking fact that in this instance no action was taken by the Government to determine how such a letter could have been issued and how it was that senior members of the DWLC could even have acted on such a letter. What is clear is that the DWLC chose not to safeguard its property on the basis of a spurious excuse, since this letter has no legal bearing on the duties and responsibilities of the Director General of Wildlife Conservation, whose actions are governed by the FFPO.

As yet no mechanism has been set in place by the government for follow-up action to this settlement. In the face of apparent inaction to uphold the 1988 court ruling, it would appear to be a major concern that, two decades later, no action will again be taken in response to the most recent court settlement, and that the DWLC will continue to allow Hakgala to be totally ruined by encroachment.

Spurious claims to prescriptive rights are used to avoid evicting encroachers

A misconception exists, and is widely held, that encroachers cannot be evicted from the Hakgala area because they have by now established prescriptive rights over the land they occupy. Prescriptive rights concern the operation of the law whereby rights may be established by long exercise of their corresponding powers or extinguished by prolonged failure to exercise such powers.

Even though the argument of prescriptive rights is periodically used as an excuse not to evict the current encroachers in Hakgala and elsewhere, it is fallacious. It should be clearly understood that the Law in Sri Lanka does not permit prescriptive rights to be claimed over the State. There are no prescriptive rights over gazetted national reserves, including the entire area of HSNR, or over State Lands located above 5,000 feet.

Yet there is a risk that those benefitting from encroachment will use the period of their occupancy (and the fact that their buildings and cultivation have been allowed to stand over a long period) to stake a claim for compensation or to make a case that these areas be handed



over to them. The length of occupation of encroachers should be completely disregarded, and eviction should be carried out without fear or favour. Wrongdoers should not be rewarded in any way.

Misuse of political power lies at the root of the problems besetting Hakgala

While the removal of illegal encroachers is absolutely vital to the continued preservation of HSNR, this — together with clear recognition and demarcation of the SNR's boundaries and the proper inclusion of Hakgala in national conservation efforts — is only the first step to finding a long-term solution. It is not the encroachers themselves who are the primary cause of the problems besetting Hakgala: they are only the symptoms of far deeper problems.

The reason that encroachment is allowed — and in fact actively encouraged — to take place is that it occurs under political patronage. Local politicians and government officials are allocating land inside Hakgala and other protected forests, in direct defiance of the law. The root causes of forest biodiversity loss and ecosystem degradation in Hakgala must therefore be recognised to be largely political in nature, and to stem from a fundamental greed — for votes, and for the accumulation of wealth by the politically powerful.

This simple and distressing fact can be better understood in the light of the patterns of encroachment which have occurred in Hakgala. At the time of declaration in 1938 there was no human habitation in the area gazetted as the SNR. Indeed, most of the area that was declared as HSNR under the FFPO, as well as the area immediately around it, lies above the 5,000-foot contour, and thus any clearing is prohibited by the Crown Land Ordinance of No.12 of 1840 (in force at the time). The Ambewela Cattle Farm was set up to fulfil a perceived national need for milk production in the wake of the Second World War by the then Minister of Agriculture (who later became Prime Minister), whose electorate was in a completely different area. The inclusion of a part of the HSNR in Ambewela Farm was due to the DWLC not having been consulted at the time the farm was established, as evidenced by the notes to the Survey. Thus, except for the then State-owned Ambewela Farm, there remained few illegal incursions within the protected area boundaries until the late 1970s.

It was in the late 1970s and 1980s that a devastating change swept Hakgala, as protected land started to be 'allocated' by the powers-that-be to their friends, relatives and cronies. The landslide victory in the General Election of 1977 was followed by the appointment of two powerful Ministers from the ruling party — one whose constituency was the Badulla District and the other from the Nuwara Eliya District. The latter held number of important portfolios including the Ministry of Lands. The maintenance of this massive parliamentary majority secured under the 'first past the post' system at the General Election of 1977 by means of a referendum held in December 1982 (which despite violent protests was deemed constitutional) meant that unbridled political power held sway for well over a decade, without further parliamentary elections. Never before (or since) had a single political party wielded this degree of power over such a long period. This period also saw the consolidation of the process of politicisation of the civil service. Even today many senior civil servants, bureaucrats and technocrats continue to have political affiliations to that regime, and continue to cover up and justify their past actions.

Since the 1980s this land grabbing has continued, largely unabated. Ambewela Farm has been sold to a commercial conglomerate, and there is massive lobbying for the issuing of title deeds to those now illegally occupying land. According to recent reports from the area, as recently as September 2007, politicians (successors of those initially responsible for the destruction of the SNR) are working with high-ranking wildlife officials to delay the implementation of the court judgements made in both 1988 and two decades later in 2007.

For the most part, land grabbing in Hakgala has been carried out with the full knowledge (and in many cases active support) of District, Provincial and National government administrators and politicians, who find it convenient to turn a blind eye to these illegal acts and rampant destruction of the precious national resource that is HSNR. Even the Department of Wildlife



Conservation, which is mandated to manage protected areas and biodiversity on behalf of the State and the general public, has remained woefully inactive. Many government officials have themselves benefited from illegal land allocation and encroachment into Hakgala.

A false rhetoric of poverty alleviation is used to justify personal gain

Those who are grabbing land in Hakgala are well aware of the illegality of their acts. They however continue to blatantly disregard the law, excusing their actions by claiming that they are acting for the benefit of the landless and the marginalised of the country by allowing them access to precious virgin forest land.

These excuses are pure hypocrisy. There is much political mileage to be had from allowing 'poor and disadvantaged' communities on to the virgin forest land in the vicinity rather than to follow a policy on agriculture beneficial to all citizenry. A deliberately false myth is being perpetuated by those behind the illegal encroachments, that their overall aim is to empower the poor and landless and to equip them with secure access to land – a rhetoric that appeals to politicians as well as to less well-informed donors and NGOs.

Long experience, repeated in many other parts of the country, shows that no sooner title deeds are issued then they are sold, often at ludicrously low prices and frequently to local and national power-brokers and elites. The 'poor and disadvantaged communities' merely become hired labour for the land grabbers who live far away in Sri Lanka's towns and cities or who have sought citizenship in other countries. A new form of absentee landlordism has been established, where a politically and economically powerful elite have found a mechanism by which state land can be alienated.

In real terms the people who are living on encroached lands in HSNR are no better off than their compatriots in other parts of the country. In fact, such blatantly illegal encroachment of Hakgala in no way serves to alleviate poverty or assist 'poor and disadvantaged communities'. Rather, the contrary holds true: it acts to increase substantially the inequity that currently prevails in the country, and to further marginalise and impoverish a large population of poor and vulnerable people who depend on HSNR's goods and services. The many residents of the Uva Basin, who depend on Hakgala's watershed protection services, are the major casualties of encroachment. The districts which comprise the Uva Basin are some of the poorest areas in the country. It is indeed a ludicrous and severely warped-logic that allows the greed and illegal actions of a few politically well-connected people to jeopardise the livelihoods and economic security of these many thousands of poor downstream residents.

To overcome and deconstruct the false rhetoric of poverty alleviation that is being used to justify the illegal actions of the politically powerful, it is necessary to question who truly gains from encroachment, and who really achieves access and ownership to this scarce and valuable asset base. It is clear that there are rich and powerful individuals, both domestic and foreign, who have benefited from the wanton rape of HSNR. There undoubtedly exist short-term political and economic gains from destroying biodiversity in areas such as Hakgala for agriculture. More significantly there is enormous potential for income from exploiting the land for quarrying, mining, removal of earth and setting up hotels in places of scenic beauty.

The security situation is used as an excuse for the breakdown in law and order

The security situation in the country has been used as a pretext for the breakdown in law and order that has resulted in the degradation and encroachment of protected areas such as HSNR. For most of the last 30 years the country has been governed under emergency regulations. Since the 1980s the Sri Lanka Police Force has consistently been called upon to neglect its normal mandated duties and instead provide protection to political figures. This diversion of resources has facilitated rampant illegal activities such as deforestation and encroachment, since the Police (and other agencies) reasonably justify turning a blind eye to them.



Any use of the security situation (which has prevailed in the country for almost three decades) as an excuse for the failure of the Police and other responsible state agencies to protect property and utilities cannot be condoned under any circumstances. Where necessary, this excuse can be countered by regarding this situation as a Force Majeure³, and by discounting the length of time over which these activities have been continued.

References and notes to this chapter

¹ According to the Survey Act, No. 17 of 2002, “plan” means a geographical representation of any survey. In addition to this “land survey” means - (a) the determination or establishment for boundary purposes of the form, contour, position, area, shape, height, depth, or nature of any part of the earth or of any natural or artificial features, and the position, length and direction of bounding lines on, below, or above any part of the earth; (b) the determination or establishment of the extent of any right or interest in land or in air space; (c) the determination of the location of any feature relative to a boundary for the purpose of certifying the location of that feature; and includes – (i) cadastral surveying; (ii) compiling a network of any order of precision; (iii) preparation of any plan or map; and (iv) establishing photogrammetric ground controls.

² According to the Survey Act, No. 17 of 2002, “map” means a representation at a scale or projection of the features (whether natural or artificial or both) or other information relating to a part or the whole of the earth in a graphical, photographic or digital form or a combination of those forms.

³ Force Majeure is a common clause in contracts which essentially frees both parties from liability or obligation when an extraordinary event or circumstance beyond the control of the parties, such as war, strike, riot, crime, act of nature (e.g., flooding, earthquake, volcano), prevents one or both parties from fulfilling their obligations under the contract.

Conclusions: conservation status and management needs for HSNR



Photo 12: It is imperative that an immediate halt is called to encroachment into Hakgala

The studies that are reported in this document present hard and incontrovertible evidence of the extremely high national and international value of Hakgala's biodiversity and ecosystem services, as well as underlining the serious threats that exist to the SNR which have led (and are continuing to lead) to its destruction.

The document has made clear that the degradation of Hakgala has very serious implications. It has also described a catalogue of management gaps and shortcomings, which have resulted in the failure by government to adequately address these threats.

It is with the DWLC that the buck stops as regards Hakgala. Regardless of the underlying causes of HSNR's illegal encroachment and ongoing degradation, DWLC is the agency that is mandated to manage the area on behalf of the State and the people of Sri Lanka. Their inaction to date in addressing the destruction of HSNR is both inexcusable and unforgivable.

Evidence that individual DWLC staff members have in fact directly benefited from encroachment raises even more serious concerns about the commitment of the agency to fulfilling its mandate – protecting the fauna, flora and natural habitats of the country.

Although other government agencies (such as the Police, Ministry of Environment and Central Environmental Authority) who are required to deal with encroachment are also culpable, and their inaction and failure to fulfil their duties are equally unpardonable, the DWLC must be held ultimately responsible for the sorry state that Hakgala is in today.



As the evidence presented and analysed in this report has shown, over the years the DWLC has:

- Failed to safeguard the boundaries of HSNR;
- Neglected to evict encroachers;
- Endeavoured to justify the presence of encroachers by spurious means (such as the letter produced in court);
- Attempted to justify their inaction on spurious grounds (such as regarding boundary issues);
- Excluded HSNR from national conservation efforts;
- Misrepresented the nature and extent of various types of encroachment;
- Undermined Hakgala's status as a biodiversity hotspot, a critical watershed, and a strictly Protected Area.

All in all, we are left with a situation where the government and people of Sri Lanka are unable to preserve even a tiny portion of the total land area for the good of the country. Even though there is repeated reference in Sri Lanka's national policies to the need to protect biodiversity and to the importance of forests for water supplies, and there is a comprehensive body of legislation that bans encroachment into protected forests and upper watersheds, it is all too apparent that little has actually been done to translate these noble statements and good intentions into practice. Encroachment is being allowed (and encouraged) to happen in Hakgala, as in many other parts of the country. If we are to save our few remaining forests, and safeguard the vital goods and services they provide, it is clear that rapid and decisive action has to be taken.

Analysis of the evidence before us has shown that while encroachment is the single largest problem currently besetting Hakgala, it is the management failings of DWLC (which are in turn underpinned by an unwillingness by the government to take action against the politically powerful minority who continue to illegally grab state land) which constitutes the major problem to be addressed.

We see that in Hakgala a well orchestrated attempt to alienate land and assets which are impossible to alienate by other means (due to them being especially recognised by Law as being essential for the greater benefit of the nation) is being utilised to allow ownership to pass into private hands. At every step, the process requires the intervention by the highest echelons of power in order that the Institutions of State are allowed to neglect their constitutionally-mandated duties. This neglect can also be seen in the case of other public assets such as roads and drains.

It is useful to make consider the ways in which this creeping alienation of State Lands is taking place. A first step is for an illegal activity to be initiated, such as deforestation and clearing of land for agriculture. Such activities are usually carried out surreptitiously, often at night, and are almost always driven by richer and politically powerful individuals. The government agencies mandated to safeguard and protect these lands (for example the DWLC, FD, and Police and the Central Environmental Authority) turn a blind eye, often under political pressure or with pay-offs. The failure of the authorities to deal with encroachment and the illegal occupation of State lands acts to encourage those who carry out the activities, and the level of illegal land encroachment escalates. More and more squatters come in and occupy the cleared land. In many instances this land starts to pass between people, with 'possession' of the land repeatedly changing hands as new occupants come in and take over the cleared land. Rumours are circulated that the area has been de-gazetted and title deeds given by the President of the country. The new occupants then claim to have legitimate occupation of the land, and that they are unaware that the area was ever forested, protected, or otherwise under the real ownership of the State.

Concurrently, the DWLC underplays the importance of Hakgala and attempts to redraw the boundaries. Other Ministries and Institutions also fail to address the issues pertaining to



Hakgala. What remains for this process to reach conclusion is for the political overlords to facilitate the next step whereby the boundaries of the Protected Area or State land are re-gazetted on the basis that the area that is now occupied and/or degraded are excluded. It is then only a matter of time before the occupants are awarded title deeds.

Once title is given, the land soon passes to the politically powerful or their cronies. A long chain of events has occurred, but the profits and gains from the illegally occupied land inevitably end up with the politically powerful individuals who have been behind the land clearance from the start. Ownership and control of fragile State lands thus pass to a tiny (and politically powerful) percentage of the population and to outside forces. The end result is that land is degraded, soil eroded and polluted, ecosystem services and biodiversity are lost, and the majority of the population suffers.

A variation on this theme can be observed in the case of Ambewela Cattle Farm where the State itself has surreptitiously allowed part of HSNR to pass from one State agency to another ostensibly for the greater good of the nation. That the DWLC took no action at that time (or subsequently) is inexcusable. Until the late 1970s, the socialist ethos and welfare state principles that drove public planning in Sri Lanka meant that Ambewela was seen as merely being the use of state lands to generate production for the social good. Since ownership was still with the State, a weak case could be made that this land was not being alienated from State control and that it was merely being used to provide another service to the whole nation. However, as for the last 6 years Ambewela Farm has been held by a private owner, these arguments are no longer valid (if indeed they ever were).

We can see this process of the alienation of State land and assets occurring in various stages, both within and around HSNR (as explained in this document, all of HSNR and its surrounds are legally protected from human occupation and use because they are located above 5,000 feet; HSNR is additionally protected as a SNR). The worry is that Hakgala will – in completion of this long history of mismanagement, deliberate blindness to illegal acts, and pandering to the greed of the politically powerful – ultimately be degazetted. Certainly there is every indication that the government and DWLC are moving inextricably towards this point.

Thus, although the Court of Appeal has twice ordered the prosecution and eviction of Hakgala's squatters as a result of EFL's court actions in 1988 and 2006, this alone will not protect Hakgala or any other protected area in the country that is under similar threat. Presently reports and observations from the area indicate that since EFL filed its latest case, the number of new encroachments have reduced, but no one has vacated land as yet.

The inaction by DWLC and other relevant ministries such as the Ministry of Environment (which is responsible for overall management of these watersheds and safeguarding biodiversity) provides clear evidence of the long reach of political influence fuelling the destruction of the invaluable national asset that is Hakgala. While it is absolutely vital that the undertaking given in the Court of Appeal should be strictly carried out, and those responsible for implementing the removal of encroachers continuously held to their task, further decisive steps must be taken by government, by those responsible for upholding the law, and by those mandated to safeguard the country's biodiversity and protected areas. Unless such decisive action is undertaken, and there is a real commitment to the removal of encroachers and halting of the illegal acts of their politically-powerful backers, Hakgala SNR will be lost, leaving little hope for other forested areas in the country which also face a similar fate.

Recommendations: what needs to be done to halt the destruction of HSNR



Photo 13: As the land around Hakgala becomes more and more densely settled, this may be the last chance to save HSNR

Uphold court rulings and relevant laws relating to HSNR

Under agreements reached in court in 1988, and again two decades later in 2007, various government institutions have committed to undertake the actions that are necessary to conserve Hakgala. Of paramount importance is the need to uphold the court rulings that have been made about the eviction of encroachers in HSNR, as well as to enforce already-existing laws concerning human occupation and activities within the larger Hakgala conservation area (i.e. both within the SNR as well as on State Lands and those over 5,000 feet in altitude). It is imperative that court rulings and relevant laws are upheld and implemented with immediate effect, including:

- develop a policy and plan for the removal of current illegal encroachers. The policy plan must be both formulated and implemented with the support of the key stakeholders, namely the DWLC, FD, Ministry of Environment, Ministry of Lands, Nuwara Eliya and Welimada local government authorities, Police and others involved in the conservation and protection of HSNR. This plan must be implemented without delay, and any authority that fails to comply with the ruling should be taken severely to task.
- effect the immediate eviction of squatters, and a halt to any further encroachment. This requires no financial compensation to be paid to encroachers.



- survey, demarcate and adhere to the SNR boundaries specified in the gazette of 1938. Aerial photographs taken during the colonial period and thereafter, available at the Survey Department, can be made use of for this purpose. A number of natural boundaries, including trees or stone markers can be used to mark the perimeter of the 1-mile radius.
- revoke all permits for activities (including the allocation of land) within the SNR, and disconnect all electricity currently being provided to households who are residing in the HSNR.

Improve the scientific knowledge base on Hakgala

There is a woeful paucity of scientific data about HSNR, and the current management plan is based on outdated and seriously flawed information. Such information is vital for planning and implementing conservation activities in the area, and is essential for effective protected area management. This knowledge base must be provided as a matter of priority, reflecting the most up-to-date information. It should include:

- a detailed inventory of the fauna and flora of HSNR, identifying species and habitats of conservation concern as well as an assessment of ecosystem services.
- a comprehensive study on the economic and cultural values of HSNR.

Accord the HSNR landscape an adequate level of protection

HSNR and its surrounding areas (including other parts of the Central Highlands Forest Complex) harbour some of Sri Lanka's richest, most important, rare and endangered biodiversity. They also provide critical watershed protection which benefits a large proportion of the nation's population and industries. For too long they have been not taken seriously (and in some ways effectively excluded) by national conservation programmes and policies. This degree of omission is completely inconsistent with their demonstrably and immeasurably high local, national and global value. Each unit of this landscape is linked, and vital, in ensuring that these services continue to be provided. Future strategies need urgently to focus on conserving the entire HSNR landscape, comprising all of its component parts, including:

- undertake forest landscape restoration and reforestation activities where land has been cleared and degraded in the past. The DWLC should take immediate steps to replant, restore and encourage the natural regeneration of forest areas.
- integrate adjacent forests which are continuous with HSNR, including the large area of undisturbed forest currently administered as part of Hakgala Botanical Gardens.
- include HSNR in the proposed UNESCO Central Highlands World Heritage Site currently being considered by the National MAB committee, planned to include Horton Plains National Park, Peak Wilderness Sanctuary and Knuckles Conservation Area.

Improve the institutions which are mandated to protect the HSNR landscape

The institutions mandated to manage HSNR, and to halt the illegal activities which are leading to its destruction, have failed woefully in their duties. Serious steps need to be taken to improve the functioning and effectiveness of the agencies who are directly charged with environmental conservation in HSNR and its surrounding landscapes, including:

- allocate an adequate level of DWLC personnel and equipment to HSNR, and take steps to ensure that these are used properly and in support of conservation activities. There is a need to allocate at least 3 more assistant rangers for the HSNR and 6 more guards with adequate firepower to protect the HSNR and themselves. There is also a need to allocate



at least one more four-wheel drive vehicle and provide the assistant rangers with at least 3 more motor bicycles.

- ensure effective coordination between FD and DWLC. Both the complementary mandates of these two institutions as regards conservation goals, as well as the fact that they are responsible for continuous areas of the Hakgala landscape (many of which are encroached), mean that it is vital that steps are taken to ensure that they work more effectively together. A “liaison officer” should be appointed in each department to coordinate some of the activities of common concern to both.

Ensure the transparency and disclosure required for public accountability and good environmental governance

There has been a serious lack of transparency and disclosure by the government as regards the management constraints and land grabbing that have beset HSNR for decades. There is also ample evidence that the authorities have turned a blind eye to the illegal actions of powerful political interests, and that even government departments and civil servants are implicated in land grabbing in and around the SNR. Action at the highest political and government levels is required to restore good governance to HSNR, and to ensure that the duty of the state to protect HSNR on behalf of the present and future generations of Sri Lankans, is discharged with the highest level of probity and accountability.

- ensure that the Ministry of Environment investigates thoroughly the past and present situation as regards Hakgala. Public land is being alienated by politicians, their cronies and other well-connected people. The Ministry of Environment must at a minimum investigate and make public the names of those behind the continuing encroachment of Hakgala. Legal action should be instituted by the State against all public officials and private individuals who have participated in the illegal activity. Wide publicity should be given to the issue, and strict and independent monitoring of the current Court Order implemented.
- set in place an extensive awareness campaign. One of the key factors for the destruction of the country’s Protected Areas is that there has been wilful neglect on the part of the state to educate its populace on the value of natural resources and ecosystem services. This neglect is particularly apparent in the case of Hakgala; the majority of Sri Lankans seem to be ignorant of its immense importance as a critical watershed.



Annex 1: Documents relating to cases filed by EFL on HSNR

Figure 17: Letter produced by the DWLC to justify illegal encroachments into HSNR (Sinhala language version)

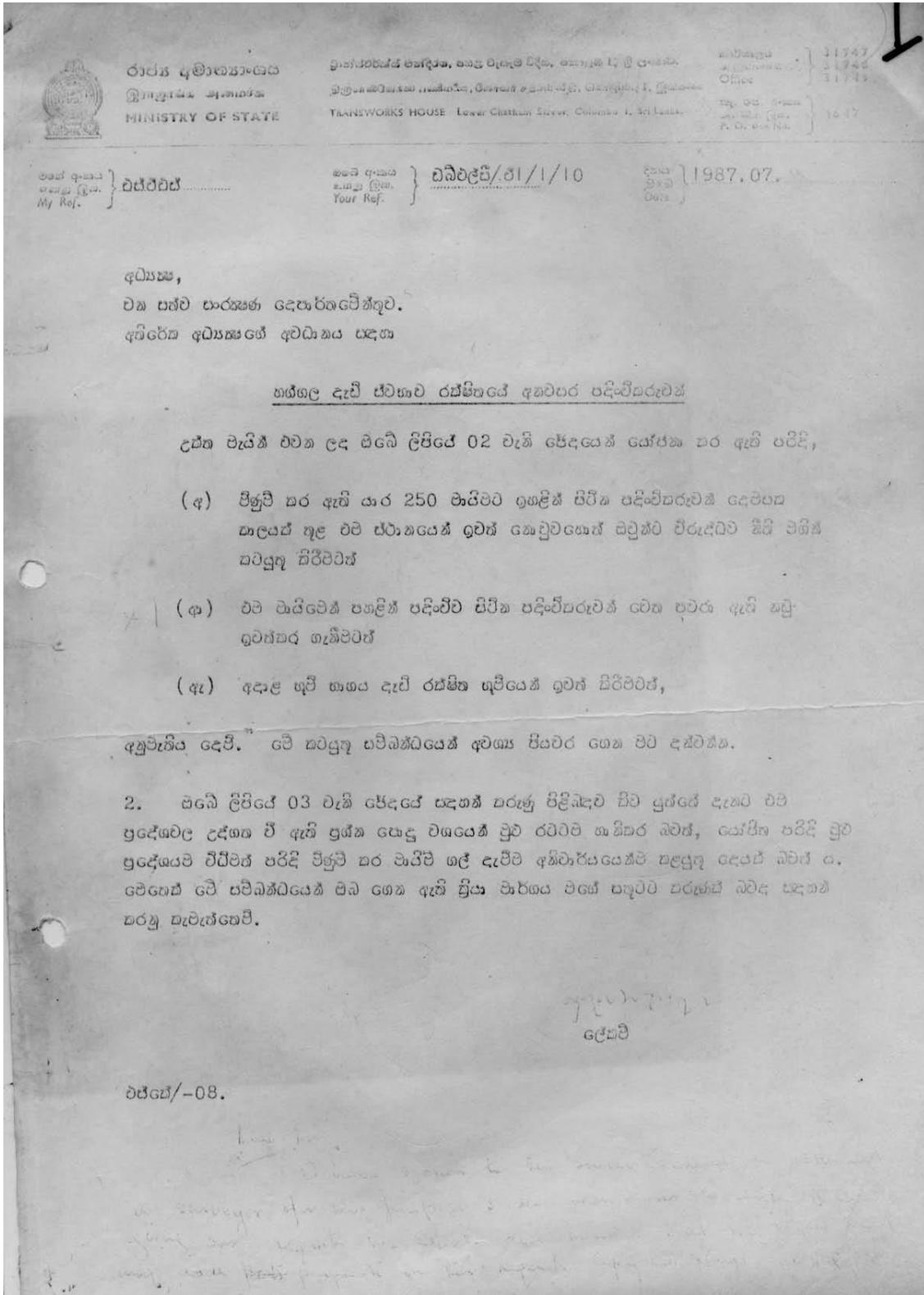




Figure 19: Terms of settlement for case filed by EFL in 1987

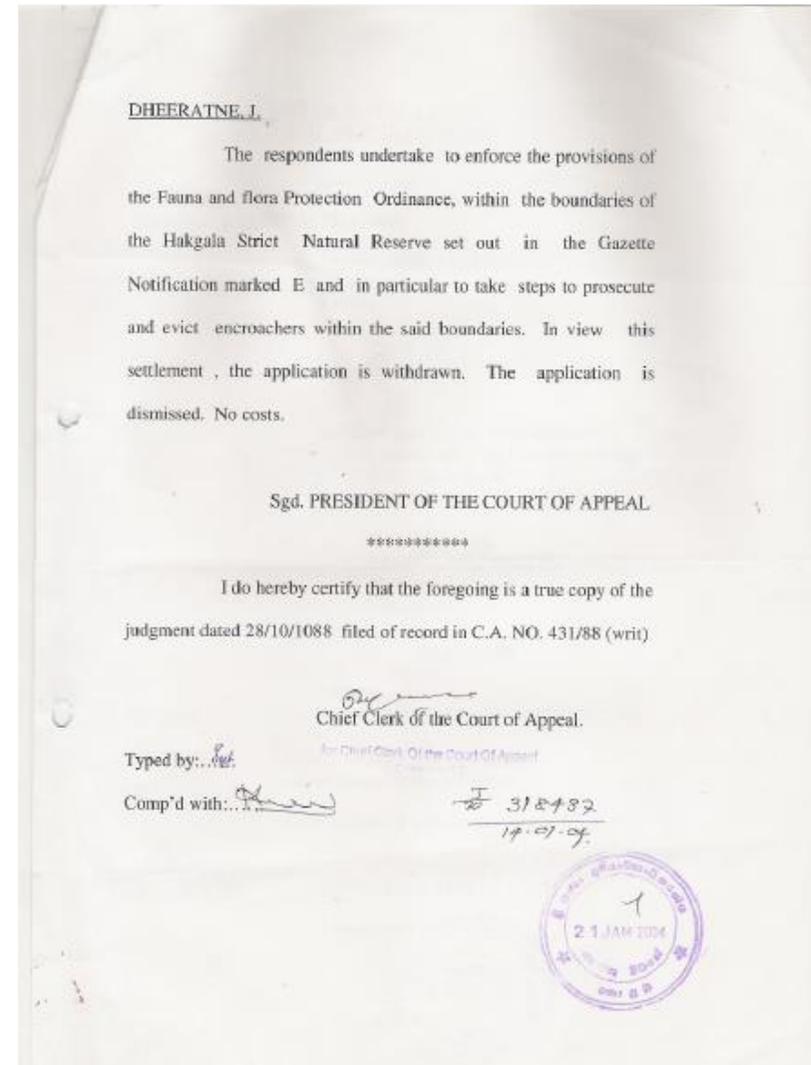
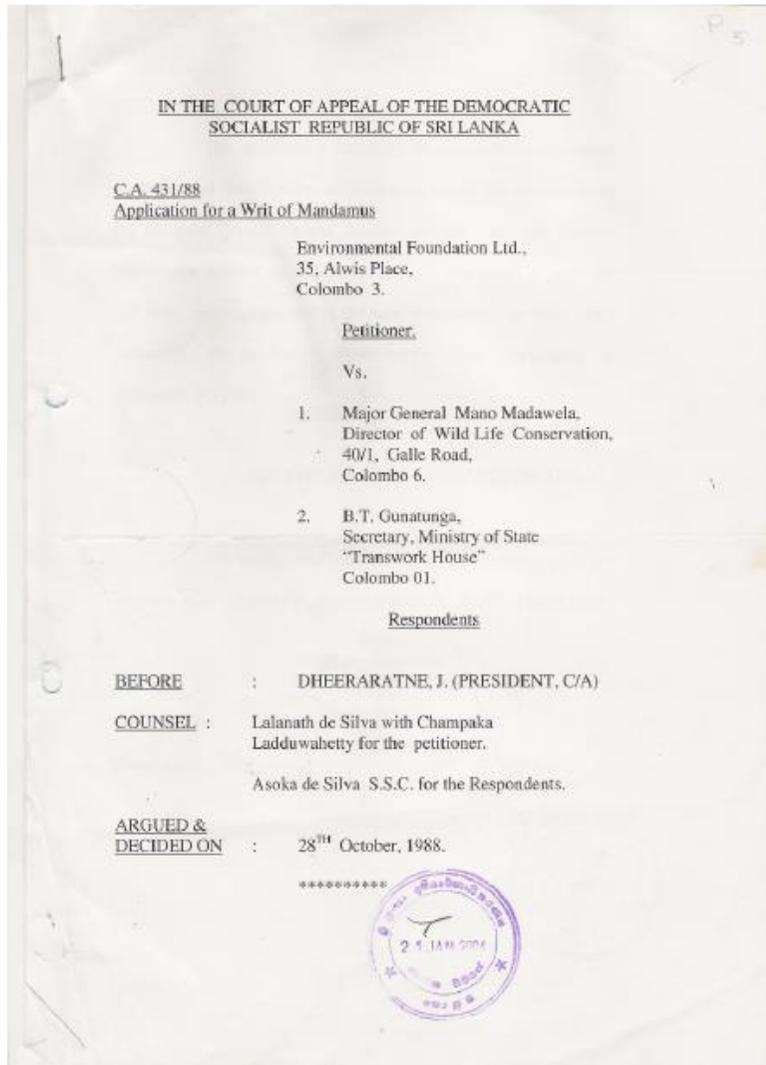




Figure 20: Terms of settlement for case filed by EFL in 2006

<p style="text-align: center;">IN THE COURT OF APPEAL OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA</p> <p style="text-align: center;">In the matter of an application for Orders in the nature of Writs of Prohibition and Mandamus in terms of Article 140 of the Constitution.</p> <p>Court of Appeal Application No. 549/ 2006</p> <p style="text-align: right;">Environmental Foundation Limited, No.146/34, Havelock Road, Colombo 5. Petitioner</p> <p style="text-align: center;">Vs.</p> <ol style="list-style-type: none"> 1. Hon. Maithripala Sirisena Minister of Agriculture, Environment, Irrigation and Mahaweli Development, C/o Ministry of Environment, "Sampathpaya", 82, Rajamalwatte Road, Battaramulla. 2. The Secretary, Ministry of Environment, "Sampathpaya", 82, Rajamalwatte Road, Battaramulla. 3. Director-General Wildlife Conservation, Department of Wildlife Conservation 18, Gregory's Road, Colombo 7. 4. Ceylon Electricity Board, 50, Sir Chintampalam A. Gardiner Mawatha, Colombo 2. 5. Divisional Secretary, Nuwara Eliya, Office of the Divisional Secretariat, Nuwara Eliya. 6. Divisional Secretary, Welimada, Office of the Divisional Secretariat, Welimada. 7. The Land Commissioner, Land Commissioner's Department, 7 Gregory's Avenue, Colombo 7. 	<p style="text-align: center;">2</p> <ol style="list-style-type: none"> 8. Senior Superintendent of Police, Nuwara Eliya, Office of the Senior Superintendent of Police, Nuwara Eliya. 9. Senior Superintendent of Police, Bandarawela, Office of the Senior Superintendent of Police, Bandarawela. <p style="text-align: right;">Respondents</p> <p>TO: HIS LORDSHIP THE PRESIDENT AND THE OTHER HONOURABLE JUDGES OF THE COURT OF APPEAL OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA.</p> <p style="text-align: center;"><u>Terms of Settlement</u></p> <p>It is hereby agreed by and between the parties to this application as follows:</p> <ol style="list-style-type: none"> 1. The 3rd Respondent will take steps to survey and demarcate the boundaries of the Hakgala Strict Natural Reserve in terms of the Gazette marked "P4". 2. The 3rd Respondent will take necessary legal action to prevent any further encroachment into the Hakgala Strict Natural Reserve. 3. The 5th and 6th Respondents will not issue, renew or extend any permit in respect of the land within the Hakgala Strict Natural Reserve and the provisions of the Fauna and Flora Protection Ordinance will be strictly enforced within the Hakgala Strict Natural Reserve. 4. The 4th Respondent will not provide or supply any new electricity connections and/or erect any transmission lines or posts with the said Hakgala Strict Natural Reserve except in terms of the provisions laid down in law, in particular in terms of the provisions laid down in the Fauna and Flora Protection Ordinance (FFPO) as amended. 5. The Department of Wildlife Conservation has already undertaken to take steps to enforce the provisions of the FFPO within the boundaries of Hakgala Strict Natural Reserve and in particular undertakes to take steps to prosecute and evict encroachers within the said boundaries. <p><i>Both parties have signed and entered in to this settlement on 23rd day of May, 2007. The respondents have undertaken to attend to the above mentioned matters and implement the terms of the settlements. In view of this settlement, the application is withdrawn.</i></p>
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Annex 2: Data tables

Water quality parameters

Table 6: Average water quality parameters for rain and fog in HSNR

	pH	Electrical conductivity (mmhos/cm)	NO ₃ -N (mg/l)	NH ₄ -N (mg/l)	SO ₄ -S (mg/l)
Stream water	6.05-7.45	0-0.01	0-1.37	0-0.32	0-3.80
Rain water	5.37-7.47	0-0.08	0-3.05	0.17-2.38	0-3.37
Throughfall	6.46-7.57	0-0.18	0-5.2	0.05-11.44	0.52-26.6
Cloud water	3.88-5.59	0-0.20	1.13-16.2	0.05-5.09	1.05-9.40

Values are for the period from February-May, 1996

From Gunawardena, E.R.N., Rajapakshe, U., Nandasena, K.A. and Rosier, P.T.W., 1998b. Water quality issues in the uplands of Sri Lanka. In: Proceedings of the final workshop, University of Peradeniya-Oxford Forestry Institute Link Project

Industries that depend on the Uma Oya

Table 7: Industries located adjacent to the Uma Oya

Industry type	Number of industries
Other mining and quarrying	83
Manufacturing of food products and beverages	535
Manufacture of tobacco	3
Manufacturing of textiles	19
Manufacturing of wearing apparel, dressing and dyeing of fur	158
Tanning and dressing of leather, manufacturing of luggage, hand	10
Manufacturing of wood and products of wood and cork except furniture	35
Publishing, printing and reproduction of recorded media	8
Manufacturing of chemicals and chemical products	9
Manufacture of rubber and plastic products	1
Manufacture of non metallic mineral products	188
Manufacture of basic metals	2
Manufacture of fabricated metal products except machinery equipment	115
Manufacture of machinery and equipments (n.e.c.)	1
Manufacture of electrical machinery and apparatus n.e.c.	1
Manufacture of vehicles, trailers and semi-trailers	4
Manufacture of furniture, manufacture of n.e.c.	201
Electricity, gas, steam and hot water supply	1
Collection, purification and distribution of water	14
Total industries	1,388

From Census of Population and Housing 2001, Badulla District Final Results (CD). 2001. Department of Census and Statistics. Colombo

Population adjacent to the Uma Oya

Table 8: Population living adjacent to the Uma Oya

Province	District	DS Division	Population	Area (ha)
Central	Nuwara Eliya	Walapane	1,565	6,807
Uva	Badulla	Hali Ela	8,013	3,503
Uva	Badulla	Kandaketiya	4,809	6,119
Uva	Badulla	Uva Paranagama	23,242	4,853
Uva	Badulla	Welimada	18,552	2,231
TOTAL			56,181	23,514

From Census of Population and Housing 2001, Badulla District Final Results (CD). 2001. Department of Census and Statistics. Colombo



Basic household characteristics (all data from EFL socio-economic survey)

Table 9: Household size and characteristics of household head

	Household size*	Male respondents	Male head	Primary occupation			
				Farming	Employed	Business	Unskilled
All respondents	5.9	28%	94%	62%	21%	6%	11%
Households inside the SNR boundaries	6.1	43%	95%	71%	14%	0%	14%
Households outside the SNR boundaries	5.7	15%	92%	54%	27%	12%	8%

* resident members only

Table 10: Length of residence

	Length of residence in area (years)					Length of residence on land (years)				
	>50	30-50	10-29	3-10	<3	>50	30-50	10-29	3-10	<3
All respondents	19%	38%	38%	0%	2%	2%	23%	60%	11%	4%
Households inside the SNR boundaries	19%	33%	43%	0%	5%	5%	5%	67%	14%	10%
Households outside the SNR boundaries	19%	42%	35%	0%	0%	0%	38%	54%	8%	0%

Table 11: Place of origin

	Place of origin		
	Within district	Other districts in province	Other area
All respondents	70%	11%	9%
Households inside the SNR boundaries	86%	5%	10%
Households outside the SNR boundaries	58%	15%	8%

Household wealth status (all data from EFL socio-economic survey)

Table 12: Access to land (perches)

	Land area	Cultivated land per resident
All respondents	86.60	20.93
Households inside the SNR boundaries	121.10	30.64
Households outside the SNR boundaries	58.73	13.09

Table 13: Cash income

	Crop value (Rs/year)	Remittances (% households)	Wage earnings (Rs/month)
All respondents	234,217	0.02	4,577
Households inside the SNR boundaries	336,499	0.05	4,100
Households outside the SNR boundaries	151,604	-	4,962

Table 14: Ownership of material assets

	Vehicle	Motorbike	Bicycle	TV	Radio
All respondents	11%	11%	9%	89%	85%
Households inside the SNR boundaries	14%	19%	5%	90%	81%
Households outside the SNR boundaries	8%	4%	12%	88%	88%

**Table 15: Type of house**

	Walls					Roof				Windows
	Plaster	Clay	Wood	Tin	Brick/block	Tin	Asbestos	Tile	Wood	Glass
All respondents	30%	9%	40%	9%	34%	49%	47%	0%	2%	74%
Households inside the SNR boundaries	33%	5%	57%	14%	20%	67%	29%	0%	5%	76%
Households outside the SNR boundaries	27%	12%	27%	4%	46%	35%	62%	0%	0%	73%

Table 16: Household water and sanitation

	Attached latrine	Piped water	Well	Shared water supply	Hand collected water
All respondents	9%	39%	28%	21%	13%
Households inside the SNR boundaries	10%	34%	43%	10%	14%
Households outside the SNR boundaries	8%	42%	15%	31%	12%

Table 17: Energy source

	Firewood	Gas	Kerosene	Mains electricity	Battery
All respondents	72%	47%	60%	57%	19%
Households inside the SNR boundaries	57%	43%	67%	62%	29%
Households outside the SNR boundaries	85%	50%	54%	54%	12%

Land use and ownership (all data from EFL socio-economic survey)

Table 18: Access to land

	This land		Other land	
	Land area (perches)	Area farmed (perches)	% households with other land	Area (perches)
All respondents	86.60	78.40	15%	30.82
Households inside the SNR boundaries	121.10	114.29	29%	117.00
Households outside the SNR boundaries	58.73	49.42	4%	0.04

Table 19: Land ownership

	Title deed	Own	Rented	Worker
All respondents	49%	81%	2%	9%
Households inside the SNR boundaries	48%	81%	0%	10%
Households outside the SNR boundaries	50%	81%	4%	8%

Table 20: Land acquisition

	Inherited	Bought	Cleared	Allocated	Given
All respondents	32%	16%	42%	11%	8%
Households inside the SNR boundaries	24%	24%	41%	18%	0%
Households outside the SNR boundaries	38%	10%	43%	5%	14%



Table 21: Clearance of forest land for farming by households inside the SNR boundaries

	Already cleared when farm acquired	Cleared after farm acquired	Whether will continue to clear	Within	Boundary
Households inside the SNR boundaries	38%	48%	10%	81%	19%

Table 22: Land use

	House	Crops	Home garden	Fallow/unused
All respondents	21.39%	78.2%	0.2%	0.1%
Households inside the SNR boundaries	14.5%	85.4%	-	-
Households outside the SNR boundaries	26.9%	72.4%	0.3%	0.1%

Livelihoods and production (all data from EFL socio-economic survey)

Table 23: Primary source of livelihood

	Crops	Livestock	Off farm income	Remittances
All respondents	64%	2%	34%	4%
Households inside the SNR boundaries	76%	5%	24%	5%
Households outside the SNR boundaries	54%	0%	42%	4%

Table 24: Off-farm income sources

	Number of residents with jobs	Samurdhi	Declared off farm income	Earnings/month (Rs)
All respondents	0.73	21%	45%	10,242.86
Households inside the SNR boundaries	0.52	29%	48%	8,610.00
Households outside the SNR boundaries	0.92	15%	42%	11,727.27

Table 25: Crops cultivated

	Potato	Carrot	Leeks	Cabbage	Beet	Radish
All respondents	64%	64%	49%	17%	9%	4%
Households inside the SNR boundaries	86%	48%	38%	24%	5%	0%
Households outside the SNR boundaries	46%	77%	58%	12%	12%	8%

Table 26: Area cultivated (perches)

	Potato	Carrot	Leeks	Cabbage	Beet
All respondents	87	82	96	181	49
Households inside the SNR boundaries	110	151	189	262	152
Households outside the SNR boundaries	53	45	46	46	14

Table 27: Harvests per year (number of harvests)

	Potato	Carrot	Leeks	Cabbage	Beet
All respondents	1.47	2.03	1.52	1.25	3.25
Households inside the SNR boundaries	1.67	1.70	1.13	1.40	1.00
Households outside the SNR boundaries	1.17	2.20	1.73	1.00	4.00

**Table 28: Crop yields (kg/perch)**

	Potato	Carrot	Leeks	Cabbage	Beet
All respondents	63	53	47	41	71
Households inside the SNR boundaries	79	83	33	51	1
Households outside the SNR boundaries	39	37	56	23	94

Table 29: Production of crops for sale

	Potato	Carrot	Leeks	Cabbage	Beet
All respondents	95%	96%	97%	100%	100%
Households inside the SNR boundaries	95%	100%	100%	100%	100%
Households outside the SNR boundaries	96%	94%	95%	99%	100%

Table 30: Value of crop production (Rs/year)

	TOTAL	Potato	Carrot	Leeks	Cabbage	Beet	Radish
All respondents	478,974	185,007	77,153	96,439	107,500	10,125	2,750
Households inside the SNR boundaries	609,774	237,693	102,275	106,556	160,750	2,500	-
Households outside the SNR boundaries	294,445	105,978	63,932	90,368	18,750	12,667	2,750

Use of forest land and resources (all data from EFL socio-economic survey)

Table 31: Forest products collection by respondent

	Whether collect products from forest	Importance of products			
		Very important	Important	Fairly important	Not at all important
All respondents	62%	51%	11%	2%	0%
Households inside the SNR boundaries	67%	52%	19%	0%	0%
Households outside the SNR boundaries	58%	50%	4%	4%	0%

Table 32: Forest products collection by others

	Collection of forest products by others	Whether people from outside area come to use forest	How common forest use is			
			Everybody	Some	Few	Nobody
All respondents	79%	26%	62%	9%	6%	15%
Households inside the SNR boundaries	90%	43%	62%	19%	10%	5%
Households outside the SNR boundaries	69%	12%	62%	0%	4%	23%

Table 33: Types of forest products collected

	Fuelwood	Housing materials	Timber	Hunting	Grazing	Medicines	Wild foods	Handicraft items	Compost
All respondents	55%	2%	0%	2%	4%	0%	4%	0%	2%
Households inside the SNR boundaries	71%	0%	0%	5%	10%	0%	10%	0%	0%
Households outside the SNR boundaries	42%	4%	0%	0%	0%	0%	0%	0%	4%



Table 34: Use of forest products as sole/primary source of good

	Fuelwood	Housing materials	Timber	Hunting	Grazing	Medicines	Wild foods	Handicraft items	Compost
All respondents	47%	0%	0%	0%	2%	0%	2%	0%	0%
Households inside the SNR boundaries	62%	0%	0%	0%	5%	0%	5%	0%	0%
Households outside the SNR boundaries	35%	0%	0%	0%	0%	0%	0%	0%	0%

Table 35: Sales of forest products

	Fuelwood	Housing materials	Timber	Hunting	Grazing	Medicines	Wild foods	Handicraft items	Compost
All respondents	0%	0%	0%	2%	0%	0%	0%	0%	0%
Households inside the SNR boundaries	0%	0%	0%	5%	0%	0%	0%	0%	0%
Households outside the SNR boundaries	0%	0%	0%	0%	0%	0%	0%	0%	0%

Perception of forest, livelihoods and conservation (all data from EFL socio-economic survey)

Table 36: Changes in forest use over time

	Same	Increased	Reduced	Variable
All respondents	19%	6%	45%	2%
Households inside the SNR boundaries	24%	10%	48%	5%
Households outside the SNR boundaries	15%	4%	42%	0%

Table 37: Changes in forest product availability over time

	Same	Increased	Reduced	Variable
All respondents	23%	2%	47%	11%
Households inside the SNR boundaries	24%	0%	52%	14%
Households outside the SNR boundaries	23%	4%	42%	8%

Table 38: Perceived owners of forest

	Local farmers	Outsiders	Government
All respondents	2%	2%	87%
Households inside the SNR boundaries	0%	5%	95%
Households outside the SNR boundaries	4%	0%	81%



Table 39: Awareness of protected area

	Respondent		Others	Respondent	
	Awareness of existence of PA	Awareness of location of PA boundaries	Awareness of location of PA boundaries	Awareness that farming prohibited	Perception of whether forest should be protected
All respondents	89%	43%	43%	100%	91%
Households inside the SNR boundaries	100%	38%	33%	100%	100%
Households outside the SNR boundaries	81%	46%	50%	100%	85%

Table 40: Incidence of fines for forest use

	Respondent				Others			
	Many	Few	Once	Never	Frequently	Sometimes	Once	Never
All respondents	9%	6%	15%	64%	23%	30%	9%	26%
Households inside the SNR boundaries	14%	14%	19%	52%	33%	29%	10%	29%
Households outside the SNR boundaries	4%	0%	12%	73%	15%	31%	8%	23%

Table 41: Incidence of arrests for forest use

	Respondent				Others			
	Many	Few	Once	Never	Frequently	Infrequently	Seldom	Never
All respondents	2%	4%	9%	74%	11%	19%	13%	45%
Households inside the SNR boundaries	5%	10%	10%	76%	19%	19%	10%	43%
Households outside the SNR boundaries	0%	0%	8%	73%	4%	19%	15%	46%

Table 42: Interactions with Forest Department/Department of Wildlife Conservation

	Frequently	Infrequently	Seldom	Never	Whether they prevent forest use
All respondents	57%	28%	19%	0%	91%
Households inside the SNR boundaries	57%	33%	19%	0%	95%
Households outside the SNR boundaries	58%	23%	19%	0%	88%

Table 43: Changes in livelihood over time

	Whether livelihood has changed	Reliance on farming			Reliance on forest products		
		More	Same	Less	More	Same	Less
All respondents	66%	40%	13%	43%	6%	19%	30%
Households inside the SNR boundaries	67%	52%	0%	52%	10%	29%	43%
Households outside the SNR boundaries	65%	31%	23%	35%	4%	12%	19%

Table 44: Future access to farmland

	Whether children will continue to farm in area	Whether farm is big enough to hand on to children	Whether will purchase more land for children	Whether will clear more forest for children
All respondents	36%	30%	49%	9%
Households inside the SNR boundaries	48%	38%	57%	19%
Households outside the SNR boundaries	27%	23%	42%	0%



Annex 3: Species lists for HSNR

Vertebrate fauna of HSNR

Group/Family	Species	Source	Common name - English	2007 IUCN Red List Status
MAMMALS				
Bovidae	<i>Bubalus bubalis</i> [^]	Bambaradeniya & Ranawana 1998	Water Buffalo, Domestic Water Buffalo	
Canidae	<i>Canis aureus</i>	Bambaradeniya & Ranawana 1998	Jackal	
Cercopithecidae	<i>Macaca sinica</i> *	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Sri Lanka Toque Monkey	
Cercopithecidae	<i>Trachypithecus vetulus</i> *	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Sri Lanka Purple-faced Leaf Monkey	Vulnerable
Cervidae	<i>Cervus unicolor</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Sambur	
Cervidae	<i>Muntiacus muntjak</i>	Forest Department, 2006; Bambaradeniya & Ranawana 1998		
Cervidae	<i>Tragulus meminna</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998		
Felidae	<i>Panthera pardus</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Leopard	Vulnerable
Felidae	<i>Prionailurus viverrinus</i>	Bambaradeniya & Ranawana 1998; IUCN, 1990	Fishing Cat	Endangered
Histricidae	<i>Hystrix indica</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Porcupine	
Leporidae	<i>Lepus nigricollis</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Black-naped Hare	
Muridae	<i>Mus mayori</i> * ⁻	IUCN, 1990	Spiny mouse	Vulnerable
Muridae	<i>Rattus montanus</i> *	Bambaradeniya & Ranawana 1998	Nillu Rat	Endangered
Muridae	<i>Srilankamys ohienensis</i> * ⁻	Bambaradeniya & Ranawana 1998; IUCN, 1990	Bicoloured rat	Endangered
Mustelidae	<i>Lutra lutra</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Eurasian Otter	Endangered
Sciuridae	<i>Funambulus layardi</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Sri Lanka Flamed-striped Jungle Squirrel	Vulnerable
Sciuridae	<i>Funambulus sublineatus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Dusky-striped Jungle Squirrel	Vulnerable
Sciuridae	<i>Petaurista philippensis</i>	IUCN, 1990	Large Ceylon Flying Squirrel, Giant Grey Flying Squirrel	Endangered
Sciuridae	<i>Ratufa macroura</i>	Bambaradeniya & Ranawana 1998; IUCN, 1990	Giant Squirrel	Vulnerable



Group/Family	Species	Source	Common name - English	2007 IUCN Red List Status
Soricidae	<i>Crocidura miya</i> *	IUCN, 1990	Long-tailed Shrew	Endangered
Soricidae	<i>Feroculus feroculus</i> ™	IUCN, 1990	Kelaart's Long-clawed Shrew	Endangered
Soricidae	<i>Solisorex pearsoni</i> *™	IUCN, 1990	Pearson's Long-clawed Shrew, Sri Lanka Long-clawed Shrew	Endangered
Suidae	<i>Sus scrofa</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Wild Boar	
Vespertilionidae	<i>Pipistrellus affinis</i>	IUCN, 1990	Grizzled Pipistrel, Chocolate Bat	
Viverridae	<i>Herpestes brachyurus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Brown Mongoose	
AMPHIBIANS				
Bufonidae	<i>Adenomus kelaartii</i> *	IUCN, 1990	Kelaart's Dwarf Toad, Torrent Toad	
Microhylidae	<i>Microhyla zeylanica</i> *	Dutta & Manamendra-Arachchi, 1996; IUCN, 1990	Sri Lankan Narrow-mouthed Frog	Endangered
Microhylidae	<i>Ramanella palmata</i> *	Dutta & Manamendra-Arachchi, 1996; IUCN, 1990	Half-webbed Pug-snouted Frog	Endangered
Ranidae	<i>Fejevaryia greenii</i> *	Bambaradeniya & Ranawana, 1998; IUCN, 1990	Sri Lanka Paddy Field Frog	
Ranidae	<i>Limnonectes lumnocharis</i>	Bambaradeniya & Ranawana, 1998; Dutta & Manamendra-Arachchi, 1996		
Ranidae	<i>Rana temporalis</i>	Dutta & Manamendra-Arachchi, 1996		
Ranidae	<i>Philautus leucorhinus</i> *	Pabla & Mathur, 1999; Bambaradeniya & Ranawana, 1998; IUCN, 1990	White-nosed Tree Frog	Extinct
Ranidae	<i>Philautus schmarda</i> *	Bambaradeniya & Ranawana, 1998; IUCN, 1990	Conical Wart Pygmy Tree Frog, Wrinkled Tree Frog	Endangered
Ranidae	<i>Philautus variabilis</i> *	Pabla & Mathur, 1999; Bambaradeniya & Ranawana, 1998	Gunther's Shrub Frog	Extinct
Rhacophoridae	<i>Philautus microtympalum</i> *	Forest Department 2006, Pabla & Mathur, 1999; Bambaradeniya & Ranawana, 1998; Dutta & Manamendra-Arachchi, 1996	Microtympalum Tree Frog	Endangered
Rhacophoridae	<i>Philautus nasutus</i> *	Pabla & Mathur, 1999; Bambaradeniya & Ranawana, 1998	Pointed Snout Shrub Frog, Lesser Sharp-nosed Tree Frog	Extinct
Rhacophoridae	<i>Polypedates cruciger</i> *	IUCN, 1990	Common Hour-glass Tree Frog	
Rhacophoridae	<i>Polypedates eques</i> *	Forest Department, 2006	Saddled Tree Frog, Ceylonese Tree Frog	Endangered
REPTILES				
Agamidae	<i>Calotes calotes</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Garden Green Lizard	
Agamidae	<i>Calotes nigrilabris</i> *	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998;	Black-cheek Lizard, Black-lipped Lizard	Vulnerable



Group/Family	Species	Source	Common name - English	2007 IUCN Red List Status
		IUCN, 1990		
Agamidae	<i>Ceratophora stoddartii</i> * ⁻	Forest Department 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Rhino-horned Lizard, Rhinohorn Lizard	
Agamidae	<i>Cophotis ceylanica</i> *	Bambaradeniya & Ranawana 1998; IUCN, 1990	Pygmy Lizard	Endangered
Colubridae	<i>Aspidura brachyorrhos</i> * ⁻	Bambaradeniya & Ranawana 1998; IUCN, 1990	Boie's Roughside	
Colubridae	<i>Aspidura trachyprocta</i> * ⁻	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Common Roughside	
Elapidae	<i>Bungarus ceylonicus</i> *	De Silva 1990	Sri Lanka Krait	
Scincidae	<i>Lankascincus taprobanense</i> *	Gans 1995	Smooth Lanka Skink	
Scincidae	<i>Sphenomorphus striatopunctatus</i> *	IUCN, 1990		
Uropeltidae	<i>Rhinophis blythi</i> *	De Silva 1990	Blyth's Earth Snake	
Uropeltidae	<i>Uropeltis melanogaster</i> *	De Silva 1990	Black-bellied Shield Tail, Gray's Earth Snake	
Viperidae	<i>Hypnale nepa</i> * ⁻	De Silva 1990	Millard's hump-nosed viper	
Viperidae	<i>Hypnale walli</i> * ⁻	De Silva 1990	Gloyd's hump-nosed viper	Endangered
BIRDS				
Accipitridae	<i>Elanus caeruleus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Black-shouldered Kite, Black-winged Kite	
Accipitridae	<i>Ictinaetus malayensis</i>	Forest Department, 2006; Pabla & Mathur, 1999	Black Eagle	
Accipitridae	<i>Spilornis cheela</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Crested Serpent Eagle	
Accipitridae	<i>Spizaetus nipalensis</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Mountain Hawk Eagle	Vulnerable
Alaudidae	<i>Alaudida gulgula</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Oriental Skylark, Indian Skylark	
Alaudidae	<i>Anthus rufulus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Paddyfield Pipit, Indian Pipit	
Alcedinidae	<i>Halcyon smymensis</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Whited-throated Kingfisher, White-breasted Kingfisher	
Ardeidae	<i>Ardeola grayii</i>	Pabla & Mathur, 1999	Pond Heron, Indian Pond Herron	
Campephagidae	<i>Hemipus picatus</i>	Bambaradeniya & Ranawana 1998	Bar-winged Flycatcher-shrike, Pied Flycatcher-shrike	
Campephagidae	<i>Pericrocotus cinamomeus</i>	Bambaradeniya & Ranawana 1998; IUCN, 1990	Small Minivet, Little Minivet	
Campephagidae	<i>Pericrocotus flammeus</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Scarlet Minivet, Orange Minivet	
Capitonidae	<i>Megalaima zeylanica</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Brown-headed Barbet	



Group/Family	Species	Source	Common name - English	2007 IUCN Red List Status
Caprimulgidae	<i>Caprimulgus indicus</i>	Bambaradeniya & Ranawana 1998; IUCN, 1990	Indian Jungle, Jungle, Highland Nightjar	
Columbidae	<i>Columba livia</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Rock Pigeon, Rock Dove	
Columbidae	<i>Columba torringtoni*</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Sri Lanka Wood Pigeon	Vulnerable
Columbidae	<i>Streptopelia chinensis</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; Forest Department, 2006	Spotted Dove	
Corvidae	<i>Corvus macrorhynchos</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998;	Large-billed Crow, Jungle Crow	
Corvidae	<i>Urocissa ornata*⁻</i>	IUCN, 1990	Sri Lanka Blue Magpie	Vulnerable
Cuculidae	<i>Centropus sinensis</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Greater Coucal, Common Coucal	
Epodidae	<i>Collocalia fuciphaga</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Indian Swiftlet, Edible-nest Swift	
Hirundinidae	<i>Hirundo rustica</i> [°]	Bambaradeniya & Ranawana 1998	Barn Swallow, Common Swallow	
Hirundinidae	<i>Hirundo tahitica domicola</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Pacific Swallow, Hill Swallow	Endangered
Lanidae	<i>Lanius cristatus</i> [°]	Bambaradeniya & Ranawana 1998	Brown Shrike	
Motacillidae	<i>Motacillia cinerea</i> [°]	Forest Department, 2006; Bambaradeniya & Ranawana 1998	Grey Wagtail	
Motacillidae	<i>Motacillia flava</i> [°]	Bambaradeniya & Ranawana 1998	Yellow Wagtail	
Muscicapidae	<i>Bradypterus palliseri*⁻</i>	Forest Department, 2006; Bambaradeniya & Ranawana 1998; IUCN, 1990	Sri Lanka Bush Warbler, Ceylon Warbler	
Muscicapidae	<i>Cisticola juncidis</i>	Bambaradeniya & Ranawana 1998	Zitting Cisticola, Streaked Fantail Warbler	
Muscicapidae	<i>Copsychus saularis</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Oriental Magpie Robin	
Muscicapidae	<i>Culicicapa ceylonensis</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Grey-headed Canary Flycatcher, Grey-headed Flycatcher	
Muscicapidae	<i>Eumyias sordida*</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Sr Lanka Dull Blue Flycatcher, Dusky-blue Flycatcher	Vulnerable
Muscicapidae	<i>Ficedula subrubra</i> [°]	Forest Department, 2006; Bambaradeniya & Ranawana 1998; IUCN, 1990	Kashmir Flycatcher, Kashmir Red-breasted Flycatcher	
Muscicapidae	<i>Hypothymis azurea</i>	Bambaradeniya & Ranawana 1998	Black-naped Monarch, Black-naped Flycatcher	
Muscicapidae	<i>Luscinia brunnea</i> [°]	Forest Department, 2006; IUCN, 1990	Indian Blue Robin, Indian Blue Chat	
Muscicapidae	<i>Muscicapa dauurica</i> [°]	Bambaradeniya & Ranawana 1998; IUCN, 1990	Asian Brown Flycatcher	



Group/Family	Species	Source	Common name - English	2007 IUCN Red List Status
Muscicapidae	<i>Myiophoneus blighi</i> * ⁻	Bambaradeniya & Ranawana 1998; IUCN, 1990	Sri Lanka Whistling Thrush	Endangered
Muscicapidae	<i>Orthotomus sutorius</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Common Tailorbird	
Muscicapidae	<i>Phylloscopus magnirostris</i> ^o	Forest Department, 2006; Bambaradeniya & Ranawana 1998; IUCN, 1990	Large-billed Leaf Warbler	
Muscicapidae	<i>Phylloscopus nitidus</i>	Bambaradeniya & Ranawana 1998; Forest Department, 2006; IUCN, 1990		
Muscicapidae	<i>Pomatorhinus horsfieldi</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Indian Scimitar Babbler	
Muscicapidae	<i>Prinia inornata</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Plain Prinia, White-browed Prinia	
Muscicapidae	<i>Prinia socialis</i>	Bambaradeniya & Ranawana 1998	Ashy Prinia	
Muscicapidae	<i>Prinia sylvatica</i>	BPabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Jungle Prinia	
Muscicapidae	<i>Rhipidura aureola</i>	Bambaradeniya & Ranawana 1998; Forest Department, 2006	White-browed Fantail, White-browed Fantail Flycatcher	
Muscicapidae	<i>Rhopocichla atriceps</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Dark-fronted Babbler, Black-fronted Babbler	
Muscicapidae	<i>Saxicola caprata</i>	Pabla & Mathur, 1999	Pied Bushchat	
Muscicapidae	<i>Saxicoloides fulicata</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Black Robin, Indian Robin	
Muscicapidae	<i>Turdus merula</i>	IUCN, 1990	Eurasian Blackbird	Endangered
Muscicapidae	<i>Zoothera dauma</i> *	Forest Department, 2006; IUCN, 1990	Scaly Thrush	Endangered
Muscicapidae	<i>Zoothera spiloptera</i> * ⁻	IUCN, 1990	Spot-winged Thrush	
Muscicapidae	<i>Zoothera wardii</i> ^o	Forest Department, 2006	Pied Thrush, Pied Ground Thrush	
Nectariniidae	<i>Dicaeum erythrorhynchos</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Pale-billed Flowerpecker, Tickell's Flower Pecker	
Nectariniidae	<i>Nectarina asiatica</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998;	Purple Sunbird	
Nectariniidae	<i>Nectarina zeylanica</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998;	Purple-rumped Sunbird	
Paridae	<i>Parus major</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Great Tit, Grey Tit	
Phasianidae	<i>Galloperdix bicalcurata</i> *	IUCN, 1990	Sri Lanka Spurfowl	
Phasianidae	<i>Gallus lafayetti</i> *	Forest Department, 2006; Pabla &	Sri Lanka Junglefowl	



Group/Family	Species	Source	Common name - English	2007 IUCN Red List Status
		Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990		
Picidae	<i>Chrysocolaptes lucidus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Greater Flameback, Crimson-backed Woodpecker	
Picidae	<i>Picus xanthopygaeus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Streak-throated Woodpecker, Small Scaly-bellied Woodpecker	Vulnerable
Pittidae	<i>Pitta brachyura</i> ^o	IUCN, 1990	Indian Pitta	
Ploceidae	<i>Lonchura kelaarti</i> [*]	Forest Department, 2006; Bambaradeniya & Ranawana 1998; IUCN, 1990	Black-throated Munia	
Ploceidae	<i>Lonchura punctulata</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Scaly-breasted Munia, Spotted Munia	
Ploceidae	<i>Passer domesticus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	House Sparrow	
Pycnonotidae	<i>Hypsipetes leucocephalus</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Black Bulbul	
Pycnonotidae	<i>Lole indica</i>	Bambaradeniya & Ranawana 1998	Yellow-browed Bulbul	
Pycnonotidae	<i>Pycnonotus cafer</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Red-vented Bulbul	
Pycnonotidae	<i>Pycnonotus penicillatus</i> ^{*^}	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990;	Yellow-eared Bulbul	Vulnerable
Scolopacidae	<i>Tringa hypoleucos</i> ^o	Bambaradeniya & Ranawana 1998	Common Sandpiper	
Sittidae	<i>Sitta frontalis</i>	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Velvet-fronted Nuthatch	
Sturnidae	<i>Acridotheres tristis</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Common Myna	
Sylviidae	<i>Turdoidea rufescens</i> [*]	IUCN, 1990	Orange-billed Babbler, Ceylon Rufous Babbler	Vulnerable
Zosteropidae	<i>Zosterops ceylonensis</i> [*]	Forest Department, 2006; Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998; IUCN, 1990	Sri Lanka White-eye, Ceylon Hill White-eye	
Zosteropidae	<i>Zosterops palpebrosa</i>	Pabla & Mathur, 1999; Bambaradeniya & Ranawana 1998	Oriental White-eye, Small White-eye	

* Endemic; ^ Exotic; ° Winter Migrant; ~ Relict Species



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Flora of HSR

Family	Species Name		English Name	IUCN 2007 Red List Status
Acanthaceae	<i>Strobilanthes diandra</i>	Rathnayake et al, 1998; IUCN, 1990 (Meijer, 1980-1)		
Acanthaceae	<i>Strobilanthes viscosa</i>	Punyalal & Ranasinghe, 1998		
Anacardiaceae	<i>Semecarpus coriacea</i> **	Punyalal & Ranasinghe, 1998; Wijesundara, 1991		Vulnerable
Anacardiaceae	<i>Semecarpus gardneri</i> *	Forest Department, 2006		
Anacardiaceae	<i>Spondias mombin</i>	Punyalal & Ranasinghe, 1998	Hog Plum Tree	
Apiaceae	<i>Centella asiatica</i> ^ ~	Rathnayake et al, 1998	Indian Pennywort	
Aquifoliaceae	<i>Ilex walkeri</i>	Rathnayake et al, 1998; Wijesundara, 1991		
Araliaceae	<i>Schefflera heterobotrya</i>	Forest Department, 2006; Wijesundara, 1991		
Asteraceae	<i>Ageratina riparia</i> ^	Forest Department, 2006; Rathnayake et al, 1998; Wijesundara, 1991		
Asteraceae	<i>Blumea hieracifolia</i>	Rathnayake et al, 1998		
Asteraceae	<i>Emilia zeylanica</i>	Rathnayake et al, 1998		
Asteraceae	<i>Eupatorium odoratum</i>	Pabla & Mathur, 1999		
Asteraceae	<i>Senecio</i> sp.	Pabla & Mathur, 1999		
Buxaceae	<i>Sarcococca zeylanica</i>	Forest Department, 2006; Wijesundara, 1991		
Caprifoliaceae	<i>Viburnum cylindricum</i>	Wijesundara, 1991		
Caprifoliaceae	<i>Viburnum erubescens</i>	Wijesundara, 1991		
Celastraceae	<i>Euonymus revolutus</i> *	Forest Department, 2006; Wijesundara, 1991		
Celastraceae	<i>Euonymus walkeri</i> *	Wijesundara, 1991		Vulnerable
Celastraceae	<i>Microtropis wallichiana</i> *	Wijesundara, 1991		
Celastraceae	<i>Microtropis zeylanica</i> *	Wijesundara, 1991		
Clusiaceae	<i>Calophyllum walkeri</i> *	Forest Department, 2006; Punyalal & Ranasinghe, 1998; Rathnayake et al, 1998; Wijesundara, 1991; IUCN, 1990 (Meijer, 1980-1)		
Clusiaceae	<i>Garcinia echinocarpa</i> *	Wijesundara, 1991		
Commelinaceae	<i>Anotis nummularia</i>	Rathnayake et al, 1998; Wijesundara, 1991		
Commelinaceae	<i>Cyanotis cristata</i>	Rathnayake et al, 1998		
Cornaceae	<i>Mastixia montana</i> *	Pabla & Mathur, 1999; Wijesundara, 1991		
Cyatheaceae	<i>Cyathea crinita</i> *	Wijesundara, 1991		
Cyperaceae	<i>Carex longicuris</i>	Rathnayake et al, 1998		
Daphniphyllaceae	<i>Daphniphyllum glaucescens</i>	Pabla & Mathur, 1999; Rathnayake et al, 1998; Forest Department, 2006; Wijesundara, 1991		
Elaeagnaceae	<i>Elaeagnus latifolia</i>	Forest Department, 2006; Pabla & Mathur, 1999		
Elaeocarpaceae	<i>Elaeocarpus glandulifer</i> *	Wijesundara, 1991		Vulnerable
Elaeocarpaceae	<i>Elaeocarpus montanus</i> *	Forest Department, 2006; IUCN, 1990 (Meijer, 1980-1)		
Ericaceae	<i>Rhododendron arboreum</i>	Forest Department, 2006; Wijesundara, 1991; IUCN, 1990 (Meijer, 1980-1)		
Ericaceae	<i>Vaccinium leschenaultii</i>	Rathnayake et al, 1998; Wijesundara, 1991		
Euphorbiaceae	<i>Actephilia excelsa</i>	Wijesundara, 1991		
Euphorbiaceae	<i>Glochidion coriaceum</i>	Forest Department, 2006; Wijesundara, 1991		



Family	Species Name		English Name	IUCN 2007 Red List Status
Euphorbiaceae	<i>Glochidion stellatum*</i>	Punyalal & Ranasinghe, 1998		
Euphorbiaceae	<i>Mallotus philippensis</i>	Forest Department, 2006		
Euphorbiaceae	<i>Meineckia sp.</i>	Rathnayake et al, 1998		
Euphorbiaceae	<i>Micrococca oligandra*</i>	Wijesundara, 1991		Vulnerable
Fabaceae	<i>Abarema subcoriacea</i>	Wijesundara, 1991		
Fabaceae	<i>Sophora zeylanica*</i>	Wijesundara, 1991		Extinct
Flacourtiaceae	<i>Casearia coriacea</i>	Wijesundara, 1991		
Flacourtiaceae	<i>Casearia thwaitesii*</i>	Rathnayake et al, 1998; Wijesundara, 1991		
Flacourtiaceae	<i>Scolopia crassipes*</i>	Forest Department, 2006; Pabla & Mathur, 1999; Wijesundara, 1991		
Gesneriaceae	<i>Aechynanthus ceylanica*</i>	Wijesundara, 1991		
Icacinaceae	<i>Apodytes dimidiata</i>	Wijesundara, 1991		
Icacinaceae	<i>Nothapodytes nimmoniana</i>	Forest Department, 2006 ; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998		
Iridaceae	<i>Aristea ecklonii^</i>	Wijesundara, 1991		
Lamiaceae	<i>Plectranthus crameri</i>	Forest Department, 2006		
Lamiaceae	<i>Plectranthus inflatus</i>	Wijesundara, 1991		
Lamiaceae	<i>Pogostemon sp.</i>	Rathnayake et al, 1998		
Lauraceae	<i>Actinodaphne ambigua*</i>	Rathnayake et al, 1998; Wijesundara, 1991		
Lauraceae	<i>Actinodaphne glauca*</i>	Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Lauraceae	<i>Actinodaphne sp 1</i>	Wijesundara, 1991		
Lauraceae	<i>Actinodaphne speciosa*</i>	Forest Department, 2006; Wijesundara, 1991	Elephant Ears	
Lauraceae	<i>Cinnamomum litseifolium</i>	Forest Department, 2006		
Lauraceae	<i>Cinnamomum ovalifolium*</i>	Pabla & Mathur, 1999; Rathnayake et al, 1998; Wijesundara, 1991		
Lauraceae	<i>Litsea ovalifolia</i>	Wijesundara, 1991		
Lauraceae	<i>Neolitsea cassia</i>	Punyalal & Ranasinghe, 1998	Wild Cinnamon	
Lauraceae	<i>Neolitsea fuscata*</i>	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Liliaceae	<i>Asparagus falcatus*</i>	Pabla & Mathur, 1999		
Liliaceae	<i>Asparagus racemosus*</i>	Rathnayake et al, 1998; Wijesundara, 1991		
Loganiaceae	<i>Strychnos benthamii</i>	Wijesundara, 1991		Vulnerable
Loganiaceae	<i>Strychnos sp.</i>	Pabla & Mathur, 1999		
Magnoliaceae	<i>Michelia nilagirica</i>	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Melastomataceae	<i>Memecylon cuneatum*</i>	Forest Department, 2006		Endangered
Melastomataceae	<i>Memecylon parvifolium*</i>	Forest Department, 2006; Wijesundara, 1991		
Melastomataceae	<i>Memecylon sp.</i>	Pabla & Mathur, 1999		
Melastomataceae	<i>Osbeckia aspera*</i>	Wijesundara, 1991		
Melastomataceae	<i>Osbeckia buxifolia</i>	Wijesundara, 1991; IUCN, 1990 (Meijer, 1980-1)		Endangered
Melastomataceae	<i>Osbeckia rubicunda</i>	Punyalal & Ranasinghe, 1998		
Melastomataceae	<i>Osbeckia sp 1</i>	Wijesundara, 1991		
Melastomataceae	<i>Osbeckia walkeri*</i>	Rathnayake et al, 1998		Endangered



Family	Species Name		English Name	IUCN 2007 Red List Status
Monimiaceae	<i>Hortonia floribunda</i> *	IUCN, 1990 (Meijer, 1980-1)		
Moraceae	<i>Ficus microcarpa</i>	Forest Department, 2006; Wijesundara, 1991		
Myrsinaceae	<i>Ardisia gardneri</i> *	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Myrsinaceae	<i>Ardisia pauciflora</i> *	Wijesundara, 1991		
Myrsinaceae	<i>Maesa indica</i> *	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Myrsinaceae	<i>Rapanea robusta</i>	Wijesundara, 1991		
Myrtaceae	<i>Eugenia mabaeoides</i> *	Forest Department, 2006; Punyalal & Ranasinghe, 1998; Rathnayake et al, 1998; Wijesundara, 1991		
Myrtaceae	<i>Rhodomyrtus parvifolia</i>	Wijesundara, 1991		
Myrtaceae	<i>Rhodomyrtus tomentosa</i>	Rathnayake et al, 1998	Wild Gauva	
Myrtaceae	<i>Syzygium assimile</i> *	Wijesundara, 1991		
Myrtaceae	<i>Syzygium revolutum</i>	Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Myrtaceae	<i>Syzygium rotundifolium</i> *	Forest Department, 2006; Pabla & Mathur, 1999; Wijesundara, 1991; IUCN, 1990 (Meijer, 1980-1)		
Myrtaceae	<i>Syzygium sclerophyllum</i> *	Rathnayake et al, 1998; Wijesundara, 1991		Critically Endangered
Myrtaceae	<i>Syzygium umbrosum</i> *	Forest Department, 2006; Punyalal & Ranasinghe, 1998		
Myrtaceae	<i>Syzygium zeylanicum</i>	Forest Department, 2006; Pabla & Mathur, 1999; Wijesundara, 1991		
Oleaceae	<i>Olea paniculata</i>	Wijesundara, 1991		
Oleaceae	<i>Olea polygama</i>	Wijesundara, 1991		
Orchidaceae	<i>Bulbophyllum sp.</i>	Pabla & Mathur, 1999		
Oxalidaceae	<i>Biophytum proliferum</i> *	Wijesundara, 1991		
Piperaceae	<i>Piper sp.</i>	Pabla & Mathur, 1999		
Piperaceae	<i>Piper zeylanicum</i> *	Pabla & Mathur, 1999; Rathnayake et al, 1998; Wijesundara, 1991		
Pittosporaceae	<i>Pittosporum tetraspermum</i>	Wijesundara, 1991		
Poaceae	<i>Cyrtococcum sp.</i>	Pabla & Mathur, 1999; Rathnayake et al, 1998; Wijesundara, 1991		
Poaceae	<i>Cyrtococcum trigonum</i>	Wijesundara, 1991		
Poaceae	<i>Sinarundinaria debilis</i> *	Rathnayake et al, 1998; Wijesundara, 1991		
Pteridaceae	<i>Asplenium sp.</i>	Rathnayake et al, 1998		
Pteridaceae	<i>Pteris quadriaurita</i>	Wijesundara, 1991		
Rhamnaceae	<i>Rhamnus wightii</i>	Forest Department, 2006; Rathnayake et al, 1998; Wijesundara, 1991		
Rhizophoraceae	<i>Anisophyllea cinnamomoides</i>	Punyalal & Ranasinghe, 1998		Vulnerable
Rosaceae	<i>Photinia integrifolia</i>	Wijesundara, 1991		
Rosaceae	<i>Pygeum ceylanica</i>	Wijesundara, 1991		
Rosaceae	<i>Rubus indicus</i>	Rathnayake et al, 1998		
Rubiaceae	<i>Hedyotis lessertiana</i> *	Wijesundara, 1991		
Rubiaceae	<i>Hedyotis marginata</i> *	Rathnayake et al, 1998; Wijesundara, 1991		Critically Endangered
Rubiaceae	<i>Hedyotis trimenii</i> *	Forest Department, 2006; Punyalal & Ranasinghe, 1998;		



Family	Species Name		English Name	IUCN 2007 Red List Status
		Wijesundara, 1991		
Rubiaceae	<i>Ixora calycina</i> *	Wijesundara, 1991		Vulnerable
Rubiaceae	<i>Ixora sp.</i>	Pabla & Mathur, 1999		
Rubiaceae	<i>Lasianthus gardneri</i> *	Rathnayake et al, 1998; Wijesundara, 1991		Endangered
Rubiaceae	<i>Lasianthus oliganthus</i> *	Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998;		Vulnerable
Rubiaceae	<i>Lasianthus protractus</i>	Forest Department, 2006		Extinct
Rubiaceae	<i>Lasianthus varians</i> *	Rathnayake et al, 1998; Wijesundara, 1991		Critically Endangered
Rubiaceae	<i>Metabolus decipiens</i>	Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Rubiaceae	<i>Neurocalyx gardneri</i> *	Rathnayake et al, 1998		Critically Endangered
Rubiaceae	<i>Pavetta involucrata</i> *	Wijesundara, 1991		Vulnerable
Rubiaceae	<i>Psychotria fosbergii</i>	Pabla & Mathur, 1999		
Rubiaceae	<i>Psychotria nigra</i>	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Rubiaceae	<i>Psychotria sohmeri</i>	Wijesundara, 1991		Endangered
Rubiaceae	<i>Psychotria sp 1</i>	Forest Department, 2006; Wijesundara, 1991		
Rubiaceae	<i>Psychotria zeylanica</i>	Forest Department, 2006; Punyalal & Ranasinghe, 1998; Rathnayake et al, 1998; Wijesundara, 1991		
Rubiaceae	<i>Psydrax montanus</i> *	Wijesundara, 1991; Forest Department, 2006		
Rubiaceae	<i>Rubia cordifolia</i>	Forest Department, 2006	Indian Madder	Endangered
Rubiaceae	<i>Saprosma foetens</i>	Wijesundara, 1991; Forest Department, 2006		Vulnerable
Rubiaceae	<i>Tarenna flava</i>	Pabla & Mathur, 1999; Wijesundara, 1991		Vulnerable
Rubiaceae	<i>Urophyllum ceylanicum</i> *	Wijesundara, 1991		
Rubiaceae	<i>Zanthoxylum tetraspermum</i>	Pabla & Mathur, 1999		
Rutaceae	<i>Acronychia pedunculata</i> ~	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Rutaceae	<i>Evodia lunu-ankenda</i> ~	Forest Department, 2006; Wijesundara, 1991		
Rutaceae	<i>Toddalia asiatica</i> ^ ~	Forest Department, 2006; Punyalal & Ranasinghe, 1998; Rathnayake et al, 1998		
Sabiaceae	<i>Meliosma pinnata</i>	Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Sabiaceae	<i>Meliosma simplicifolia</i>	Forest Department, 2006; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Sapindaceae	<i>Allophylus zeylanicus</i>	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		Vulnerable
Sapotaceae	<i>Isonandra montana</i>	Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Schizandraceae	<i>Kadsura heteroclita</i>	Wijesundara, 1991		
Selaginellaceae	<i>Selaginella sp.</i>	Wijesundara, 1991		
Smilacaceae	<i>Smilax aspera</i>	Forest Department, 2006		
Smilacaceae	<i>Smilax zeylanica</i> *	Pabla & Mathur, 1999; Wijesundara, 1991		
Solanaceae	<i>Cestrum aurantiacum</i> ^	Forest Department, 2006; Wijesundara, 1991		
Solanaceae	<i>Cestrum nigrum</i>	Pabla & Mathur, 1999		
Solanaceae	<i>Solanum hispidum</i> ^	Wijesundara, 1991		
Staphyleaceae	<i>Turpinia malabarica</i>	Pabla & Mathur, 1999; Wijesundara, 1991		
Symplocaceae	<i>Corydoblaste pendula</i>	Wijesundara, 1991		



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Symplocaceae	<i>Symplocos bractealis</i> *	Rathnayake et al, 1998; Wijesundara, 1991		Vulnerable
Symplocaceae	<i>Symplocos cochinchinensis</i> ~	Forest Department, 2006; Pabla & Mathur, 1999; Punyalal & Ranasinghe, 1998; Rathnayake et al, 1998; Wijesundara, 1991		
Symplocaceae	<i>Symplocos elegans</i> *	Forest Department, 2006; Pabla & Mathur, 1999; Wijesundara, 1991		
Symplocaceae	<i>Symplocos major</i>	Wijesundara, 1991		
Symplocaceae	<i>Symplocos obtusa</i> *	Forest Department, 2006; Wijesundara, 1991		
Symplocaceae	<i>Symplocos suborbicularis</i>	Wijesundara, 1991		
Theaceae	<i>Adinandra lasiopetala</i> *	Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Theaceae	<i>Eurya ceylanica</i>	Wijesundara, 1991		
Theaceae	<i>Eurya chinensis</i>	Forest Department, 2006		
Theaceae	<i>Eurya nitida</i>	Punyalal & Ranasinghe, 1998		
Theaceae	<i>Gordonia elliptica</i>	Forest Department, 2006; Punyalal & Ranasinghe, 1998; Wijesundara, 1991		
Ulmaceae	<i>Celtis cinnamomea</i>	Forest Department, 2006; Wijesundara, 1991		
Urticaceae	<i>Elatostema</i> sp.	Wijesundara, 1991		
Violaceae	<i>Viola pilosa</i>	Rathnayake et al, 1998	Violet	
Vitaceae	<i>Tetrastigma nilagiricum</i>	Forest Department, 2006; Wijesundara, 1991		
Vitaceae	<i>Tetrastigma</i> sp.	Pabla & Mathur, 1999		
Zingiberaceae	<i>Alpinia altucifolia</i>	Pabla & Mathur, 1999		
Zingiberaceae	<i>Amomum involucreatum</i> *	Wijesundara, 1991		
Zingiberaceae	<i>Amomum</i> sp.	Pabla & Mathur, 1999		

* Endemic; ^ Exotic; ~ Medicinal Value

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