File Name: 1017.pdf **UNESCO Region:** LATIN AMERICA AND THE CARIBBEAN

SITE NAME: **Central Suriname Nature Reserve**

DATE OF INSCRIPTION: 2nd December 2000

STATE PARTY: SURINAME

CRITERIA: N (ii)(iv)

DECISION OF THE WORLD HERITAGE COMMITTEE:
Excerpt from the Report of the 24th Session of the World Heritage Committee

Criteria (ii) and (iv): The site encompasses significant vertical relief, topography and soil conditions that have resulted in a variety of ecosystems. This ecosystem variation allows organisms within these ecosystems to move in response to disturbance, adapt to change and maintain gene flow between populations. The site's size, undisturbed state (in general a rare condition in Amazonian forest parks) and protection of the entire Coppename watershed, will allow long-term functioning of the ecosystem. The site contains a high diversity of plant and animal species, many of which are endemic to the Guyana Shield and are globally threatened.

The Delegate of Thailand expressed his concern about potential threats from gold mining and impacts to the integrity of the site. IUCN noted that the site is a pristine area, that the first phase of the management planning has been completed and that a US$ 18 million trust fund to support protection of the site was established, which could serve as a model for other sites.

This Chairperson informed the Committee that the site is Suriname's first inscription on the World Heritage List.

BRIEF DESCRIPTIONS

The Central Suriname Nature Reserve comprises 1.6 mil. ha. of primary tropical forest of west-central Suriname. The Reserve protects the upper watershed of the Coppename River and covers a range of topography and ecosystems of notable conservation value due to their pristine state. Its montane and lowland forests contain a high diversity of plant life with almost 6,000 vascular plant species collected to date. There are viable populations of animals typical of the region including jaguar, giant armadillo, giant river otter, tapir, sloths and eight species of primates, as well as 400 bird species.

1.b State, Province or Region: District Sipaliwini

1.d Exact location: 4° 0' N, 56° 30' W

NOMINATION DOSSIER

CENTRAL SURINAME NATURE RESERVE

FOR

THE WORLD HERITAGE LIST

ON BEHALF
OF
THE GOVERNMENT
OF
THE REPUBLIC OF SURINAME,

MINISTER OF NATURAL RESOURCES A.I.

Ir. S. REDJOSENTONO

PARAMARIBO, SURINAME

JULY 1999

NOMINATION DOSSIER CENTRAL SURINAME NATURE RESERVE

FOR THE WORLD HERITAGE LIST

1. IDENTIFICATION OF THE PROPERTY

a. Country (and State Party if different)

Republic of Suriname

b. State, Province or Region

District Sipaliwini

c. Name of Property

Central Suriname Nature Reserve

d. Exact location on map and indication of geographical coordinates to the nearest second

4 º Northern Latitude and 56 º30' Western Longitude

e. Maps and/or plans showing boundary of area proposed for inscription and of any buffer zone

(See attachment)

f. Area of property proposed for inscription (ha.) and proposed buffer zone (ha.)

Area of the Property : 1,600,000 hectares

2. JUSTIFICATION FOR INSCRIPTION

a. Statement of significance

The Central Suriname Nature Reserve (CSNR) is situated entirely within - and is representative of - the Guayana Shield, a region containing the largest expanse of completely undisturbed tropical rain forest remaining in the world today.

The word "Guayana" is believed to mean "land of many waters," a fitting description for this region of northern South America that is essentially an island of land, bounded by the waters of the Caribbean Sea and Atlantic Ocean to the north and east, the Rio Orinoco to the west and the Rio Negro and Rio Amazonas to the South. It includes all of Guyana, Suriname, and French Guiana, and adjacent parts of Venezuela, Colombia and Brazil. For countless millennia, the Guayana Shield has supported a great diversity of fauna and flora.

The country of Suriname, in particular, is rich in vertebrate wildlife, including at least 668 species of birds, 185 species of mammals, 152 species of reptiles, 95 species of amphibians, and 790 species of fish. Of the 1,890 known species of vertebrates, at least 65, or 3 percent, are endemic to Suriname and likely occur within the CSNR. Plant species in Suriname are well documented: of the roughly 5,800 species of mosses, ferns and seed plants found in Suriname1, an estimated 50 percent are endemic to the Guayana Shield region. Much, however, is still to be discovered about the flora and fauna of the area; each new expedition or forest inventory reveals species new to science.

The CSNR is a huge expanse of pristine tropical forest. Covering over 1.6 million hectares, it is one of the largest nature reserves in South America. It also represents the largest protected block of Guayana Shield tropical wilderness biota - a global resource that is elsewhere being rapidly destroyed or degraded.

The CSNR is of global significance in terms of biodiversity and ecological value. The CSNR has many forest types and contains a high diversity of plant life. Until present, nearly 6,000 vascular plants specimens have been collected there. In addition, the CSNR is known to contain more than 400 of Suriname's known bird species, including Scarlet, Red-and-Green and Blue-and-Gold Macaws, Great Tinamou, Black Curassow and the Guianan Cock-of-the-Rock. Further, the former Raleighvallen area in the northern section of the CSNR is known worldwide as one of the best places to see the Red and Green Macaws and the Guianan Cock-of-the-Rock (Rupicola rupicola) . The CSNR is also home to all eight species of Suriname's primates, including the White-faced Saki (Pithecia pithecia) and the Common Squirrel Monkey (Saimiri sciureus) and stable populations of the Jaguar (Panthera onca), the Giant Armadillo (Myrmecophaga tridactyla) and the Giant River Otter (Pteronura brasiliensis). The extent of the diversity of this huge and largely unexplored territory has yet to be documented.

Further, because the CSNR encompasses the entire upstream watershed of the Coppename River, one of Suriname's largest rivers, it effectively protects globally important ecological and watershed functions.

The geography of the area - a two-billion-year-old Pre-Cambrian formation - is also outstanding. Adding to the spectacular nature of the vast expanse of pristine forest are dramatic geological formations and waterfalls, including a number of granite inselbergs rising out of the forest, and the easternmost « tepui » or table top mountain (Tafelberg) in the Guayana Shield. The most famous of the inselbergs is the 250-meter Voltzberg Dome, which can easily be climbed and affords a view of unbroken tropical wilderness for hundreds of miles. The Devil's Egg, a giant rock balanced atop a granite spire hundreds of feet high, is another example of the dramatic geological formations contained within CSNR.

Finally, the fact that the interior of Suriname - covered with completely undisturbed Neotropical Amazonian forest and the rich diversity of life contained in it - is largely uninhabited (and therefore has been spared from hunting and other pressures) makes it one of the most important places anywhere in the world for tropical forest conservation and aesthetic satisfaction. Here, ecosystems and their genetic diversity will be preserved as a reservoir for future generations. Scientists and conservationists will be able to study undisturbed ecosystems and take lessons learned from the CSNR's functioning ecosystems to their efforts to conserve other tropical forest communities. At the same time, the knowledge that there exists so large an area of protected pristine tropical forest will serve as an aesthetic touchstone to people around the world.

b. Possible comparative analysis (including state of conservation of similar Properties)

Although other protected areas do exist within the Guayana Shield Region the Central Suriname Nature Reserve, by virtue of its size, protects a globally-significant expanse of Guayana Shield tropical wilderness. It links three pre-existing protected areas (Raleighvallen Nature Reserve, Tafelberg Nature Reserve, Eilerts de Haan Gebergte Nature Reserve) to form a conservation corridor of more than 1.6 million hectares. The area is one of the largest nature reserves in South America and quite possibly the single most pristine tropical forest protected area on earth.

The area also effectivly protects the watershed of one of Suriname's most important river systems, the Coppename River

c. Authenticity/Integrity

(i) The CSNR contains all of the key interrelated and interdependent elements in their natural relationships.

The CSNR conserves a major and representative portion of the Guayana Shield, an ancient, mineral-dense layer of the earth's crust estimated to be two billion years old that forms the land mass of Suriname and its immediate neighbours. It is a geologically stable speciation center that has produced a well defined floristic and ecological assemblage of species, including many endemics.

Globally, biologists and geologists recognize this area as one of the biologically richest regions in the world.

The CSNR encompasses a large and characteristic example of the Guayana Shield ecosystems, including various types of tropical forest and savannas, watersheds and rivers, lowlands and mountains, as well as populations of plants and animals which have evolved in the region. The ecosystems contained within the CSNR are, as a result of the size of the protected area and the lack of intrusion by human populations, intact and large enough to encompass all key interrelated elements - flora, fauna, and ecosystem processes - in a manner that conserves their integrity.

(ii) The CSNR has sufficient size and contains the necessary elements to demonstrate the key aspects of processes that are essential for the long-term conservation of the ecosystems and the biological diversity they contain.

At 1.6 million hectares, and encompassing variations in topography and an entire watershed, the CSNR has the essential elements needed to ensure long-term ecosystem maintenance. For instance, each of the three pre-existing protected areas which were linked by the creation of the Central Suriname Nature Reserve (these individual reserves have been partly documented to a greater degree than the larger CSNR) contain variations in elevation, topography and vegetation:

> Vegetation in the pre-existing Raleighvallen Nature Reserve consists mostly of mesophytic forests. These forest types contains a large variety of tree species, with the uppermost canopy reaching about 30 meters, and sometimes as much as 40-50 meters, high. Mostly, palms are dominant in the undergrowth, and the forest floor is sparsely populated with ferns and moss-ferns. The Reserve is also characterized by dramatic geological formations and waterfalls, including a number of granite inselbergs rising from the forest.

> The pre-existing Tafelberg Nature Reserve encompasses primary rainforest and savanna ecosystems, and includes both the easternmost tepui (flat-topped mountain) in South America and the only Roraima sandstone savanna in Suriname.

> The pre-existing Eilerts de Haan Gebergte Nature Reserve includes part of the Eilerts de Haan Gebergte mountain range and encompasses of primary tropical rain forest and savanna ecosystems.

The CSNR therefore encompasses significant variation in elevation above sea level, topography and soil conditions, which have resulted in a variety of ecosystems. This variation is critical for long-term regional conservation; biologists and planners generally agree that successful conservation must encompass ecosystem variation across environmental gradients so that organisms within these ecosystems can move in response to disturbances, adapt to change, and maintain gene flow between populations.

Another important feature necessary for long-term conservation is connectivity, the extent to which ecological and evolutionary processes are maintained within a certain area. The CSNR's vast size, undisturbed state and its protection of the Coppename watershed ensure an unusually high level of connectivity for a tropical forest protected area. In fact, the CSNR is the most intact and least disturbed tract of primary rainforest in all of South America, including the Amazon.

(i) The CSNR contains superlative natural phenomena and areas of exceptional beauty, and includes areas that are essential for maintaining that beauty.

The undisturbed forests of the CSNR, rivers, waterfalls, mountains, geological formations and plant and animal species represent a resource of exceptional natural beauty, and, as a region unchanged by man, holds enormous symbolic value in a world where the human population is near 5 billion and pristine wilderness is increasingly scarce. The CSNR includes lowland and montane tropical forests as well as a number of interesting geological features and mountain ranges. Throughout the reserve one can encounter a number of inselbergs - extraordinary granite outcroppings found in e.g. Suriname, Venezuela, Guyana en French Guiana. Further, in the central region of the reserve is the Tafelberg, the eastern most Tepui, while in the south is the Wilhelmina mountain range which contain the Julianatop (1,230 m), the highest peak in Suriname.

(iv) The CSNR contains habitats for maintaining the most diverse fauna and flora characteristic of Guayana Shield tropical forest ecosystems.

The intact primary forests of the CSNR, the general richness of the flora of the Guianas, and the dramatic topography towards the south have made the reserve rich in biological diversity.

At more than 1.6 million hectares, the CSNR is sufficiently large to provide adequate habitat for maintaining diverse species of wild flora and fauna - including a number of endangered species such as the Jaguar, the Giant River Otter, the Harpy Eagle, and the Guianan Cock-of-the-Rock, to name a few. Environmental conditions in the rainforest of the CSNR are heterogeneous and consequently provide a great variety of habitats for animals. Mature forest, canopy gaps and forest edges, swamp forests or rocky savannas, all provide suitable habitats.

In addition, CSNR is uniquely situated within a wider region that is largely uninhabited and faces little or no hunting or development pressure. The reserve can only be accessed by river and road at the northern most tip in Raleighvallen. The only other access points are three airstrips - one at Raleighvallen in the north, Tafelberg in the central region, and Eilerts De Haan in the south. This inaccessibility affords the CSNR an effective - if unofficial - "buffer zone" of nearly 100 miles in almost all directions.

d. Criteria under which inscription is proposed (and justification for inscription under these criteria)

(i) Representing major stages of earth's history and records of life

The CSNR conserves a major portion of the Guayana Shield. In geological terms, a Shield is a formation which has been stable (i.e., not affected by orogenic or mountain building activity) for a thousand million years. The Guayana Shield lies, for the most part, between the Orinoco and Amzonian River basins and is a massif of hard, mainly proterozoic rock-founations. The parental crystalline rocks of the Guayana Shield are generally low in mineral content, and, together with the high weathering rates that occur under tropical conditions, harbor soils that are very poor in nutrients and highly acidic.

The characteristic vegetation of the Guayana Shield is tropical rainforest. In general the vegetation of the region is remarkable not only in its abundance and diversity, but also in the localized restriction of individual species. In the lowland region alone, there are an estimated 138 general of endemic trees. The level of botanical endemism for the whole of the Guayana Shield is estimated to be around 40 percent. The Guayana Shield is covered by the largest unfragmented block of tropical forest in the world.

(ii) Representing significant on-going ecological and biological processes

At more than 1.6 million hectares, the CSNR is sufficiently large to provide adequate habitat for maintaining diverse species of flora and fauna - including a number of endangered species such as the Jaguar, the Giant River Otter, the Harpy Eagle, and Guianan Cock-of-the-Rock, to name a few. Environmental conditions in the rainforests of the CSNR are heterogeneous and, consequently provide a great variety of habitats for animals. Mature forests, canopy gaps and forest edges, swamp forests or rocky savannas, all provide suitable habitats for animals.

The intact primary forests of the CSNR, the general richness of the flora of the Guianas, and the dramatic topography towards the south have made the reserve rich in biological diversity for its size.

(iii) Contains superlative natural phenomena or areas of exceptional beauty

One of the few pristine tropical wilderness areas left on Earth, the CSNR's primary forests, rivers, waterfalls, mountains, inselbergs, and plant and animal species demonstrate exceptional natural beauty unchanged by man. The CSNR provides aesthetic value across a series of ecosystem types: lowland and montane tropical forests, interesting geological features (especially inselbergs - extraordinary granite outcroppings- tepui, and mountain ranges, including the highest peak in Suriname.

(iv) Contain the most important and significant natural habitats for in-situ conservation of biological diversity

Because of its pristine condition - and in contrast to the condition of much Amazonian tropical forest, which has been significantly degraded - the Central Suriname Nature Reserve is of scientific value for study of the natural dynamics of the undisturbed ecosystem, and as a gauge against which to measure changes in tropical forest ecosystems which have been altered. Furthermore, the CSNR is well positioned - by virtue of its remote and inaccessible location, and the Government of Suriname's commitment to conservation -- to provide opportunities for in-situ conservation in perpetuity.

3. DESCRIPTION

a. Description of Property

Name of Property	**Biome/Geographical Location**
Central Suriname Nature Reserve	Guayana Shield Tropical Wilderness

Date of Creation: July 31, 1998
Date Published: September 10, 1998
Date Effective: September 11, 1998
Location: 4 º Northern Latitude and 56 º 30'Western Longitude
Area: 1,600.000 ha.
Ownership: Republic of Suriname

Natural Protected Areas description incorporated within the boundaries of the CSNR

The pre-existing Raleighvallen Nature Resrve
Date of Creation: April 22, 1966, enlarged August 26, 1986 by State Resolution.
Location: 4º 40´ Northern Latitude and 56º 10´ Western Longitude
Area: 78,000 ha (approx.)

The pre-existing Eilerts de Haan Gebergte Nature Reserve
Date of Creation: April 22, 1966 by State Resolution
Location: 3º 20´ Northern Latitude and 56º 30´ Western Longitude.

Area: 220,000 ha (approx.)
Including: (Counties)

The pre-existing Tafelberg Nature Reserve
Date of Creation: April 22, 1966 by State Resolution.
Location: 3º 50´ Northern Latitude and 56º10´Western Longitude.
Area: 140,000 ha (approx.)

Suriname has a typical tropical climate with a mean daily temperature of about 27(C and an annual range of only 2(C. Annual rainfall varies between 1750 and 3000 mm, and a generally high humidity prevails throughout the year. There are two rainy seasons, a major one from approximately mid-April to mid-August and a minor one from December to January and two dry seasons, a major one from August to November, and a minor one from February to April.

Geomorphologic features are primarily responsible for ecological and forest diversity in Suriname, and are defined by the following broad ecological zones:

* The young coastal plain is located 0-4 m above mean sea level, and consists of Holocene swamp clays with the natural vegetation of mangrove forests, open herbaceous swamps and several types of swamp forest;
* The old coastal plain is located 4-11 m above mean sea level, and consists of swamp clays and sand ridges covered with various types of grass and herbaceous swamps, swamp forests, mesophytic forests, and vast areas of peat swamps;
* The so-called savanna belt is located 10-100 m above mean sea level, and is a dissected plain characterized by savannas that consist of white or brown sands or loams. The zone is mainly covered with mesophytic forest, savannaforests, savannawoods, savannascrubs and swamp forests. The dry to very wet grass and shrub savannas cover approx. 7% of this area;
* The interior ranges from sea level to 1,230 m, and covers three-quarters of the country. This is rugged terrain on the ancient Guayana Shield, with natural vegetation consisting mainly of primary tropical rain forest, interrupted by small patches of marsh forest along rivers and creeks. Also isolated savannas, refugia from the Pleistocene ice-ages are found here.

Although the diversity of Suriname's fauna is not as high as that of larger countries such as Brazil, it is rich in vertebrate wildlife, including at least 668 species of birds, 185 species of mammals, 152 species of reptiles, 95 species of amphibians, and 790 species of fish. Of the 1,890 known species of vertebrates, at least 65, or 3%, are endemic to Suriname. There have been no comprehensive surveys of Suriname's invertebrate population, although one estimate puts the total number of species between 6000,000 - 1,000.000.. Plant species in the northern part of Suriname are rather well documented. Of the roughly 5,800 species of mosses, ferns and seed plants found in Suriname, an estimated 50% of these species are endemic to the Guayana Shield region.

The CSNR comprises more than 1.6 million hectares of primary tropical forest of west central Suriname and effectively protects the pristine ecological function of the entire upper watershed of one of Suriname's largest undisturbed rivers, the Coppename River. The CSNR covers a wide range of topography and ecosystems and houses perhaps the largest tract of completely undisturbed, uninhabited and unhunted primary forest in the tropical world. Further, the Reserve represents the largest protected block of the Guayana Shield tropical forest wilderness biota.

The Reserve forms a corridor linking the three most important protected areas in central Suriname: the pre-existing Raleighvallen Nature Reserve in the north, and the pre-existing Tafelberg and Eilerts de Haan Gebergte Nature Reserves in the central and southern portion of the corridor. These three reserves are connected by large tracts of undisturbed, and unexplored lowland and mountane rainforest and support abundant populations of globally rare or endangered species including the Harpy Eagle, eight species of monkey, the giant river otter, the Cock-of-the-Rock, and four species of cats. Due to the genuine inaccessibility of the majority of the Reserve, detailed knowledge about its biodiversity does not exist. The majority of existing biological research has taken place within the three originally existing reserves as their airstrips provide easy access. These three nature reserves are described below:

The pre-existing Raleighvallen Nature Reserve (Raleighvallen), established in 1966 and expanded in 1986 covers approximately 78,000 hectares. Raleighvallen is located in north central Suriname, about 200 km from Paramaribo. The reserve's vegetation consists mostly of moist mesophytic forest, the same forest type that covers approximately 80 percent of Suriname. There is a large variety of tree species, the tallest of which reach more than 4 to 5 stories into the air. The uppermost canopy averages about 30 meters, but can reach 40-50 meters, high.Mostly palms are dominant in the undergrowth, and the forest floor is sparsely populated with ferns and moss-ferns. Raleighvallen is characterized by dramatic geological formations and waterfalls, including a number of granite inselbergs rising out of the forest. The most famous of these, the 250-meter high Voltzberg Dome, can be climbed by tourists. The reserve's many forest types contain a high diversity of plant life and nearly 1,000 vascular plants specimens have been collected there. The reserve contains more than 400 of Suriname's 668 known bird species, including Scarlet, Red-and-Green and Blue-and-Gold Macaws, the Great Tinamou, the Black Curassow and the Guianan Cock-of-the-Rock. The Reserve is also home to all eight species of Suriname's primates and stable populations of the Jaguar, the Giant Armadillo and the Giant River Otter.

The pre-existing Tafelberg Nature Reserve (Tafelberg), established in 1966, covers approximately 140,000 hectares in central Suriname, between the Saramacca and Coppename Rivers. Tafelberg is located in a remote area that includes the geographic center of Suriname and has no surrounding human populations. Tafelberg encompasses primary rainforest and savanna ecosystems, and includes both the easternmost tepui (flat-topped mountain) in South America and the only Roraima sandstone savanna found in Suriname. Although biological surveys have been conducted in the reserve in the past, very little is known about its biodiversity. Of the 1,330 plant specimens that have been collected within the Reserve (mainly on the tepui itself and on the Roraima sandstone savanna), 29 are endemic.

The reserve formerly known as the Eilerts de Haan Gebergte Nature Reserve (Eilerts de Haan), established in 1966, covered approximately 220,000 hectares in south central Suriname, east of the Corantijn River and bordered by the Zuid and Lucie Rivers. There are no human populations living within or directly adjacent to the reserve. The reserve includes part of the Eilerts de Haan Gebergte mountain range whose altitude reaches over 850 meters, and encompasses primary tropical rain forest and savanna ecosystems. Due to a lack of exploration and biological surveys in Eilerts de Haan, little is known about its flora and fauna, although sporadic surveys have identified 13 species of amphibians, 29 reptile species, and 43 bird species. The flora of the region has been studied very little. Nevertheless, the diversity in Wilhelmina Gebergte, a mountain range bordering the reserve, is likely to be very similar to that of Eilerts de Haan Gebergte. In the Wilhelmina Gebergte over 3,000 vascular plants specimens have been collected , including 143 rare and 11 endemic species.

Although no communities live within the CSNR, there are 3 main communities that are potentially affected by the CSNR: the Kwinti Maroon communities of Witagron and Kaaimanston who reside immediately north of the CSNR along the middle reaches of the Coppename River and the Trio indigenous community of Kwamalasamutu, who reside in the far south below the southern border of the CSNR. Although the village of Kwamalsamutu is over 100 Km south of the border of the CSNR, they are still considered stakeholders as their land claims reach the southern border of the reserve.

Witagron and Kaaimanston are the only remaining Kwinti Maroon communities in Suriname. Presently about 20 families with children live in Witagron area and a lesser number of people reside in Kaaimanston. These communities have been marginally involved in providing labour for operations in the pre-existing Raleighvallen Reserve acting as guards, guides and porters for ecotourists and researchers. Current resettlement plans entail the re-establishment of the community school so those families with small children can move back to the villages.

A primary guard station is planned at Witagron and two satellite stations are planned on two of the adjacent creeks. These two stations will be managed by the community in collaboration with the Foundation for Nature Preservation (STINASU) and the Government of the Republic of Suriname. The station in Witagron will also serve as a visitor center and "craft store" for tourists travelling through the region. Community members will receive training as park guards and guides. The community has also expressed interest in building a guest house or lodge in Witagron to cater for the tours on their way to the Central Suriname Nature Reserve.

b. History and Development

See Raleighvallen Management Plan (attached)

c. Form and date of most recent records of property

State Resolution:	July 31, 1998 (Central Suriname Nature Reserve)
Date of Creation:	June 17, 1998 (Council of Ministers Approval)
Date Published:	September 10, 1998
Date Effective:	September 11, 1998
Location:	4 º Northern Latitude and 56 º 30'Western Longitude
Area:	1,600.000 ha
Gazette :	Natuurbeschermingsbesluit 1998, S.B. 1998 No. 65
Ownership:	Republic of Suriname.

d. Present state of conservation

The size, pristine nature, and low level of threats to the Central Suriname Nature Reserve make it an ideal site for biodiversity conservation. The absence of human impact within the reserve and the scarcity of human populations within a 100-mile radius of the Reserve make for a basically pristine state of conservation. The only human impacts present within the Reserve are at the three airstrips and include the airstrips themselves and minimal surrounding infrastructure, which includes housing for tourists and researchers and rudimentary trail systems at Raleighvallen, Tafelberg and Eilerts de Haan. Because the Reserve encompasses the entire Coppename River Watershed, and remains inaccessible by road (combined with the general inaccessibility of Suriname's interior), no development pressure exists south of the Reserve.

e. Policies and programmes related to the presentation and promotion of the property.

The Government of Suriname and Conservation International launched an international media campaign in June 1998 to publicize the creation of the Central Suriname Nature Reserve. The establishment of the reserve was announced by Ambassador Wim Udenhout, senior advisor to President Jules Wijdenbosch at a press conference in New York, and was subsequently announced in Suriname by the President of Suriname in a television address in July 1998.

International media coverage following the announcement of the establishment of the reserve has been extensive. Major international television networks including Reuters, CNN International, and World Television News broadcasted the story. The Central Suriname Nature Reserve was also covered by major television networks in the United States, the Netherlands, and Guyana. Print coverage has been equally comprehensive. Several major newswires in the United States and abroad carried the story, as did Brazilian, Guyanese, Canadian, British, French, and Japanese newspapers and magazines.

Coverage in Suriname has occurred both through international media, and through Surinamese newspaper, television and radio. The Surinamese parastatal agency STINASU has also issued promotional materials about the reserve. However, the Government of Suriname has postponed its national promotional campaign so that it can coincide with the launching of the Suriname Conservation Foundation.

In addition to the national promotional campaign expected in late 1999, STINASU will have as one of its primary goals to raise conservation awareness and promote environmental education in Suriname. The Foundation will therefore provide funding to develop conservation curricula in schools, and will sponsor training programs for teaching on environmental issues. The Foundation will also provide scholarships to help train a cadre of conservation professionals and decision-makers in Suriname, and will sponsor workshops at the University of Suriname both for government and non-government professionals.

4. MANAGEMENT

a. Ownership

Ownership: The Republic of Suriname

b. Legal status

The Central Suriname Nature Reserve is protected under Suriname's Nature Protection Act of 1954. The Law recognizes that establishment of protected areas is important for scientific, recreational and educational purposes, as well as for ethical and economic reasons. In order to qualify as a nature reserve, an area must be noteworthy because of its biodiversity or varied landscape, or as a result of fauna, flora or geological features of scientific or cultural value.

The Act prohibits any activity within reserves that will negatively affect their integrity, and provides for both civil and criminal sanctions for infractions. The act also gives the government the right to seize plants, animals or other resources illegally obtained in the park. The Act designates the Director of the Suriname Forest Service (LBB) as the responsible entity for managing the nature reserves and for handling all matters regarding nature conservation, including appointing guards and wardens to enforce reserve regulations. The operational management is entrusted to the Nature Conservation Division. of the Forest Service.

Suriname's Planning Act establishes procedures for national and regional land use planning and provides guidelines for drafting land use plans. The Planning Act also empowers the government to establish protected areas other than nature reserves, such as the special management area. Laws on the Issuance of State-Owned Lands provide for the issuance of long-term leases for management of public lands. This is the case for the Brownsberg Nature Park and the Bigi Pan Multiple Use Management Area, which have been entrusted to the Foundation for Nature Preservation in Suriname (STINASU) respectively the Head of the Forest Service for operational management.

Suriname's Forest Management Act of 1992 provides for the sustainable management of forest concessions. The Forest Management Act also provides for the establishment of communal forests for the benefit of tribal groups, and therefore potentially affects conservation on tribal lands as well. The act also has provisions designed to promote the interests of local communities, stating that the common law rights of the inhabitants of the interior living in tribal communities will be respected as much as possible. This act also makes provisions to install "Communal Ground" and "Communal Forest" for tribes where they can settle and practice agriculture. Wood cutting leases were the former legal mechanism used to give local communities preferential access to their ancestral territories. These licenses have been granted on an indefinite basis and permit the cutting of wood, the collection of plants and non timber forest products for use by the community.

Suriname has laws governing resource use that do not directly address biodiversity conservation, but do contain relevant environmental and land use provisions. For example, the Game Law of 1954 protects all mammals, birds, sea turtles, and other species named in the Game Resolution except those that are designated game species, cage species or predominately harmful species. The Fish Protection Act regulates freshwater fish, and the Mining Act of 1986 regulates all mineral use. The Agreement for National Reconciliation and Development (Lelydorp Akkoord 1992), which is the peace treaty between the Government of Suriname and tribal groups, signed in 1992, recognizes some indigenous and maroon rights. As such, it gives these communities a role in determining locations for logging and mining concessions.

Suriname has engaged in a number of national environmental planning exercises over the last decade. A Conservation Action Plan for Suriname was published in 1990 and was later complemented by the publication of "Priority Conservation Activities for Suriname" in 1994. Sixteen priority initiatives were outlined, including preparation and implementation of management plans for nature reserves, training of conservationists, nature conservation education, research on threatened species and enforcement of nature conservation legislation.

Suriname also has a Concept National Environmental Action Plan (NEAP), drafted in 1996 by the University of Suriname's Institute for Development, Planning and Management with funding from the Organization of the American States. The biodiversity component of the NEAP outlines the following initiatives:

* Increase efforts to make inventories of biodiversity so that a revised system of protected areas will be representative of all ecosystems and biodiversity;
* Strengthen institutions involved in the research and sustainable use of biodiversity;
* Support projects that improve the ability of the Nature Conservation Division and Fisheries Division to control the exploitation and use of biodiversity;
* Develop legislation to regulate the use of genetic resources;
* Adapt the Forest Management and Mining Acts to comply with the Convention on Biological Diversity and the National Biodiversity Strategy for Suriname;
* Require Environmental Impact Assessments for all activities that may potentially damage the environment, including biodiversity.

A regional UNDP/GEF project entitled Regional Strategies for the Conservation and Sustainable Management of Natural Resources in the Amazon provided funds for a National Biodiversity Strategy for Suriname. In 1995, the Department of the National Planning Office within the Ministry of Planning and Development Cooperation established a Working Group on Biodiversity. The Working Group was charged with coordinating two stakeholder workshops and drafting a national strategy based on the results of those workshops. The draft National Strategy, published by the working group in January 1998, lays out four broad objectives:

* The development of a national policy framework for the conservation and sustainable use of biological diversity;
* The realization of sustainable use and conservation of biodiversity by way of national planning and international cooperation;
* The creation of conditions for effective management of biodiversity through the application of existing legislation and the development of necessary legislation;
* The substantial strengthening of human capacities in order to ensure sustainable use and conservation of biodiversity.

Finally, Suriname is also a party to several international instruments. Suriname signed the UN Convention on Biological Diversity in June 1992 and ratified it on January 12, 1996. Suriname is also a signatory to the Amazon Cooperation Treaty with Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru and Venezuela. This treaty established, amongst others, the Commission on the Amazonian Environment (CEMAA) to address conservation in border areas. Suriname is also signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention), and the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (The Western Hemisphere Convention).

c. Protective measures and means of implementing them

Several government agencies and parastatal organizations share responsibilities for biodiversity conservation and land use planning. The Nature Conservation Division (NCD) within the Forest Service (LBB) of the Ministry of Natural Resources (MNR) is responsible for policy, the strategic and operational management of protected areas, wild flora and fauna and regulating trade in wildlife.

Because the CSNR is isolated, guards are needed only at areas of access. The outline for the CSNR management plan identifies guard posts at 3 sites around Raleighvallen Nature Reserve, the airstrip at Raleighvallen, as well as at the airstrips at Tafelberg and Eilerts de Haan -covering all access sites to the reserve.

Presently at Raleighvallen, there is a Reserve Manager and 3-4 guards/field workers at the base-camp at Foengoe Island. One boat with outboard motor is also available. At Tafelberg, Gum Air and Aracari Tours have in place 2 caretaker/managers. At Eilerts de Haan, no permanent guard station is in place. Plans to train additional guard forces for all main airstrips and access points

within the Reserve will be included in the management plan. Currently the Government through its recurrent annual budget provides for the current level of management. With support of UNDP, C.I. and other donors the Suriname Conservation Trust Fund (to be established and launched in 1999) should be providing the additional funds necessary to complete the development and implementation of the management plan, develop guard stations and provide training. The Trust will provide long-term financing to support the Reserve's management in perpetuity.

d. Agency/agencies with management authority

The Nature Conservation Division within the Forest Service, under the Ministry of Natural Resources, is the agency primarily responsible for conserving Suriname's biological diversity. It is in charge of nature conservation including the management of wild flora and fauna, management of protected areas and control of the wildlife trade, enforcement of Game Law and Nature Protection Law.

The Foundation for Nature Preservation (STINASU) is a parastatal agency responsible for undertaking research within the national system of nature reserves, enhancing public awareness regarding nature preservation, undertaking educational activities, and encouraging and facilitating ecotourism in the reserves such in close cooperation with the Nature Conservation Division. STINASU is involved in ecotourism promotion activities and rehabilitation of lodging facilities within several protected areas including Raleighvallen, Brownsberg and the Galibi (Sea Turtles) Nature Reserve

e. Level at which management is exercised and name and address of person for contact purposes

The Ministry of Natural Resources has been designated by Presidential decree as the agency responsible for the CSNR. The Ministry of Natural Resources oversees the Forest Service and the Nature Conservation Division of the Surinam Forest Service. The Nature Conservation Division is responsible for the operational management aspects of all Protected Areas in Suriname.

Contacts:
Ir. Ferdinand L.J. Baal
Head Nature Conservation Division
Suriname Forest Service
Cornelis Jongbawstraat No.10
P.O. Box 436
Paramaribo, Suriname
Tel: (+597) 479431
Fax.: (+597) 422555
E-mail: lbbnb@sr.net

f.. Agreed plans related to property (e.g., regional, local plan, conservation plan,
tourism development plan)

In addition to the management plan being developed for the CSNR, an ecotourism plan for the reserve is also being developed. This plan will promote sustainable ecotourism within the protected area as a central component of tourism infrastructure establishment, promotion and policy development. The focus of interventions will be site-specific near the airstrips at Raleighvallen Nature Reserve, Tafelberg, and Eilerts De Haan. The first step will involve assessment of cost-benefit ratios for different ecotourism scenarios, and development of strategies to ensure that ecotourism development is socially equitable. The plan seeks to establish a set of minimum standards for management of visitors and provide zoning recommendations. Tourists will be sensitized to the fragility of ecosystems and local culture, and a code of practice would be developed and strictly enforced. Visitor centers will be developed and interpretational materials designed and produced for educational purposes. Appropriate training will be provided to tour operators and guides. The plan will also include a detailed strategy for national and international marketing of the reserve and potential itineraries will also be developed. A Conservation Action Plan for Suriname published in 1990 also exists and is attached.

g. Sources and levels of finance

Suriname has a strong and biogeographically representative network of protected areas dating back prior to its independence. However, despite a slight increase in the 1990s, management investments in the network have remained small. To ensure the necessary capacity and long-term financing to manage the CSNR and Suriname's other protected areas, the Government of Suriname, Conservation International and UNDP/GEF have engaged in a 6 year project.

The project will undertake a number of capacity building activities, including providing funds to train more conservation professionals in Suriname, and to draft a management plan for the CSNR. The project will also help establish a conservation trust fund, the Suriname Conservation Foundation (SCF), that will endow the protected areas network and finance a range of conservation-based development activities. The four target areas for the SCF will include long-term management support for the CSNR and other protected areas, ecological surveys and protected area monitoring, conservation awareness and education, and ecotourism.

The capacity building exercise described above totals $2.88m. The SCF's endowment is projected at $15m by year six of the project, though the actual total may well be higher. These totals will be supplemented by continuing government expenditures for the protected areas network, as well as by continued spending by the non-profit sector in Suriname.

h. Sources of expertise and training in conservation and management techniques

The remoteness of the CSNR has thus far protected it, but this same factor has also slowed the government's conservation activities there. Financing from the SCF will allow the government agencies charged with managing the CSNR to mobilize the resources and capacity to enforce its protected area status and develop the necessary park management infrastructure. Of the three pre-existing protected areas that have been linked to form the CSNR, only the Raleighvallen NR in the north has the infrastructure for park management. The UNDP/GEF project will operationalize basic conservation functions such as planning, policing, enforcement, and monitoring in the reserve. These actions would further serve to increase the profile of the CSNR within national policy and decision making processes, ensuring that conservation and development objectives are better integrated.

The capacity building component of the UNDP/GEF project for Suriname will provide a total of 20 scholarships for conservation professionals and decision-makers to attend training courses focusing on conservation management disciplines. Course selection would be based on training needs assessments, but the courses would include participatory conservation, conservation planning, operational management, integrated conservation and development and public outreach methods.

i. Visitor facilities and statistics

Visitor facilities are present at Raleighvallen. There are two guesthouses at Foengoe Island within walking distance of the airstrip as well as one research/guest facility owned by the Forest Service. Further, Conservation International recently completed a research station with field housing at the base of the Voltzberg Dome. STINASU is responsible for upkeep of the facilities at Raleighvallen and for promoting tourism to the area. Plans are in hand for reconstruction of the visitor facilities at Raleighvallen.

Aracari Tours (Nature Tour Operator) has refurbished one guesthouse at Rudi Kappel airstrip in the Tafelberg area. This hosts 4 guestrooms. This operator runs tours to the top of the mountain. On average 4 -6 four-day tours (totalling 40 guests) are held during the dry season.

The Foundation the Friends of Kayser manages 3 lodges and tour facilities in the southern airstrip of Kayser at Eilerts de Haan. During the dry season abou 4 groups are accommodated in these facilities.

The community-based Foundation for the Resettlement of Witagron and Kaaimanston, two communities to the North, by boat on route to the CSNR have plans to develop facilities and transport. These project activities are likely to be funded through the UNDP/GEF /SGP (Small Grants Programme.).

j. Property management plan and statement of objectives (copy to be annexed)

There currently exists a management plan for the Raleighvallen Nature Reserve. The Foundation for Nature Preservation in Suriname (STINASU) assists in the implementation of the plan. Please see attached management plan in Annex (_) The Tafleberg and Eilerts de Haan Gebergte Nature Reserves currently have no management plans. The superintendence of these reserves will be specified in the overall management plan for the entire Central Suriname Nature Reserve.

CSNR Management Plan: A management plan will be developed for CSNR to prioritize conservation actions and ensure management operations at the site are effectively geared towards the long-term mitigation of threat, and are adapted to biological, ecological, social and institutional management needs.
The first step will involve preparation of an operational plan for year 1 to guide the management planning process and develop a schedule for social and biological assessment, public consultation and formalization of a management plan.

The second step will involve fielding a Rapid (Biological) Assessment Programme (RAP), involving international and Surinamese scientists, aimed at strengthening the inventory of biodiversity at sample sites and developing long-term monitoring indicators.

Satellite images of the area would guide the location of sampling by identifying general areas of interest. Systematic overflights of the protected areas will be conducted and videotaped by a small team of RAP biologists and coordinators to choose specific survey locations. At the end of the expedition, an executive summary with conservation recommendations will be prepared and immediately distributed to the government and other relevant stakeholders and utilized for the development of the management plan. RAP results would then be integrated with other available data (geo-reference, social assessment, etc.) on a computer database and into a Geographic Information System (GIS) to produce a comprehensive overview of the biological, social and economic status of the Reserve. The database and GIS will then serve as a tool for long-term monitoring and management and operational planning.

Social assessments of and consultations with local communities living near the Nature Reserve would be performed and undertaken as an integral part of developing the management plan. Consultations will comprise an essential first step. But the management objective is to involve local communities to the North of the CSNR in all aspects of Protected Area planning and operations, and collaborative strategies will be developed through a community-driven process to achieve this. The proposed social assessment will provide additional baseline information on maroon populations living north of the CSNR, their patterns of resource use, and socioeconomic needs.

Once complete, the plan will be presented to all stakeholders in a workshop in Paramaribo and circulated to the scientific community for review. One of the objectives of the exercise is to strengthen the planning capacities of the Nature Conservation Division and other key institutional stakeholders, taking a learning-by-doing and debate approach. Technical assistance would be provided to effect consultations, analyze data, and prepare and formalize the management plan. The plan

will include specific regulations to manage human activities, including customary uses by interior communities, scientific research and visitation and zone core areas and buffers for multiple uses and law enforcement.

k. Staffing levels (professional, technical, maintenance).

See Management Plan for Raleighvallen for the Northern part of the CSNR. (attached)

5. FACTORS AFFECTING THE PROPERTY

a. Development Pressures (e.g., encroachment, adaptation, agriculture, mining)

The Central Suriname Nature Reserve is the largest protected area in Suriname, and the largest in the globally important Guayana Shield biogeographic region. The Reserve is presently uninhabited and nearly completely covered by primary tropical rain forest. Because of its remoteness and lack of population pressure, there have thus far been few threats to its biodiversity. However, as development proceeds around the Reserve, it is likely that threats will gradually increase. But park management and enforcement activities need to be geared towards preventing possible negative externalities from these activities, thus ensuring that the CSNR remains one of the most pristine tropical protected areas in the world.

Several large-scale mining and logging concessions are being awarded in areas north, east and west of the CSNR's boundaries, mainly to multinational companies seeking new sources of minerals and timber to meet global demand and providing much needed foreign investment to Suriname's economy. Several mining companies are prospecting for gold north of Raleighvallen, which covers the northern tip of the larger CSNR. Recently identified Bakhuis bauxite deposits in the Bakhuis Mountains to the west of the Reserve, may be some of the largest in the world. Finally, there are several exploratory timber concessions east and north of the CSNR.

While the aforementioned concessions lie outside of the CSNR's watershed, vigilance is needed to ensure that future development activity is not expanded into areas critical to maintaining ecological functions within it. This is necessary to foreclose mercury contamination within the Reserve, or alteration of vital hydrological functions through water abstraction and sedimentation. Increased human activity and traffic could pose a threat. A Regional Development Plan needs to be defined to ensure that any development around the CSNR is strictly controlled and zoned through baseline environmental management interventions.

As is the case with much of Suriname's protected areas system, the CSNR suffers from a general lack of resources and capacity within government agencies to enforce its protected area status or provide the necessary park management infrastructure. The remoteness of the CSNR has thus far protected it, but this same factor has also slowed the government's conservation activities there. Of the three pre-existing protected areas that have been linked to form the CSNR, only the Raleighvallen NR in the north has a basic infrastructure for park management. It is considered essential to operationalize basic conservation functions such as planning, policing, enforcement,

and monitoring. These actions would further serve to increase the profile of the Reserve within national policy and decision making processes, ensuring that conservation and development objectives are better integrated.

b. Environmental Pressures (e.g., pollution, climate change)

Not applicable.

c. Natural disasters and preparedness (earthquakes, floods, fires, etc.)

Not applicable.

d. Visitor/tourism pressures

Not applicable at this time, however will be addressed in CSNR ecotourism development plan.

e. Number of inhabitants within property, buffer zone

No permanent settlements or inhabitants.

f. Other.

Not applicable.

6. MONITORING

a. Key indicators for measuring state of conservation

Under the UNDP/GEF project, the Rapid (Biological) Assessment Programme (RAP) of CSNR will be aimed at strengthening the inventory of biodiversity at sample sites and developing long-term monitoring indicators that verify the state of conservation of the CSNR. Indicator species that have shown to be sensitive to habitat change and increased hunting pressure are the Black Spider Monkey, the Black Curacao, the White-Lipped Peccary, the Collared Peccary, the Piping Guan, and the Tinamou. Relative populations of rare and endangered species such as the Jaguar and the Guianan Cock-of-the-Rock will also be monitored. If populations of indicator, rare, or endangered species are shown to be in decline, proper measures will be taken to identify the reason for the decline and alternative management strategies to ensure the long-term health of populations will be developed and incorporated into the CSNR management plan and operation.

Success and failure will be determined in part by monitoring relative changes in forest cover and human presence in the Reserve. Satellite imagery will indicate whether the landscape integrity of CSNR remains secure with no significant change in habitat block size. Demographic assessments will indicate the rate of encroachment of CSNR by resource extractors and illegal settlers. Indicators of the Reserve's policing and enforcement success will be that no illegal settlement occurs within CSNR.

b. Administrative arrangements for monitoring property

Biennial surveys to monitor impacted areas within priority protected areas are imperative in order to maintain their integrity, and ensure that protected areas operations are necessary to mitigate threat. The monitoring of impacted areas within the CSNR is the responsibility of the Nature Conservation Division of the Suriname Forest Service within the Ministry of Natural Resources. The Nature Conservation Division works in close collaboration with the National Herbarium and National Zoological Collections, the National Environmental Research Center at the University of Suriname, STINASU, Conservation International, WWF and NIMOS National Instituut for Environment and Development in Suriname.

Further monitoring of the CSNR and Sipaliwini Nature Reserve will be carried out through the use of satellite imagery. In cases where cloud cover becomes a major issue, radar data will be used to show changes in forest cover. This information will be compared with the existing land-cover map that will be refined as ground-truthing data is collected and compiled. Periodic comparisons over time (initially every 5 years) will be carried out to see what kind of regional changes have occurred. If incursions are identified, a plan will be developed to deal with these land-use changes. Further, new satellite image technologies that will become available in the next 2 to 3 years will enable Suriname to detect landscape changes at a much higher resolution than has been possible in the past.

c. Results of previous reporting exercises.

Not applicable.

7. DOCUMENTATION

a. Photographs, slides and, where available, film/video

Will be submitted separately.

b. Copies of property management plans and extracts of other plans relevant to the property

Management Plan of the pre-existing Raleighvallen Nature Reserve -Reichart H. A. 1993, Raleighvallen/Voltzberg Nature Reserve Management Plan 1993 -1997. LBB, STINASU, WWF.

President of the Republic of Suriname, Drs. J. A. Wijdenbosch and President Conservation International, Dr R. Mittermeier, 1998. Memorandum of Understanding.

c. Bibliography

- Adhin S., F.L.J. Baal, B. de Dijn, S.A.J. Malone, P.E. Ouboter, MCM Werkhoven.1998. Draft Nationale Strategie Biodiversiteit. UNDP Subproject RLA/92/932.

- Baal, F. L.J. 1997. Policies, legislation and orgianizational structure for protected areas in Suriname. In J.V. Oltremari (ed). 1998. Protected Areas in Suriname and Guyana. FAO/ROLAC, ACT/CEMAA . p. 7 - 18.

- Government Suriname. 1954, Natuurbeschermingswet 1954 (Nature Protection Law 1954 in Government Bulletin 1954 No. 26) -Dutch and English texts-.

- Government Suriname 1998, Natuurbeschermingsbesluit 1998, (Nature Protection State Resolution 1998 in State Bulletin 1998 No. 65)

- Hiwat, H.1997. Protected Areas in Suriname. In : J, V, Oltremari (ed.) 1998.Protected Areas in Suriname and Guyana, FAO/RDLAC, ACT/CEMAA. P. 19 - 40.

- Institute for Development Planning and Management, 1996 Concept Suriname National Environmental Action Plan. 100 pp.

- Mittermeier R. A., S. A. Malone, M. J. Plotkin, F. L. J. Baal, K. Mohadin, J. Mac Knight, M.M. Werkhoven, T. H. Werner, 1990. Conservation Action Plan for Suriname. Conservation International, Suriname Forest Service, WWF-USA, STINASU, University of Suriname. 45 pp.

- Stichting Planbureau Suriname, 1988, Suriname Planatlas. OAS, Washington.

- UNDP. 1995. PRIF/GEF Project Proposal. Enhancing the Capacity of Suriname to Conserve Biodiversity. 24 pp

- Werkhoven, M. C. M. and M.M. Held 1989. Conservation of Natural Ecosystems versus Land-Use in Suriname (Suriname Country Paper for Workshop 90. (Priority Areas for Conservation in Amazonia).

- Werkhoven MCM, P.E. Ouboter and K. Mohadin.1997. Area profiles dossier for the Workshop (Selection Protected Areas.University of Suriname 4 July 1997). Environment Research Center, University of Suriname, Paramaribo. 42 pp.

d. Address where inventory, records and archives are held.

(i) Head of the Surinam Forest Service,
Att.: Head Nature Conservation Division
Cornelis Jongbawstraat # 10,
POBox: 436
Tel.: (+597) 479431 or 471316
Fax.: (+597) 422555 or 410256
Email: lbbnb@sr.net

(ii) University of Suriname,
The National Herbarium, POBox 9212
Leysweg, Paramaribo, Suriname,
Tel./ Fax.: (+597) 464151,
Email: bbs@cq-link.sr

(iii) University of Suriname,
The National Zoological Collection
Leysweg, Paramaribo, Suriname,
Tel./Fax.: (+597) 494756,
Email: nzcs@cq-link.sr

(iv) Conservation International Suriname
Gravenstraat # 17,
POBox.:2420
Paramaribo, Suriname
Tel.: (+597) 421305
Fax.: (+597) 421172
Email: cisgravn@sr.net

(v) The Foundation for Nature Preservation in Suriname (STINASU)
Cornelis Jongbawstraat # 12,
Paramaribo, Ssuriname,
Tel.: (+597) 476597
Fax.: (+597) 421850
Email: stinasu@sr.net

(vi) The National Institute for Environment and Development in Suriname (NIMOS)
Flustraat # 35,
Paramaribo, Suriname,
Tel.: (+597) 431130
Fax: (+597) 499987
Email: nimos@sr.net

8. SIGNATURE ON BEHALF OF THE STATE PARTY.

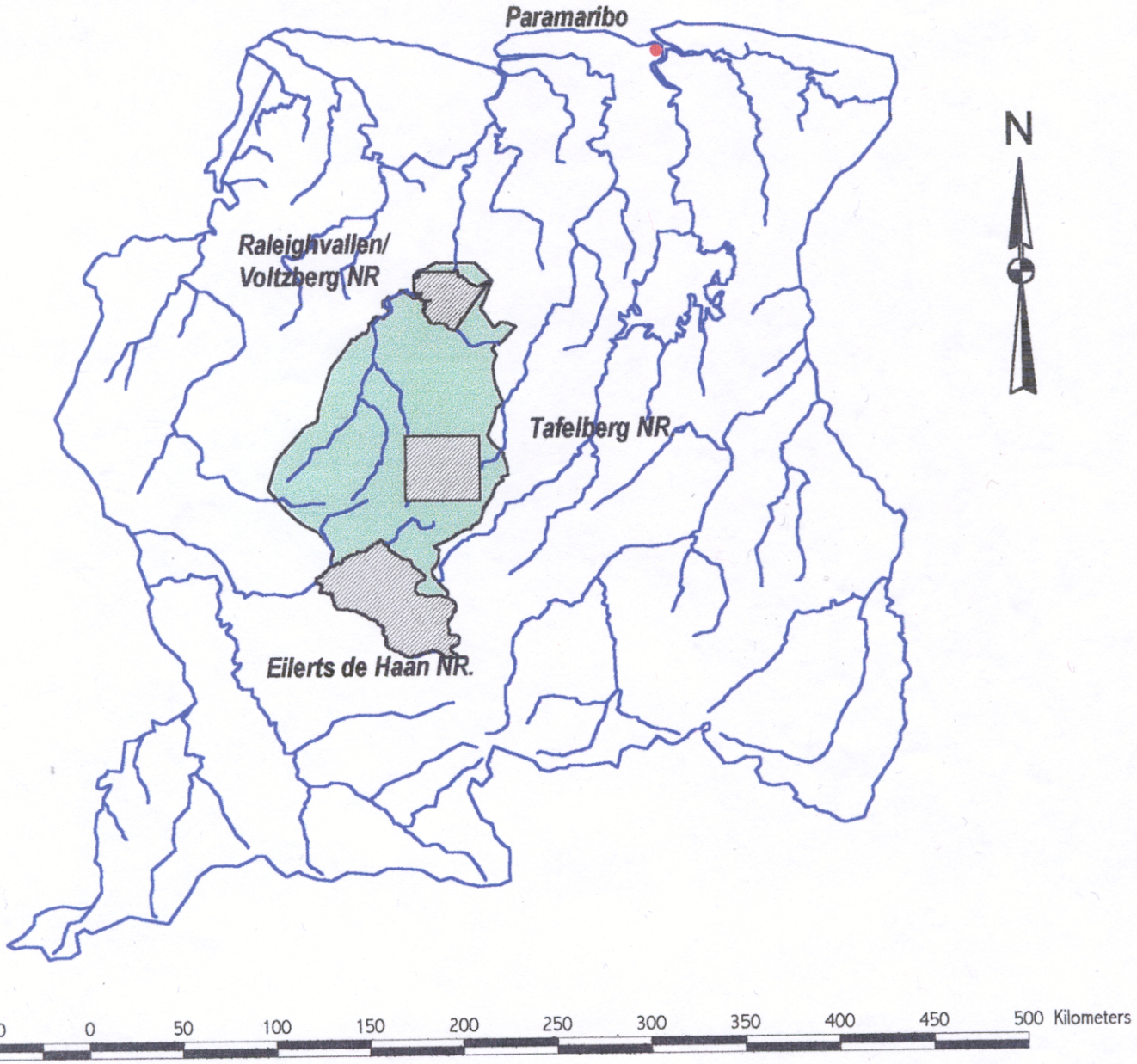
Signed on behalf of the Government of the Republic of Suriname,

_____

Full name: Ir. S. REDJOSENTONO
Title: Minister of Natural Resources a.i.
Date: July 1999

SURINAME

Central Suriname Nature Reserve



13

Natuurbeschermingswet 1954

WET van 3 April 1954, houdende voorzieningen tot bescherming en behoud van de in Suriname aanwezige natuurmonumenten (G.B. 1954 no. 26), gelijk zij luidt na de daarin aangebrachte wijzigingen bij G.B. 1954 no. 105, S.B. 1980 no. 116, S.B. 1992 no. 80.

Artikel 1

Tot bescherming en behoud van de in Suriname aanwezige natuurlijke rijkdommen kan de President, de Staatsraad gehoord, bij besluit gronden en wateren behorende tot 's Landsdomein als natuurreservaat aanwijzen.

Artikel 2

Om aangewezen te worden als natuurreservaat moet een gebied voldoen aan de volgende eisen:

dat het bescherming van overheidswege verdient uit hoofde van afwisselend natuur- en landschapsschoon en/of door de aanwezigheid van in wetenschappelijk of cultureel opzicht belangrijke flora, fauna en geologische objecten.

Artikel 3

Het algemeen beheer over de natuurreservaten berust bij het Hoofd van 's Lands Bosbeheer, die daartoe het advies inwint van de Natuurbeschermingscommissie.

De Natuurbeschermingscommissie bestaat uit tenminste zeven leden.

Ambtshalve hebben als lid zitting:

1°. De Directeur van de Landbouw;

2°. Het Hoofd van 's Lands Bosbeheer;

3°. De Entomoloog bij het Landbouwproefstation;

4°. Het Hoofd van de Geologisch Mijnbouwkundige Dienst.

De overige leden, waarvan tenminste een Districts-Commissaris is, worden benoemd en ontslagen door de President.

De President wijst uit de leden de voorzitter en secretaris aan.

Voorzover nodig wordt voor ieder reservaat een plaatselijk beheerder aangewezen.

Artikel 4

Het Hoofd van 's Lands Bosbeheer kan, op advies van de Natuurbeschermingscommissie een natuurreservaat geheel of gedeeltelijk voor het publiek sluiten.

Het is verboden een krachtens het vorig lid gesloten gebied te betreden, tenzij met schriftelijke vergunning van het Hoofd van 's Lands Bosbeheer en met inachtneming van de daarin gestelde voorwaarden.

Artikel 5

Het is verboden in een natuurreservaat:

a. met opzet of door onachtzaamheid schade toe te brengen aan de bodemgesteldheid, het natuurschoon, de fauna, de flora of handelingen te verrichten, waardoor afbreuk wordt gedaan aan de waarde van het reservaat als zodanig;

b. te kamperen, vuur te maken, hout te kappen of houtskool te branden, tenzij met een daartoe door het Hoofd van 's Lands Bosbeheer verkregen schriftelijke toestemming en met inachtneming van de daarin gestelde voorwaarden;

c. te jagen, te vissen en bij zich te hebben, zonder vergunning van het Hoofd

3.

2. De Procureur-Generaal is gerechtigd in artikel 100 van het Wetboek van Strafrecht bedoelde bevoegdheid te delegeren aan het Hoofd of een daartoe door het Hoofd speciaal aangewezen ambtenaar. Door de Procureur-Generaal worden de transactiebedragen vastgesteld voor de verschillende bij of krachtens deze Wet strafbaar gestelde feiten en bekendgemaakt.

In het belang van een richtig toezicht op de verantwoording van de ontvangen bedragen is het Hoofd of de voormelde ambtenaar niet toegestaan om enige andere voorwaarde te stellen aan de betaling van de door de Procureur-Generaal vastgestelde bedragen.

3. De Procureur-Generaal kan in het belang van een goede rechtsindeling bevelen, dat in bepaalde zaken door het Hoofd of door deze gemachtigde ambtenaar geen gebruik wordt gemaakt van de transactiebevoegdheid. Evenzo kan hij, indien naar zijn oordeel de taakvervulling van genoemde functionarissen zulks vordert, bevelen, dat dezen tot nader bericht geen gebruik zullen maken van de transactiebevoegdheid.

4. De in lid 2 bedoelde functionaris reikt aan degene, die vrijwillig aan de gestelde voorwaarde voldoet, onverwijld een gedagtekend en door hem ondertekend betalingsbewijs uit. Hij houdt aantekening van elke persoon, die vrijwillig aan de door hem gestelde voorwaarde heeft voldaan, van het op heterdaad ontdekte strafbare feit en van de betaalde geldsom. Deze aantekeningen worden binnen zeven dagen na het verstrijken van elke maand aan de Procureur-Generaal toegezonden.

5. De ontvangen transactiebedragen worden maandelijks afgedragen middels storting bij de Centrale Betaaldienst ten name van het Directoraat Justitie. Van het beheer van deze gelden wordt zodanig administratie gehouden, dat steeds toezicht en verantwoording mogelijk zijn.

6. De Procureur-Generaal stelt het model vast van het in lid 4 van dit artikel bedoelde betalingsbewijs, van het in hetzelfde lid bedoelde register van aantekeningen van transacties, alsmede nadere regels met betrekking tot de afdoening ervan.

Artikel 12

Bij de aanwijzing van de natuurreservaten kunnen verdere voorschriften tot uitvoering van deze wet worden gegeven, bij of krachtens Staatsbesluit, de Staatsraad gehoord.

Artikel 13

Het toezicht op de uitvoering van de bij of krachtens deze wet gestelde bepalingen en de behartiging van alle zaken op het gebied van natuurbescherming worden opgedragen aan het Hoofd van 's Lands Bosbeheer, die advies vraagt aan de Natuurbeschermingscommissie.

Artikel 14[4]

Deze wet kan worden aangehaald als "Natuurbeschermingswet 1954" en treedt in werking op een nader door de President te bepalen tijdstip.

[4] I.w.t. 1 januari 1955 (G.B. 1954 no. 105).

Hz. Malone
Svp corrigeren
F. Baal 9/7

nbw 195"

"Natuurbeschermingswet 1954" (Nature Protection Law 1954, Government Bulletin 1954 no. 26 with Amendments by Government Bulletin 1954 no. 105, State Bulletin 1980 no 116 and State Bulletin 1992 no. 80) *1

Article 1
For protection and preservation of the Suriname's present natural wealth, the President can, after having heard the Council of Advice, designate lands and waters belonging to the nation's domain as nature reserve.

Article 2
To be designated as a nature reserve, the area has to satisfy the following requirements:
that it deserves protection by the Government because of its varied nature and landscape beauty and/ or because of the presence, from a scientifically or culturally point of view, important flora, fauna and geological objects.

Article 3
The general management of the nature reserves rests with the Head of the Forest Service, who takes the advice of the Nature Protection Commission.
The Nature Protection Commission consists of at least seven members.
Official members are:
1. The Director of the Ministry of Agriculture;
2. The Head of the Forest Service;
3. The Entomologist of the Agriculture Research Station;
4. The Head of the Geological Mining Service.
The other members of which at least one is a District Commissioner, are appointed and discharged by the President.
Where needed, a local manager is appointed for each reserve.

Article 4
The Head of the Forest Service can, at the advice of the Nature Protection Commission, close a nature reserve entirely or partially for the public.
In accordance with aforementioned paragraph, it is prohibited to enter a designated area except with a written permit from the Head of the Forest Service and with observance of the stipulated conditions.

Article 5
Within a nature reserve it is forbidden:
a. on purpose or by carelessness to damage the condition of the soil, the scenery, the fauna, the flora or to act in such a way that the value of the reserve is being harmed;
b. to camp, to make fire, to cut timber or burn charcoal, unless with a written permission of the Head of the Forest Service to do so while taking care of the conditions of this permission;
c. to hunt, to fish and carry - without permit from the Head of the Forest Service- a dog, a fire arm or any hunting or capturing means.

Article 6
The prohibitions meant in the articles 4 and 5 are not applicable to persons indicated by the Head of the Forest Service, to whom a special permit has been issued or to whom an order has been given to implement - under the conditions of this Head -one or more actions as mentioned in these articles in behalf of a scientific, educational, cultural or other purpose.

Article 7
The Head of the Forest Service can issue a written permit to certain persons to implement a business according to plan- which plan has been approved by him- in a part of the reserve which has been closed, or to collaborate in a business under the strict reservation that no damage or harm at all will be done by these persons or businesses.
The Head of the Forest Service can issue a written permit under his conditions to certain persons under the conditions to gather forest products and non- timber forest products, to graze cattle or to practise fishery in certain parts of the reserve which parts he has indicated.

Article 8
Trespass of the regulations set by or in virtue of this law is punished with a custody of maximum three months or a fine of maximum one thousand guilders. *2

Article 9
The investigation officers are at all times authorized to confiscate the objects concerned. For that purpose they can demand surrender.

Article 10
The facts which are punishable by or in virtue of this law are considered to be offences "overtredingen". *3

Article 11
Enforcementof this Nature Conservation Law is done by Officials mentioned in article 134 of the Suriname Criminal Prosecution Code ("Surinaams Wetboek van Strafvordering") and by persons sworn in by the Head of the Forest Service.

Article 11a
1. In this Article "the Head" means the Head referred to in Article 3.

2. The Attorney General may delegate his authority mentioned in Article 100 of the Criminal Code to the Director and/ or the Head or a civil servant nominated especially by the Director or the Head. The Attorney General will establish and publish the discharge amounts for the different acts which are punishable under or by virtue of this Act.
In the interest of a proper supervision over the accounts of the amounts received, the Director and/ or the Head of the earlier mentioned civil servant, may not apply conditions other than payment of the amounts determined by the Attorney General.

3. The Attorney General may, in the interest of a proper administration of justice order that the Director and/ or the Head, or the civil servant authorized by them, do not utilize the authority to discharge of liability of conviction. Likewise he may order that, if to his discretion such is

required for the fulfillment of the tasks of the officials mentioned, the later will avail themselves of the aforementioned authority until further notice.

4. The official referred to in paragraph 1 will immediately issue a receipt, dated and signed by him, to the person who voluntarily complies with the conditions laid down. He will keep notes of each person who has voluntarily complied with a condition imposed by him, of the punishable acts detected while they were being committed, and of the amount of money paid. These notes will be sent to the Attorney General within seven days upon the completion of each month.

5. The discharge payments received will be deposited monthly with the Central Paymaster for the benefit of the Directorate of Justice. An Administration of these amounts will be kept in such a manner that supervision and accounting will at all times be possible.

6. The Attorney General will determine the model of the receipt mentioned in paragraph 3 of this Article, of the register of discharge paymnets referred to in the same paragraph, as well as further rules regarding their settlement.

Article 12

At the time of the designation of the nature reserves additional regulations for the implementation of this law may be given by, or in virtue of a State Resolution, after hearing the Council of Advice.

Article 13

The supervision of the implementation of the regulations of, or in accordance with this law, and the care off all matters pertaining to nature protection are assigned to the Head of the Forest Service, who is to request advice from the Nature Protection Commission.

Article 14

Tis law can be quoted as " Natuurbeschermingswet 1954" (Nature Protection Law 1954) and will become affective at a date to be announced by the President.*4

NOTES:

*1. This unofficial translation of the Nature Protection Law is as literally as possible.

*2 However, on base of the Law on Economic Delicts the maximum penalties are six years imprisonment or a fine of one million guilders.

*3 "Offences" is here used for the Dutch word "Overtredingen".

*4 Enactment date was 1 January 1954 (Government Bulletin 1954 no. 105).

6

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE GOVERNMENT OF THE REPUBLIC OF SURINAME, represented by the President of the Republic of Suriname, his excellency Drs. J.A. Wijdenbosch,

AND

CONSERVATION INTERNATIONAL, a non-profit, non-governmental organization with offices at 2501 M Street, N.W., Suite 200, Washington, D.C. 20037, U.S.A., represented by its President, Dr. Russell A. Mittermeier.

WITNESSETH

WHEREAS the President of the Republic of Suriname and Conservation International mutually recognize the critical global importance of biological resources, biological diversity, and wilderness areas.

WHEREAS the President of the Republic of Suriname and Conservation International mutually recognize the particularly urgent need to protect intact primary tropical forests for their unique scientific, ecological, economic, and aesthetic values.

WHEREAS the President of the Republic of Suriname and Conservation International mutually recognize that the long-term scientific, ecological, economic and aesthetic values of intact primary tropical forests exceed the values that can be derived through extractive industries.

WHEREAS the Republic of Suriname has strong protected areas legislation, and is a signatory to the Convention on Biological Diversity, the Convention for the Protection of the World Cultural and Natural Heritage, the Framework Convention on Climate Change, the Amazon Cooperation Treaty and other international and regional instruments recognizing the importance of a healthy environment.

WHEREAS Conservation International recognizes the legitimacy of the Republic of Suriname's claims to reasonable compensation for the global environmental benefits (including biodiversity conservation and carbon sequestration) generated by the protection of intact primary tropical forest.

WHEREAS the Republic of Suriname and Conservation International mutually recognize the importance of forests in sequestering greenhouse gases such as carbon, their role in reducing climate change, and the potential for financing forest conservation through "carbon offset" projects.

WHEREAS Conservation International is an organization dedicated to the conservation of biological diversity and has technical expertise in protected area management, biodiversity assessment, eco-tourism and community based development, conservation enterprise and communications.

IN CONSIDERATION of the common interest of the parties in the conservation and sustainable management of protected areas, the preservation of biological diversity, and preventing global warming, the parties agree as follows:

ARTICLE 1
OBJECTIVE: DECLARATION OF A PROTECTED AREA

1. Under the authority of the Nature Protection Act of 1954, the Government of the Republic of Suriname will create by resolution and in perpetuity a Nature Reserve consisting of not less than 1 million hectares of new protected area that will protect the upper Coppename River watershed and link the existing Raleighvallen, Tafelberg, and Eilerts de Haan Nature Reserves, as demarcated in the map attached in Annex 1.

2. The nature reserve in section 1 of this article will be named the Central Suriname Nature Reserve and will be referred to hereinafter as the Central Suriname Nature Reserve.

3. The Central Suriname Nature Reserve will be submitted to the United Nations Educational, Scientific and Cultural Organization as a World Heritage natural and cultural site for inclusion on the World Heritage List.

4. Articles 2 through 8 are contingent upon, and will occur subsequent to, implementation of section 1 of this Article.

ARTICLE 2
COMMUNICATIONS

1. Conservation International will call press conferences to announce the designation of the Central Suriname Nature Reserve.

2. Conservation International will undertake a Central Suriname Nature Reserve media campaign to publicize the Central Suriname Nature Reserve and a Green Suriname campaign to publicize the Republic of Suriname's commitment to conservation.

3. Conservation International will produce a video news release describing the Central Suriname Nature Reserve for major news agencies.

4. Conservation International will commemorate the creation of the Central Suriname Nature Reserve with a publication and a series of other educational materials describing the creation of the Central Suriname Nature Reserve.

ARTICLE 3
PRELIMINARY DATA AND MANAGEMENT PLAN

1. Conservation International will work with the Nature Conservation Division of the Suriname Forest Service and other entities or persons designated by the President of the Republic of Suriname and with local NGOs to gather preliminary data and conduct baseline surveys of the Central Suriname Nature Reserve including: the physical and biological characteristics, maps, and an overview of possible constraints to effective management.

2. Conservation International will work with the Nature Conservation Division of the Suriname Forest Service and other entities or persons designated by the President of the Republic of Suriname in drafting a technical management plan for the Central Suriname Nature Reserve and will propose recommendations for scientific, land-use, and administrative policies.

ARTICLE 4
CARBON CREDITATION PROJECT

1. Conservation International will perform an economic assessment of the potential carbon offset value of the Central Suriname Nature Reserve and of other areas in the Republic of Suriname.

2. Conservation International will establish a baseline for carbon emissions that will be prevented by protecting the Central Suriname Nature Reserve and other areas in the Republic of Suriname.

3. Conservation International will assist the Government of the Republic Suriname in assessing the potential for implementing a carbon offset project jointly.

ARTICLE 5
CONSERVATION BASED DEVELOPMENT STRATEGY

1. Conservation International will assemble a team of industry experts to consult with the relevant ministries of the Government of the Republic of Suriname and business interests in the Republic of Suriname regarding approaches to attract conservation friendly development investments.

2. Conservation International will assist in efforts to promote and market the Republic of Suriname as an ecotourism destination through Conservation International's Ecotourism Development Process.

3. Conservation International will assist in efforts to promote non-timber forest products and community artisanry from the Republic of Suriname.

5. Conservation International will explore opportunities for agroforestry projects in the Republic of Suriname, and in particular the possibility of agroforestry projects integrating medicinal plants and herbals.

ARTICLE 6
TRUST FUND

1. Conservation International will cooperate with appropriate entities in the Republic of Suriname to design a trust fund that will finance protected area management and biodiversity conservation in the Republic of Suriname.

2. The trust fund will be named the Suriname Conservation Trust and will be referred to hereinafter as the Suriname Conservation Trust.

3. Conservation International will draft a financial plan for the Suriname Conservation Trust.

4. Conservation International will be represented on the board of directors of the Suriname Conservation Trust.

5. The Suriname Conservation Trust will benefit the Nature Conservation Division of the Suriname Forest Service, or in the event that this agency ceases to exist, the agency responsible for management of protected areas in the Republic of Suriname.

ARTICLE 7
FUNDING: CONTRIBUTION TO TRUST FUND, DIRECT FINANCING, CONSERVATION DEVELOPMENT ASSISTANCE

1. In recognition of the vital importance of conserving intact primary tropical forests and in order to finance the management of the Central Suriname Nature Reserve, Conservation International will transfer the sum of *one million United States dollars* to the Suriname Conservation Trust according to the schedule of payments in Article 8.

2. Conservation International will finance the activities under Article 2 through 6.

3. Conservation International will assist the Government of the Republic of Suriname to obtain funding sources for conservation-based development from multilateral institutions including the World Bank, the Global Environmental Facility, the Inter-American Development Bank.

4. Conservation International will assist the Government of the Republic of Suriname to obtain funding sources for conservation-based development from the private sector.

ARTICLE 8
SCHEDULE OF EVENTS AND DISBURSEMENTS

1. The President of Suriname will create by resolution the Central Suriname Nature Reserve as stated in sections 1 and 2 of Article 1.

2. Subsequent to the resolution designating the Central Suriname Nature Reserve as stated in sections 1 and 2 of Article 1, Conservation International will transfer $250,000 to a provisional interest bearing account and will hold these funds in trust pending the establishment of the Suriname Conservation Trust.

3. Upon establishment of the Suriname Conservation Trust, Conservation International will transfer $250,000 to this trust, and transfer the funds in the provisional account in section two of this article to the Suriname Conservation Trust.

4. Upon completion of the management plan and submission of the Central Suriname Nature Reserve as a World Heritage site, and subsequent to the creation of the Suriname Conservation Trust, Conservation International will transfer an additional $250,000 to the Suriname Conservation Trust.

5. CI will transfer an additional $250,000 to the Suriname Conservation Trust six months after the transfer in section 4 of this article.

Excellency Drs. J.A. Wijdenbosch
President, Republic of Suriname

Date 4 June 1998

Dr. Russell A. Mittermeier
President, Conservation International

Date June 4, 1998

RALEIGHVALLEN / VOLTZBERG NATURE RESERVE

MANAGEMENT PLAN 1993 - 1997

STINASU

WWF

L B B

WWF Project No. 6538 - Conservation Action Plan for Suriname

Paramaribo, April 1993

RALEIGHVALLEN/VOLTZBERG NATURE RESERVE

MANAGEMENT PLAN 1993 - 1997

Prepared for the

Surinam Forest Service (LBB)

and the

Foundation for Nature Preservation in Suriname (STINASU)

Paramaribo, Suriname

by

HENRI A. REICHART

WNF Senior Technical Advisor at LBB and STINASU

WWF

World Wildlife Fund (USA & The Netherlands)

Surinam Forest Service

L B B

WWF Project No. 6538 - Conservation Action Plan for Suriname

Paramaribo, April 1993

TABLE OF CONTENTS

page

page

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The 78,170 ha large Raleighvallen/Voltzberg Nature Reserve is located in the northcentral part of Suriname. The region is for a large part covered by mesophytic, tropical forest. The composition of plant communities in the nature reserve is typical for tropical highland forest. Where the Coppename River flows through the nature reserve there are some spectacular waterfalls and rapids. In the eastern part of the reserve there are some geologically interesting granite domes, called "inselbergs." The area is mountanous to hilly, and the highest point in the reserve is the top of the Van Stockumberg, at 362 m above sea level.

The reserve area was inhabited by indians long before the arrival of Columbus, but there are no indications of more recent indian settlements. On the other hand, some bushnegro villages are currently situated north of the reserve along the Coppename River. There are, however, no indigenous people living inside the reserve. Management of the reserve must be integrated with regional land-use planning, and the local communities should get a voice in certain aspects of the decision-making process.

At this time, the reserve borders are not marked in the field. At certain strategic places, such as where the Coppename River or creeks cross reserve boundaries, border markers should be placed. Recommendations are also made to establish usage zones inside the reserve (where visitors will have to abide by certain rules), and bufferzones outside the reserve (which can be managed for sustainable-use projects to benefit local people).

Terms of reference are proposed for each category of reserve personnel. To upgrade work skills, and to improve their general knowledge of conservation, a training program is being recommended. This program must also include the development of a standard code of behavior in dealing with the public.

Because of the recently ended armed conflict in the interior, the reserve infrastructure has been seriously impaired. Buildings for personnel and tourists on Foengoe Island (where the reserve headquarters is located) have been destroyed. Equipment and materials have been either stolen or made useless by vandalism. Besides rebuilding this infrastructure, an improvement in the facilities is necessary to make the reserve better suitable for research, education and nature tourism.

The development of hydro-power installations to provide cheap electricity for the reserve facilities should have high priority. Other development projects to be considered in the near future are: construction of a research station and an education/information center.

A schedule for the implementation of this management plan has been outlined but, because of the current, volatile financial situation in the country, no attempt has been made to develop a budget for it. As soon as is it feasible to implement certain parts of this management plan, specific budgets will have to be developed for those tasks. The current 5-year Plan (1993-1997) proposes the following objectives for managing the Raleighvallen/Voltzberg Nature Reserve:

-- Develop and install a system of boundary markers

-- Protect the reserve's natural and cultural resources

-- Protect the reserve from unlawful encroachment

-- Involve local people in the management of the reserve

-- Improve research, staff, and tourist facilities

-- Promote research, education, and nature tourism

-- Improve and enlarge the system of marked nature trails

-- Provide appropriate training for field personnel

-- Construct one or more hydro-power installations in the reserve

-- Build an education and information center in the reserve

-- Build a biological field research station in the reserve

In order to achieve these objectives, the management plan proposes the following strategy:

-- Establishment of firm boundaries for the reserve

-- Establishment of usage zones inside and around the reserve

-- Establishment of a strong guard force

-- Improvement of relations with nearby communities

-- Maintenance and expansion of the nature trails network

-- Establishment of a team of trained field personnel

-- Expansion of tourist facilities to other areas in the reserve

-- Construction of mini hydro-power installations

-- Development of an education and information center

-- Construction of a biological field research station

RECOMMENDATIONS

This management plan provides a set of general guidelines for the development and management of the Raleighvallen/Voltzberg Nature Reserve, acknowledging the fact that it has been developed for an ideal scenario in a currently somewhat less than ideal situation.

As part of the plan, and throughout the text, recommendations are being made to arrive at an optimal functioning of the reserve. It is clear, however, that at this time some of the recommendations cannot be implemented because of financial, logistic, and personnel constraints.

Nevertheless, some activities should, and can, be initiated now. Action should be undertaken as soon as possible on the following items:

1. Make extra personnel available to repair the damage done to the reserve buildings and facilities by the recently ended armed conflict in the country.

2. Nurture a good relationship of local people with the Surinam Forest Service (LBB) and the Foundation for Nature Preservation in Suriname (STINASU) for a mutually beneficial use of the reserve and its resources (see sections 2.2.5 and 2.3).

3. Discuss with representatives from the local population their possible participation in the development of tourism, and their views on protecting cultural objects in the reserve (see sections 2.2.5 and 2.3).

4. Start reconstructing the LBB/STINASU building at Bitagron. This building serves as control post and as a half-way station for persons traveling to and from the reserve.

5. Place signposts or information boards to indicate the reserve boundaries and usage zones. Initially, these can best be located where the Coppename River and the various creeks cross these boundaries or zones (see sections 3.3.1 and 3.3.2).

6. Investigate the possibility of constructing some small-scale hydro-power installations as a substitute for fossil fuel power generators to provide electricity for Foengoe Island (see section 3.9.4).

This document is an English language version of the already completed Raleighvallen/Voltzberg Nature Reserve Management Plan written in Dutch for use in Suriname (Reichart, 1993).

ACKNOWLEDGEMENTS

The development of this plan has been aided considerably by discussions with a number of persons. Regarding the vegetation of the Raleighvallen/Voltzberg Nature Reserve, I want to thank most of all Marga Werkhoven, Curator of the National Herbarium of the University of Suriname for pointing out pertinent literature. In the Surinam Forest Service (LBB), I want to thank Ferdinand Baal, Muriel Held, and Kris Mohadin for their helpful suggestions. Many thanks also to Humphrey Ooiberg, Henri Asmoredjo, and Lilian Wirowikromo of the LBB drafting Department for their cooperation in preparing some of the maps used in this management plan -- for this also my appreciation to Tracey Bolseng of the Canadian Crossroads Program who assisted us in this.

Data for the development of this management plan have come from several sources. The Surinam Museum graciously made its library available for background research -- I especially want to thank Ivonne Tjin A Kiem for her invaluable help in searching the stacks to find obscure literature. I also want to express my appreciation to Mr. J. Wekker for enlightening me with historical anecdotes about the Raleighvallen area. I thank Ir. Fung of the Meteorological Services for providing me with the meteorological data measured at Foengoe Island in the reserve. Thanks also to Mr. Jamoena of the Department of Soils Survey (DBK) for helping me acquire the most recent soils map of the area.

The checklist for reptiles and amphibians has been compiled from various sources, including data published by Hoogmoed (1975), Moonen et al (1979), and Stumpel (1976), and from lists given to NB/STINASU by other visiting scientists. The checklist for birds was compiled from field observations of birdwatching experts and ornithologists who have visited the reserve. Additional records came from various publications, prominently the book "Birds of Surinam" by Haverschmidt (1968). The checklist for mammals has been compiled from personal data and from checklists made by visiting scientists. All the original lists are on file at NB and STINASU.

This management plan has been prepared as part of the Conservation Action Plan for Suriname (CAPS), a 5-year project to ensure the sound development of the country's conservation program and its network of protected areas (Mittermeier et al, 1990).

Sranan Tongo (the lingua franca of Suriname) has been used as much as possible for the common names of plants and animals. There is still some confusion regarding the proper spelling of words in Sranan Tongo and it can be expected that shortcomings will surface here and there. I thank Eva Essed for making the most recent list of Sranan Tongo names of plants and animals available for my use. That new list will eventually appear in an updated re-publishing of the: "Sranan Nederlands English Woordenlijst" (Anon., 1980a).

PROPOSED LOGO

The Raleighvallen/Voltzberg Nature Reserve contains a number of interesting plant and animal communities. One species, however, stands out: the cock-of-the-rock (Rupicola rupicola). Throughout the Neotropics these birds are rare but near the Voltzberg and some other inselberg areas in Suriname they can be easily observed on their leks (areas where the males through ritualistic, aggressive behavior will attempt to establish mating territories). Although several animals could be considerd for the logo of the reserve, the cock-of-the-rock may be the best candidate. It is a spectacular bird that can be used as a "Flagship Species" for fundraising and to promote nature tourism to the reserve.

The cock-of-the-rock is about the size of a pigeon. The female has a rather even, gold-brown plumage, and is not very conspicuous. The color of the male, however, is almost entirely bright orange; only the wings and the end of the tail have a series of black and brown bars, which accentuate the orange color. The males have a very interesting courtship behavior. During the breeding season (roughly mid-January to mid-April) they gather in groups of often 30-40 individuals on the leks. Intra-specific competition for prime territoria is great, and only a few dominant males wil be able to mate with one of the females flying across the lek.

In the Raleighvallen/Voltzberg Nature Reserve, leks of the cock-of-the-rock occur mostly in rocky areas which also have a stunted tree cover. The area around the Voltzberg has been the center of an intensive study on the biology and behavior of this bird (Trail, 1983, 1984, 1985). For specific details on the biology and ecology of the cock-of-the-rock, see this literature.

The logo must be displayed on all notice boards, boundary markers, and trail markers in the reserve. It can also be used as letterheads on all reports and communications dealing with the reserve. Patches or insignias with the logo must be worn by all personnel to show their affiliation with the reserve. STINASU can further use it commercially through the sale of posters, bags, and T-shirts printed with the logo.

INTRODUCTION

Suriname is in the early stages of economic development of its natural resources. This fact, combined with a low human population density, has presented the country's decision makers with a unique opportunity to apply the principles of the World Conservation Strategy (WCS) (Anon., 1980b). This strategy was developed by three of the world's leading conservation agencies: the Worldwide Fund for Nature (WWF) (formerly called the World Wildlife Fund), the World Conservation Union (IUCN) (formerly called the International Union for the Conservation of Nature and Natural Resources), and the United Nations Environment Program (UNEP). These agencies point out that sound ecological principles must be applied if sustainable economic use of resources is to be attained. In short, the strategy recommended is as follows:

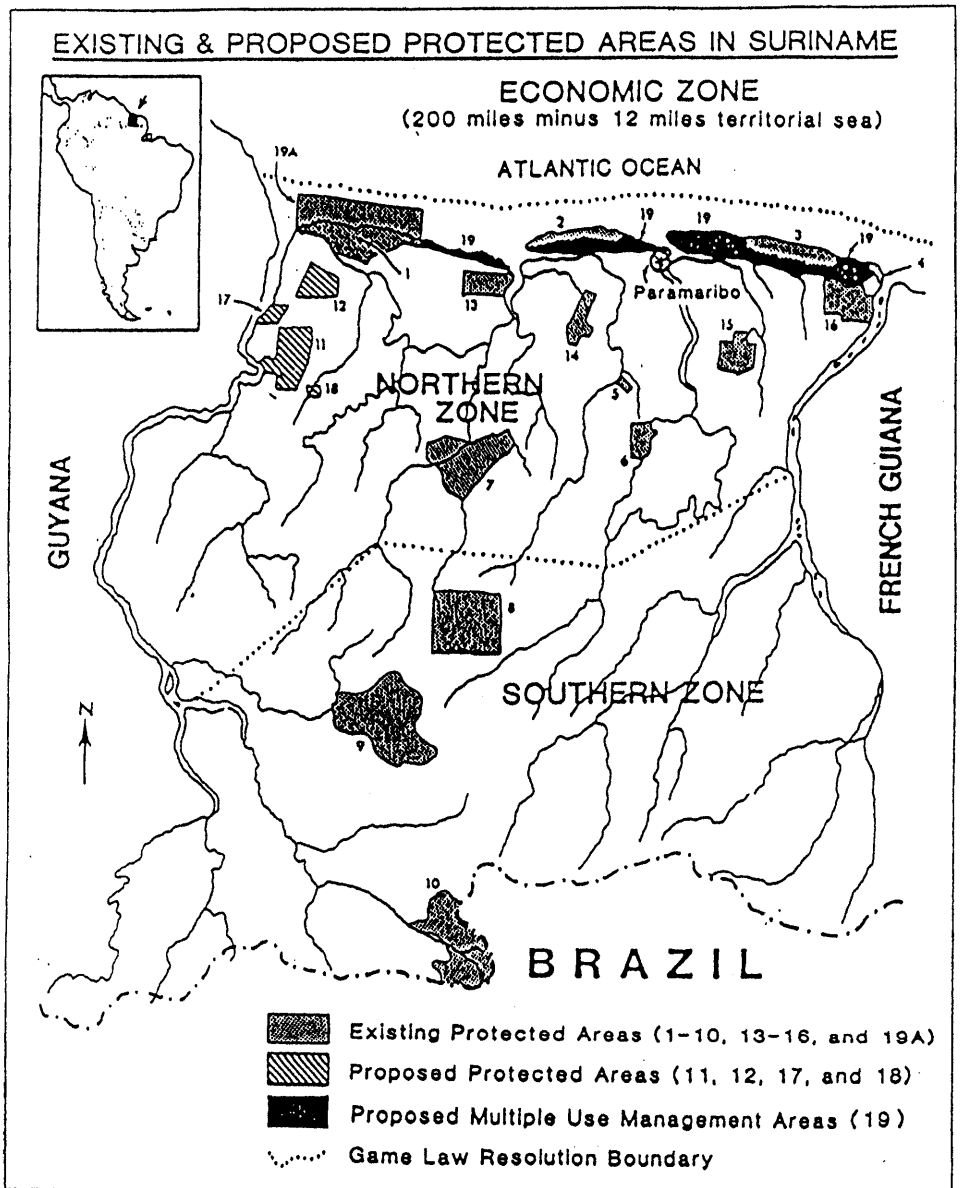
--- maintenance of essential ecological processes and life-support systems;

--- preservation of genetic diversity;

--- sustainable utilization of ecosystems and species.

Nature conservation and economic development are often considered to be mutually exclusive interests. This is a short-sighted attitude of advocates of both positions. The main problem, however, is caused by economic planners. Seldom, if ever, is the value of the functions of natural ecosystems for society included in cost/benefit analyses of economic development projects: soil, water, forest and clean air are generally considered to be "free" commodities. The usually costly ramifications of mitigating social opheavals (such as the forced displacement of people) are also conveniently ignored. An all-encompassing and careful analysis will often show that an alternate, sustainable use of the resource is far more profitable for society in the long run than the financial rewards of poorly thought-out, short-term projects benefiting only a few people.

Nearly forty years ago, long before the WCS was formulated, the Government of Suriname had already embarked on developing such a policy of renewable natural resource conservation. Since 1954, with the proclamation of the Nature Protection Law (see Appendix A), the Government can give certain unique ecosystems or wildlife species protection through application of pertinent legislation. This Nature Protection Law is the foundation on which the system of nature reserves in Suriname has been built. Figure 1 is a map of Suriname, showing all nature reserves and other protected areas. Studies, foremost the one by Schulz (1960), have shown that the Raleighvallen/Voltzberg area contains some interesting and unique ecosystems that justify their protection. On 22 April 1966 the Voltberg/Raleighvallen area was designated a nature reserve (G.B. No. 59, see Appendix B). On 26 August 1986, the reserve was enlarged (G.B. No. 52, see Appendix C), with the result that its size is now 78,170 ha.



EXISTING PROTECTED AREAS IN SURINAME (1990)*

1. Hertenrits NR (100 ha)
2. Coppename Monding NR (12,000 ha)
3. Wia-Wia NR (36,000 ha)
4. Galibi NR (4,000 ha)
5. Brinck-heuvel NR (6,000 ha)
6. Brownsberg NP (8,400 ha)
7. Raleighvallen-Voltzberg NR (78,170 ha)
8. Tafelberg NR (140,000 ha)
9. Eilerts de Haan NR (220,000 ha)
10. Sipaliwini NR (100,000 ha)
13. Peruvia NR (31,000 ha)
14. Boven-Coesewijne NR (27,000 ha)
15. Copi NR (28,000 ha)
16. Wanekreek NR (45,000 ha)
19a. Bigi Pan MA (68,000 ha, excludes adjacent sea area)

PROPOSED PROTECTED AREAS IN SURINAME (1990)

11. Kaboeri kreek NR (68,000 ha)
12. Nani NR (54,000 ha)
17. Mac Clemen FR (6,000 ha)
18. Snake Creek FR (4,000 ha)
19. Estuarine Zone MA (310,000 ha)

FR = Forest Reserve
MA = Multiple-Use Management Area
NP = Nature Park
NR = Nature Reserve
* = Hectares listed are estimates of land surface only

Figure 1 - The nature reserves of Suriname (modified from: Mittermeier et al, 1990)

The terminology in these legislative documents dates from the colonial period when Suriname was still a part of the Kingdom of The Netherlands, as can be seen in the pertinent Appendices. After the country's independence on 25 November 1975, and the subsequent changes in its Constitution, these terms have been changed with the Law of 3 August 1977, No. 8821 of the Government Publication of the Republic of Suriname No. 45 (see Appendix D).

At the time when nature reserves were being legislated in Suriname, it was decided that these reserves should not become "paper reserves" as so many in the world already are. Over the past twenty years, and dependent on the availability of funds, Suriname has developed some of its reserves for scientific research, nature education, and nature tourism.

A semi-government foundation was proposed to assist in the development and promotion of these activities. The advantage of such a foundation is that it can act as a private enterprise (with a minimum of bureaucracy) but that it will also have support from the Government. With this in mind, the Foundation for Nature Preservation in Suriname (STINASU) was established in 1969. In the Raleighvallen/Voltzberg Nature Reserve, STINASU is mainly involved in promoting and developing nature tourism. The Management and protection of the reserve is the responsibility of the Division of Nature Conservation (NB) of the Surinam Forest Service (LBB). Over the years, this symbiotic relationship between NB and STINASU has been exceptionally beneficial for nature conservation in Suriname.

The Raleighvallen/Voltzberg Nature Reserve is special because it is part of a large area of undisturbed mesophytic tropical rainforest. Furthermore, it has interesting plant communities near the many waterfalls and rapids, on the granite plateaus, and on the outcroppings in the eastern part of the reserve. Research projects done over the years here have made important contributions to the ecology and general knowledge of the tropical rainforest. As a result, the reserve has attained an excellent, international reputation for such studies, and it has become a favorite site for nature tourism.

To maintain this reputation, however, the reserve will have to be managed in a professional manner. Successful management depends to a great extent on the leadership quality of the reserve manager, on having qualified and motivated personnel, and on the cooperation of local people. In these aspects there are serious shortcomings. With appropriate training, all workers, regardless of their educational background, can be taught to do their share in effectively managing and protecting the reserve. Developing a sound public relations program is an important, but often neglected, aspect of management. Personnel must, among other things, be taught standards of common courtesy in dealing with the public -- tourists as well as tribal people living near the reserve.

At this time, the reserve has an informal infrastructure which has evolved over the years since its inception in 1966. It is being run in a rather haphazard manner since no structured management plan is available. This management plan proposes some guidelines to develop, manage, and improve the use the reserve for research, education, and tourism. The plan is not meant to be used for a "cookbook" approach to management, but rather to provide guidelines for developing and managing the reserve more effectively. The reserve has not yet reached its full potential as a research and education site, nor is it fully used for nature tourism. By continuing to develop the reserve for these non-consumptive uses, the value of this national asset will increase. The support and cooperation from people living near the reserve is imperative. In a cooperative effort between LBB, STINASU and local people, their economic welfare may also improve. This can be accomplished in several ways, such as:

-- Providing employment for local people in the reserve

-- Developing pertinent cottage industries (such native handicraft), and services (like working as independent guides, or providing transportation for tourists)

-- Developing agroforestry projects in the bufferzones around the reserve's periphery

1. DESCRIPTION OF THE RESERVE

1.1 Location

The Raleighvallen/Voltzberg Nature Reserve is situated in northcentral Suriname (see figure 2). The region is rather hilly. The highest point in the reserve is the 362 m high Van Stockumberg (see figure 3). The Coppename River, which flows from south to north through the reserve, has an approximately 2 km long stretch of rapids (called sulas in Suriname) just south of Foengoe Island, where the reserve headquarters is located. The vegetation in the reserve consists mostly of mixed tropical rainforest (Werkhoven and Held, 1989). The area is well drained, and as such is almost entirely covered with high dryland forest. In smaller areas within this forest, the following other forest types occur: swamp forest, which is inundated for a large part of the year; marsh forest, which is periodically inundated; liane forest, which stands on firm soils; savanna forest, which can be found on granite soils; mountain savanna forest, which is found on the higher parts in the area (see section 1.4.1).

The reserve headquarters is located on Foengoe Island, which lies just north of the sula complex in the Coppename River (see figure 4). Section 1.6 gives more information about the legal basis in establishing the Raleighvallen/Voltzberg Nature Reserve.

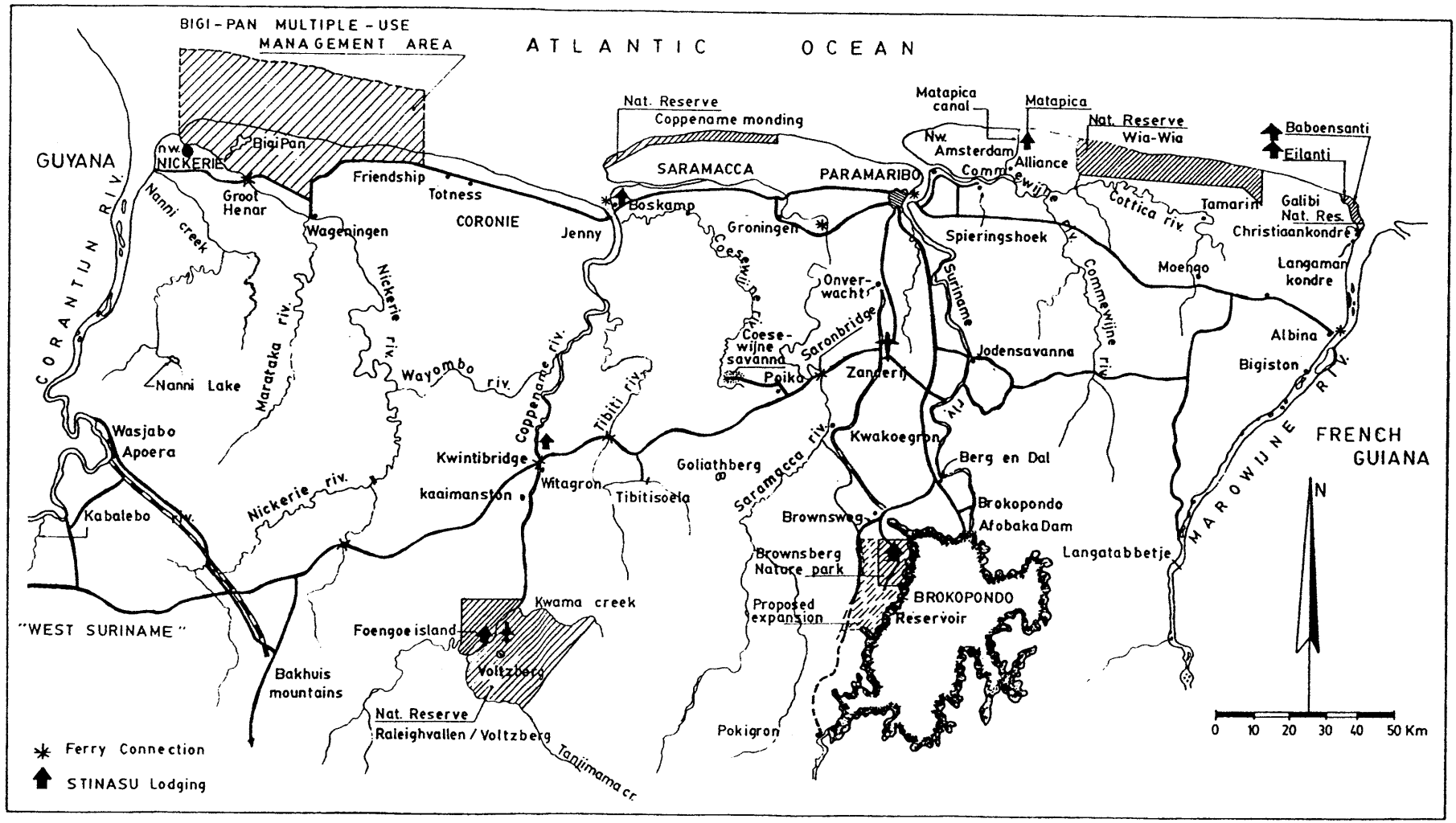


Figure 2 - Map of Northern Suriname (source: STINASU)

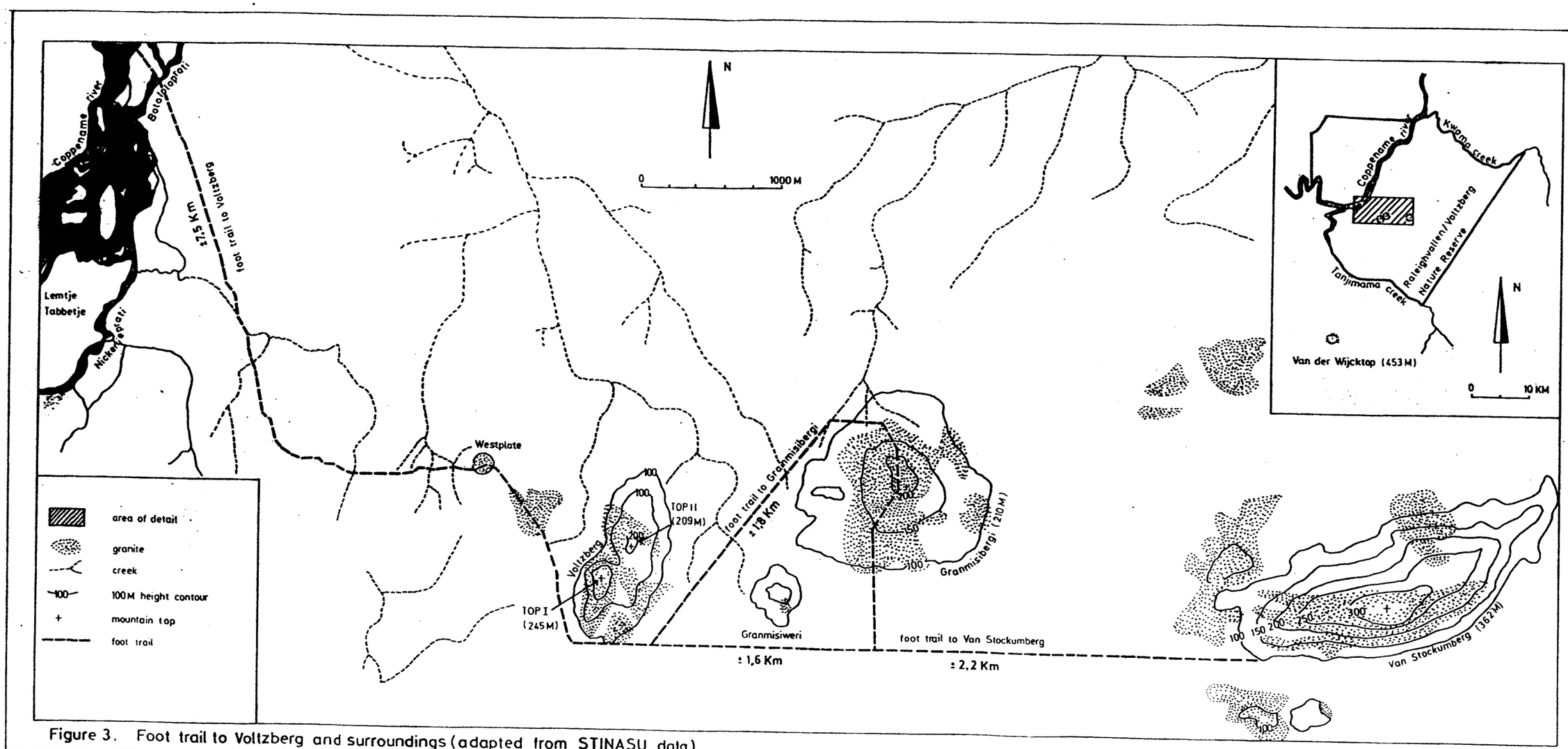


Figure 3. Foot trail to Voltzberg and surroundings (adapted from STINASU data)

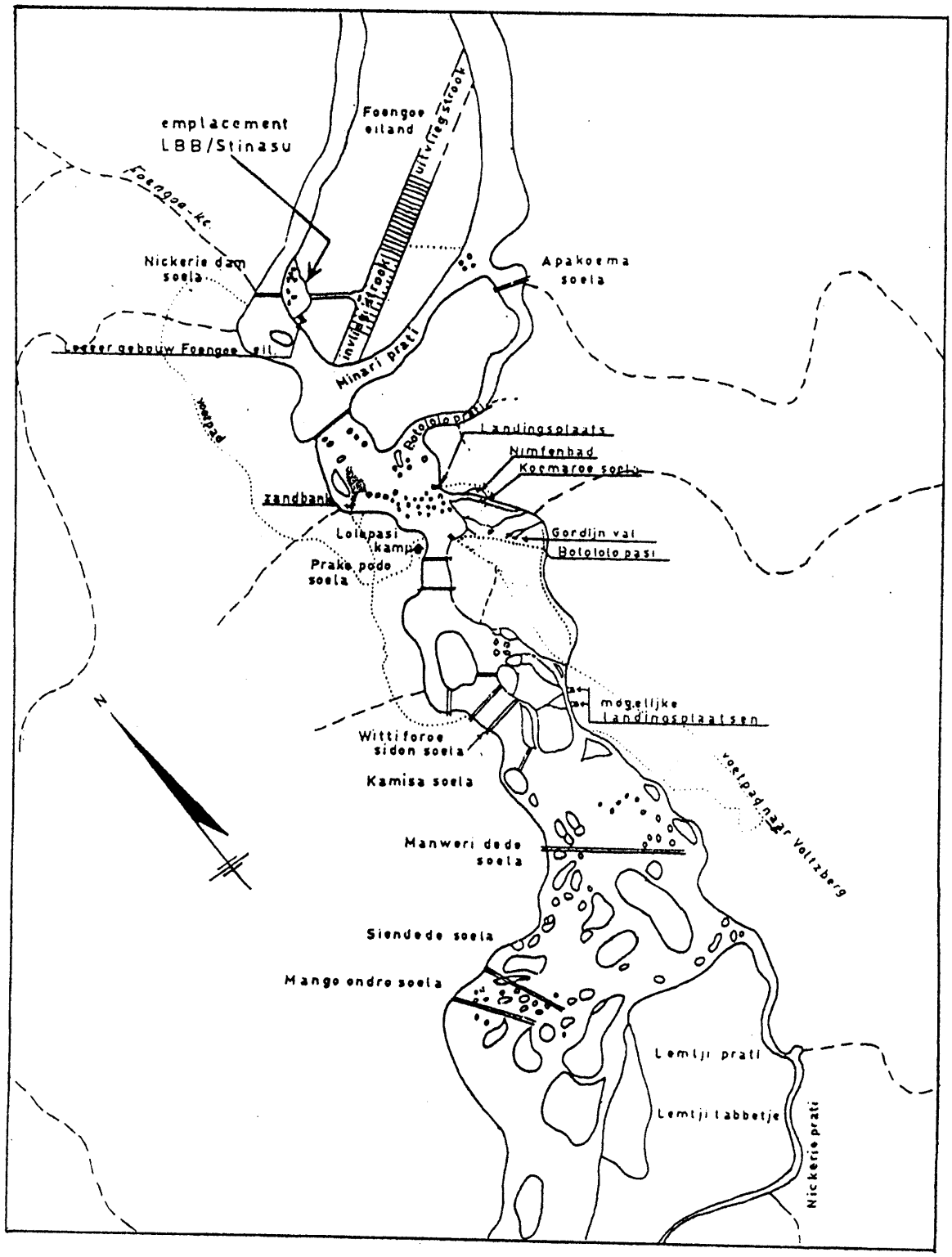


Figure 4 - The Raleighvallen sula complex near Foengoe Island (modified from STINASU data)

1.2 Access

There is no direct road connection with the reserve, but it can be reached by a combination of car and boat travel. There is also a well-maintained 550 m long grassy, hard surface airstrip on Foengoe Island (see Appendix E), which provides for a fast flight connection with Paramaribo. The various ways to travel to the reserve are as follows (see figure 2):

I) **by car and boat:**

a) from Paramaribo by car past Zanderij to the Kwinti Bridge near the village of Bitagron on the Coppename River. Then by boat from Bitagron to the reserve headquarters located on Foengoe Island (see figure 4);

b) from Paramaribo to Boskamp at the mouth of the Coppename River. Then by boat from Boskamp to Foengoe Island;

II) **by plane:**

from the airfield Zorg en Hoop in Paramaribo to the airstrip on Foengoe Island.

The usual way to travel to the reserve is by method Ia). The first part, the 45 km long road from Paramaribo to Zanderij is asphalt and concrete, and is usually in good condition. The second part is a laterite-surface road (completed in 1970 by the Surinam Forest Service) that goes from Zanderij to Washabo on the Corantijn River in west Suriname. Because of erosion during the rainy season, but mostly because of rough, and inconsiderate use by logging trucks, this road is sometimes difficult to negotiate. The road passes by Bitagron, from where STINASU or LBB boats leave for Foengoe Island. The distance Paramaribo - Bitagron is about 185 km and, when road conditions are favorable, it is an approximately 4 hour drive (see figure 2). On some maps the name Witagron is indicated instead of Bitagron but, to avoid confusion, in this management plan the name Bitagron will be used throughout.

Past Zanderij there are no service stations for fuel or repairs. It is strongly recommended to leave Paramaribo with a full tank of fuel, to have good tires and, if possible, to have two complete spare wheels. The boattrip from Bitagron to Foengoe Island takes about 4-5 hours, depending on the water level of the river. The boattrip is quite enjoyable; the Coppename River is scenic and a variety of interesting birds can be seen along the way.

The quickest way to get to the reserve is by plane, but it is not as interesting as far as scenery is concerned. The flight takes only about an hour, depending on the type of aircraft used.

For reserve access, travel arrangements, and accommodations contact the Foundation for Nature Preservation in Suriname. The address is:

STINASU
Cornelis Jongbawstraat 14
P.O. Box 436
Paramaribo
Suriname
Tel: 475845 ext. 37, or
471856 direct line

1.3 Physical Features

1.3.1 Topography

The Raleighvallen/Voltzberg Nature Reserve is situated in the northcentral part of Suriname, straddling the Coppename River (see figure 2). The reserve is in the hilly-to-mountainous region of the country, which consists mostly of erosion products of metamorphic lava. Characteristic landscape features in the region are the inselbergs. These are bare, dome-shaped granite hills rising out of the surrounding landscape with steep, or even vertical sides (Leeflang et al, 1976). In the Raleighvallen/Voltzberg Nature Reserve, the adjoining 245 m high top I and the 209 m high top II of the Voltzberg are typical examples thereof. The highest point in the reserve is the 362 m high top of the Van Stockumberg, which lies a few kilometers east of the Voltzberg (see figure 3).

The Coppename River flows from south to north through the reserve, and it is the primary access route to the region. The source rivers are the Rechter-Coppename River, the Midden-Coppename River, and the Linker-Coppename River. These originate on the slopes of the Tafelberg and the Wilhelmina Mountain range. Here and there creeks join these rivers and, before reaching the reserve, the source rivers come together and become the Coppename River. Some of the larger side creeks of the Coppename River are the Adampada Creek and the Tanjimama Creek (see figure 3). The surface area of the watershed of these streams is about 12,300 km^2, and the river has an average flow of 295 m^3/sec, with an average range of 3 m^3/sec to 2,320 m^3/sec (Bruijning and Voorhoeve, 1977).

Locally, the Coppename River consists of a long stretch of white-water rapids (sulas) and a number of small waterfalls. The latter are located in the surrounding forest near the river. During the dry season, when the water in the river is low, the often house-sized granite boulders in the river are a prominent feature of the landscape.

1.3.2 Climate

Suriname has a lowland, tropical rainforest climate. Mean daily air temperature (at Paramaribo) is 27.1°C, with an annual range of about 2°C. January is the coldest month (avg. 26.1°C) and October the warmest (avg. 28.3°C). Diurnal temperature fluctuations are greater, ranging from 5°C to 9°C. The relative humidity in Paramaribo averages 80%. At night this may rise to 90% and can be as low as 70% during the day (Scherpenzeel, 1977). In general: the humidity in the Surinam rainforest in the early morning is about 95%, at noon about 82%, and at night back to 95% (Schulz, 1960). In open areas of the interior the humidity can be as low as 40%.

In mid-July, sunset occurs at roughly 18:30 hours and in early November at 17:51. Dusk lasts only about 22 minutes. The difference in length of daylight between the longest day (21 June) and the shortest day (21 December) is some 41 minutes (Scherpenzeel, 1977). In 1985, clocks in Suriname were officially set back 30 minutes so that the hours of sunset have become respectively 18:00 and 17:21.

The climate in Suriname is determined by the north-south movement of the Inter-Tropic Convergence Zone (ITCZ). The ITCZ follows (with some lag) the annual, relative movement of the sun between the Tropic of Cancer and the Tropic of Capricorn. From a meteorological point of view, Suriname lies for about half a year in the northern hemisphere, and for half a year in the southern hemisphere (Scherpenzeel, 1977).

Because the rains are not evenly distributed over the country during the year, three types of climate can be distinguished:

> Af (always wet) - all months have an average precipitation of more than 60 mm;
>
> Am (monsoon climate) - one or more months have less than 60 mm precipitation; the deficit is compensated for by the annual total;
>
> Aw (wet and dry climate) - one or more months have less than 60 mm precipitation; the annual deficit is not compensated for by a high annual total.

According to figure 5, the Raleighvallen/Voltzberg Nature Reserve falls in the Am category. Ordinarily, the accompanying vegetation is tropical rainforest. Even though this type of climate is actually too wet for a savanna vegetation, it is important to realize that it would take only little human interference to change this rainforest into a savanna (Scherpenzeel, 1977).

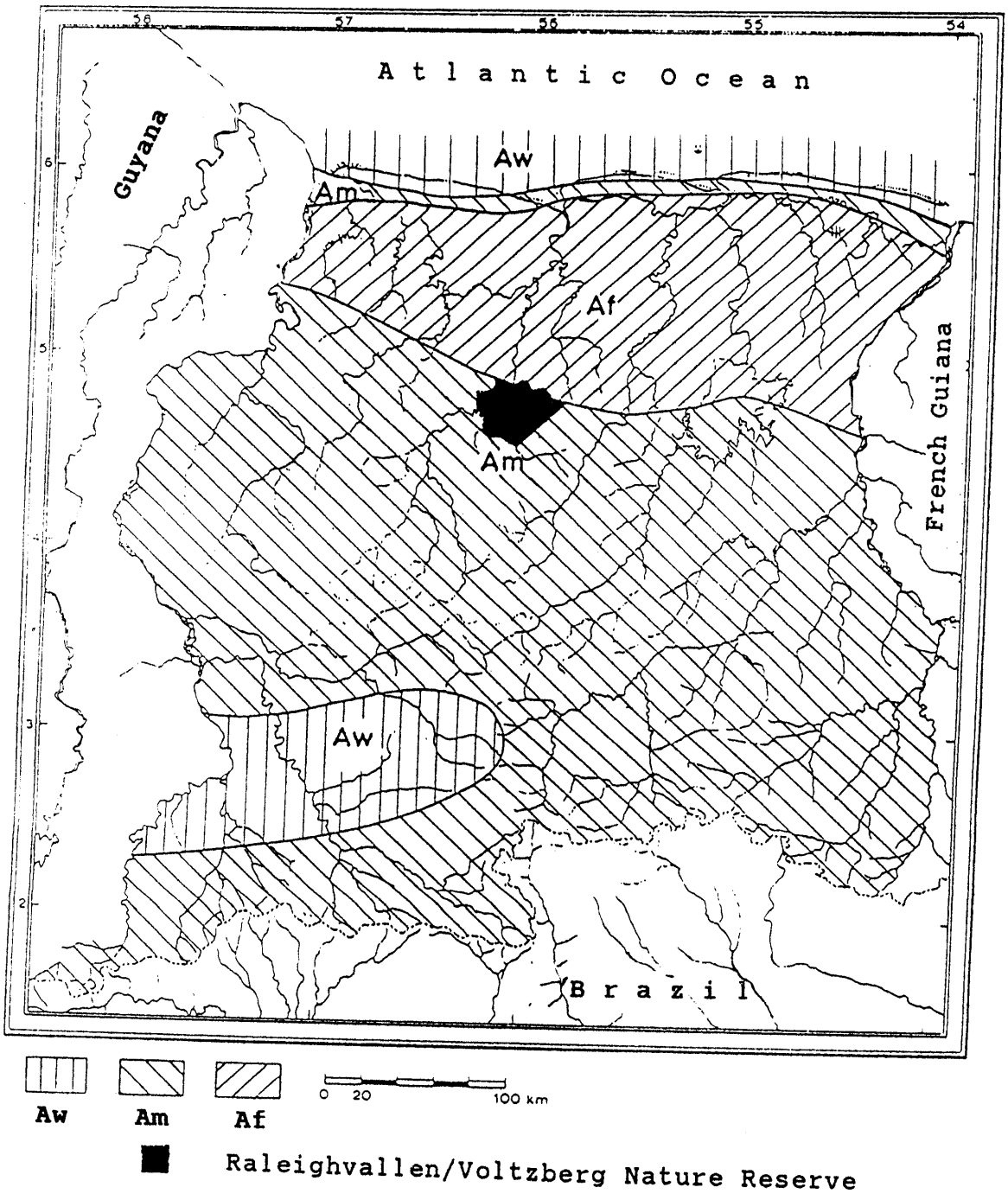


Figure 5 - Climate zones of Suriname
(source: Scherpenzeel, 1977)

Changes in the ITCZ movement are best measured by the amount of changes in precipitation. As such, the ITCZ is useful in characterizing the climate and for determining the seasons.

The year can be divided into two rainy and two dry periods. The seasons are not fully predictable, but they can be generalized as follows:

Long rainy season:	begin May to mid-August;
Long dry season:	mid-August to end November;
Short rainy season:	begin December to end January;
Short dry season:	begin February to end April.

Precipitation in Suriname is almost entirely in the form of rainshowers. The average, annual rainfall in Paramaribo fluctuates between 2,250 mm and 2,500 mm. In a narrow strip along the coast there is less rainfall (about 1,500 mm), but even in the driest month (October), there is usually still more than 60 mm. Figure 6 is a map of Suriname with the rainfall distribution for the period 1961-1970. Table 1 gives the average, monthly rainfall on Foengoe Island for the period 1971-1985. According to these (admittedly incomplete) data, the average annual precipitation on Foengoe Island is 2,141 mm.

In July and August there are occasionally some heavy thunderstorms. In the interior these are often accompanied by tornadoes (in Suriname called "sibibusi"), which can cause considerable damage to the forest by uprooting trees. Sibibusis can also occur during September through November (Anon., 1988a).

The average windforce in Suriname is 1.3 on the Beaufort Scale. In February and March there is a maximium windforce of 1.6, and a second maximum of 1.4 in September and October -- in other words during the dry seasons. A minimum windforce (of about 1.0) usually occurs in June. In the interior, the evenings are usually windstill (Anon., 1988a). General information on the climate in Suriname can be found in Scherpenzeel (1977).

1.3.3 Geology

Geologically, Suriname can be divided into the Coastal Plain and the socalled Shield Area of the interior. The Coastal Plain originated in the Quarternary (about 2.5 million years ago), and consists exclusively of sediments that were deposited along the north edge of the Shield Area (Leeflang et al, 1976). This Coastal Plain can be subdivided into an Old Plain and a Young Plain. The Old Plain, the Coropina Series, was formed as the result of glacial and interglacial changes in sea level. The Young Plain was formed during the Holocene (about 6,000 years ago) by the sedimentation of silt on top of the Old Plain.

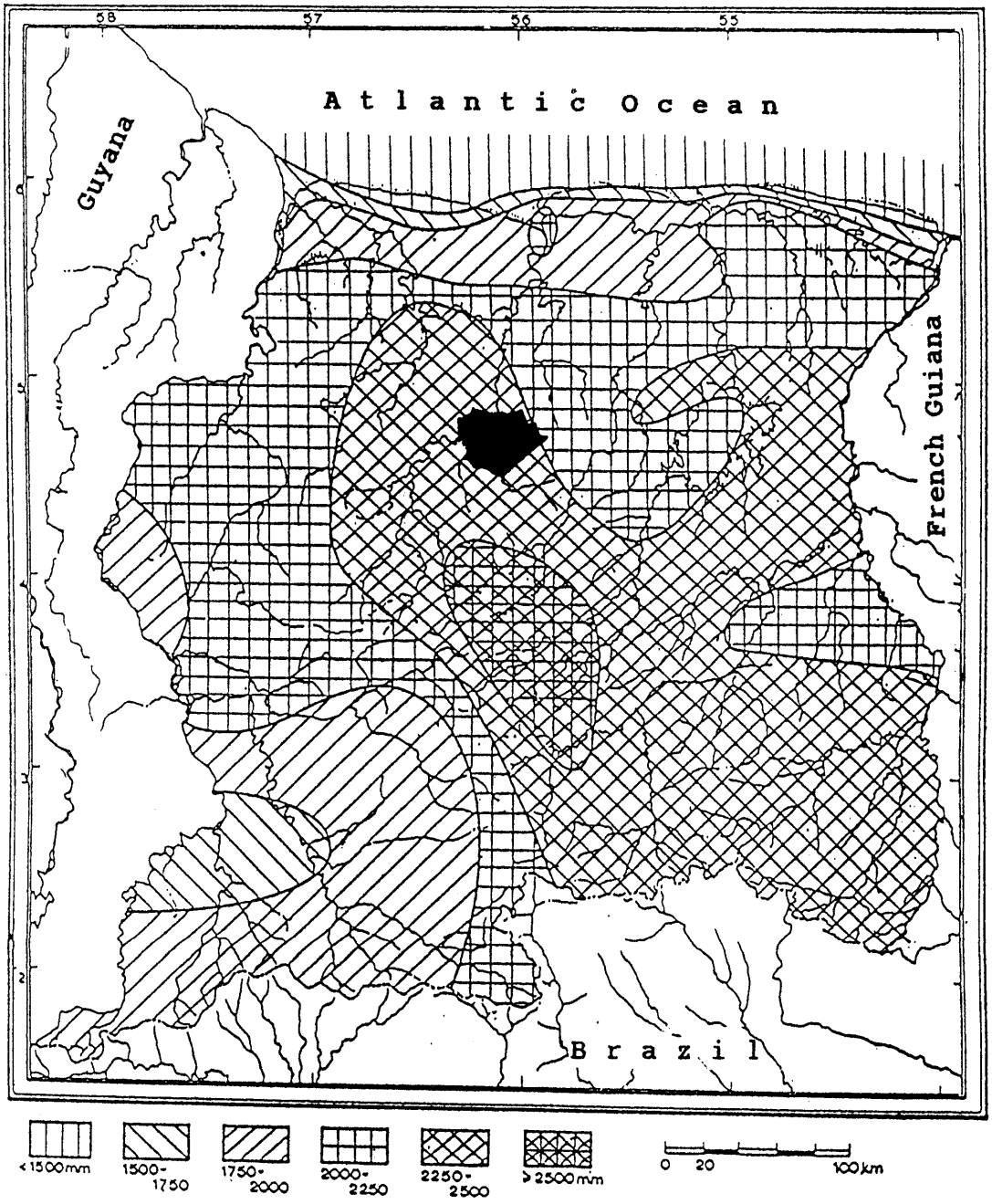


Figure 6 - Rainfall distribution pattern over Suriname for the period 1961 - 1970 (source: Scherpenzeel, 1977)

MONTHLY DATA: Rainfall (in mm)
STATION: Raleighvallen 419

JAAR	JAN	FEB	MRT	APR	MEI	JUN	JUL	AUG	SEP	OKT	NOV	DEC	JAAR
1971	353.5	237.1	219.1	-	-	-	-	176.1	55.0	69.5	44.4	97.5	-
1972	317.0	213.5	504.5	287.8	297.5	333.2	180.0	114.5	-	-	169.4	193.3	-
1973	98.8	71.9	160.5	291.3	371.4	303.5	224.5	133.1	213.5	106.5	139.3	181.0	2295.3
1974	232.2	140.8	80.7	78.2	118.2	390.3	246.8	163.5	89.8	115.8	88.0	206.8	1951.1
1975	229.6	70.5	219.9	-	-	-	-	-	84.2	31.9	52.5	-	-
1976	-	124.4	332.8	314.2	455.0	341.1	288.8	92.2	10.1	9.2	59.0	169.6	-
1977	92.9	232.0	190.7	146.4	207.3	145.7	235.9	199.1	97.6	83.3	94.0	161.5	1886.4
1978	156.0	103.1	187.3	A	398.3 S	312.9	205.6	238.3	11.9	62.3	96.4	-	-
1979	95.9	41.5	270.4	286.8	120.0	-	-	-	-	-	-	76.3	-
1980	78.7	30.1	216.3	406.5	485.9	317.6	198.7	52.9	5.8	19.6	99.1	136.0	2047.2
1981	56.8	220.0	92.6	422.4	632.5	450.9	374.4	56.2	65.2	60.8	94.1	121.0	2646.9
1982	114.4	150.8	268.3	330.6	224.1	225.9	166.5	53.8	17.4	60.1	36.8	152.8	1801.5
1983	107.8	95.5	289.3	258.9	313.5	139.8	122.8	115.9	36.0	46.0	47.5	208.7	1781.7
1984	264.2	298.4	99.1	101.0	418.6	517.8	263.4	90.0	173.9	160.0	186.1	156.0	2728.5
1985	88.5	78.0	-	-	210.5	326.3	122.3	164.6	30.3	-	-	-	-
19													
19													
19													
19													
19													

A = monthly total incorporated in the following month
S = in this total the monthly total(s) have been incorporated

Table 1 - Precipitation on Foengoe Island in the Raleighvallen/ Voltzberg Nature Reserve for the period 1971 - 1985 (data provided by the Meteorologival Service Suriname)

The Shield Area covers more than 80% of Surinam territory. It is part of the Guayana Shield, a two billion years old Precambrian, crystalline basal complex, which stretches over eastern Venezuela, Guyana, Suriname, and northern Brazil; it is generally enclosed by the Lower Amazon, the Rio Negro, the Orinoco and the Atlantic Ocean (Anon., 1988a).

The largest part of Suriname's interior originated during the socalled Trans-Amazonian orogeny (process of mountain formation) of that time and consists mostly of igneous and metamorphic rocks. Subsequent erosion has flattened the region considerably (Leeflang et al, 1976). From a geological viewpoint, the Guayana Shield is currently quite stable: there are no vulcanic activities or earthquakes.

The region in which the Raleighvallen/Voltzberg Nature Reserve is located is part of this Trans-Amazonian complex. Here are also some localized, metamorphized pelitic (clayey) sediments, such as phyllites and schists (Armina Formation) from the Trans-Amazonian greenstone belt called the Marowijne Group. In a few places the reserve is also being intersected from southwest to northeast by some dolerite dykes (Avanavero dolerite), formed about 1.6 billion years ago. These dolerites, which consist of dark, fine-grained igneous rock, are more resistant to weathering than the surrounding rocks and they stand out as mountain ridges above the land. The Van Asch Van Wijck Mountain is an example of this (Anon., 1988a).

The formation of inselbergs has been the result of two types of climates that occurred alternately during the Tertiary and the Pleistocene: a tropical moist climate, characterized by heavy rains the entire year, and a semi-arid climate with relatively rare, but torrential rainshowers. During tropical moist climates the highland forest weathered the granite substrate to a depth of several meters to a loamy grit. During semi-arid climates, the highland forest was replaced by savannas, and erosion transported the grit away. In places where this weathered layer was thin, the untouched granite substrate eventually appeared as inselbergs. Figure 7 is a series of simplified sketches explaining the process. After their formation, the inselbergs remained intact because even during the tropical moist climates the rains ran quickly off the steep slopes and did not have time to attack the granite chemically (Leeflang et al, 1976). Nowadays the weathering is primarily a physical process consisting of the peeling off of thin rock slabs (Leeflang et al, 1976). This is clearly visible on the Voltzberg. Figure 8 shows the origin and erosion process of inselbergs diagramatically.

A description from the previous century about the geology and soils in the rivers of Suriname, which include the Coppename River, is given by Martin (1881). Figure 9 is a simplified, geological map of Suriname.

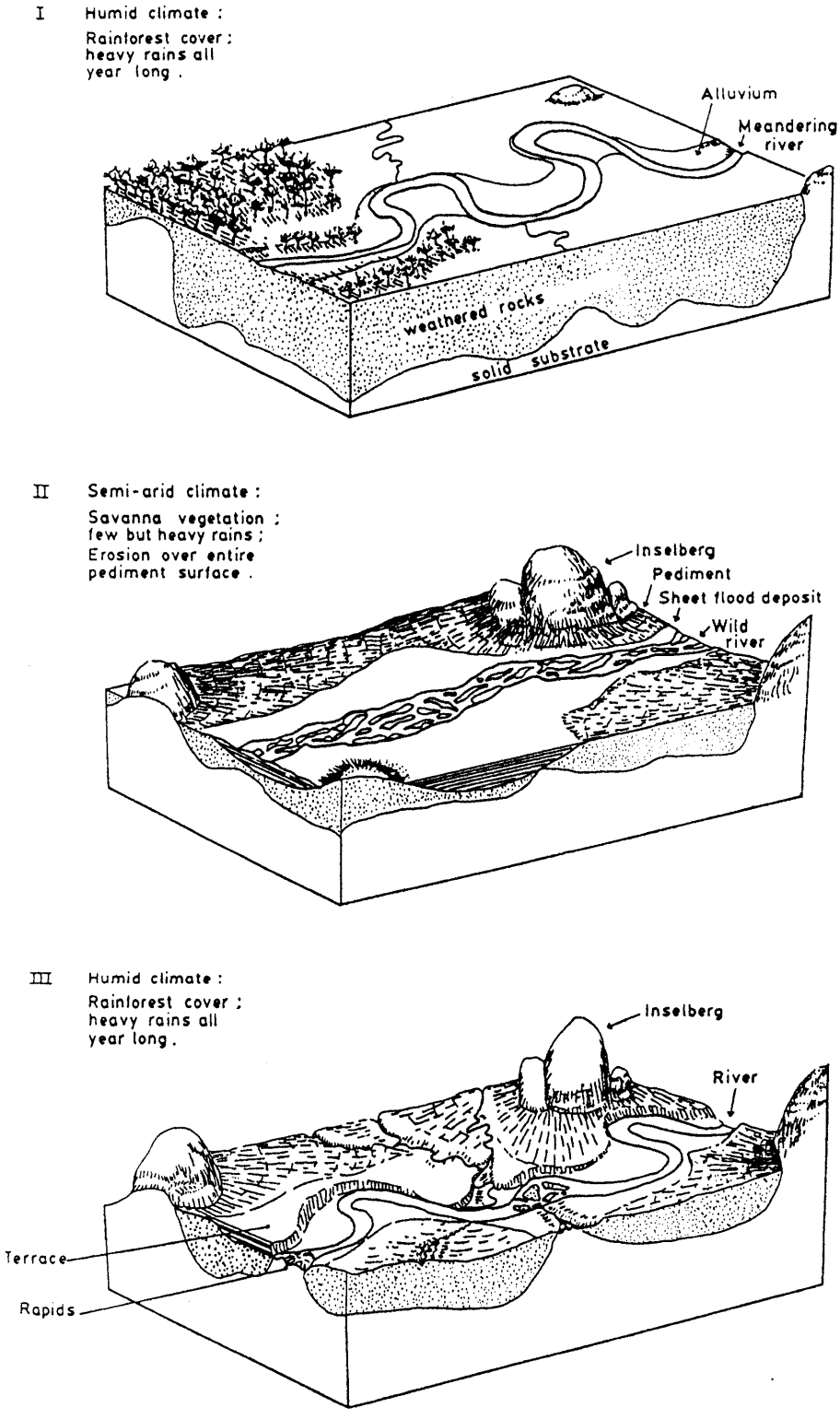


Figure 7 - The effect of changing climates on the landscape (modified from: Leeflang et al, 1976)

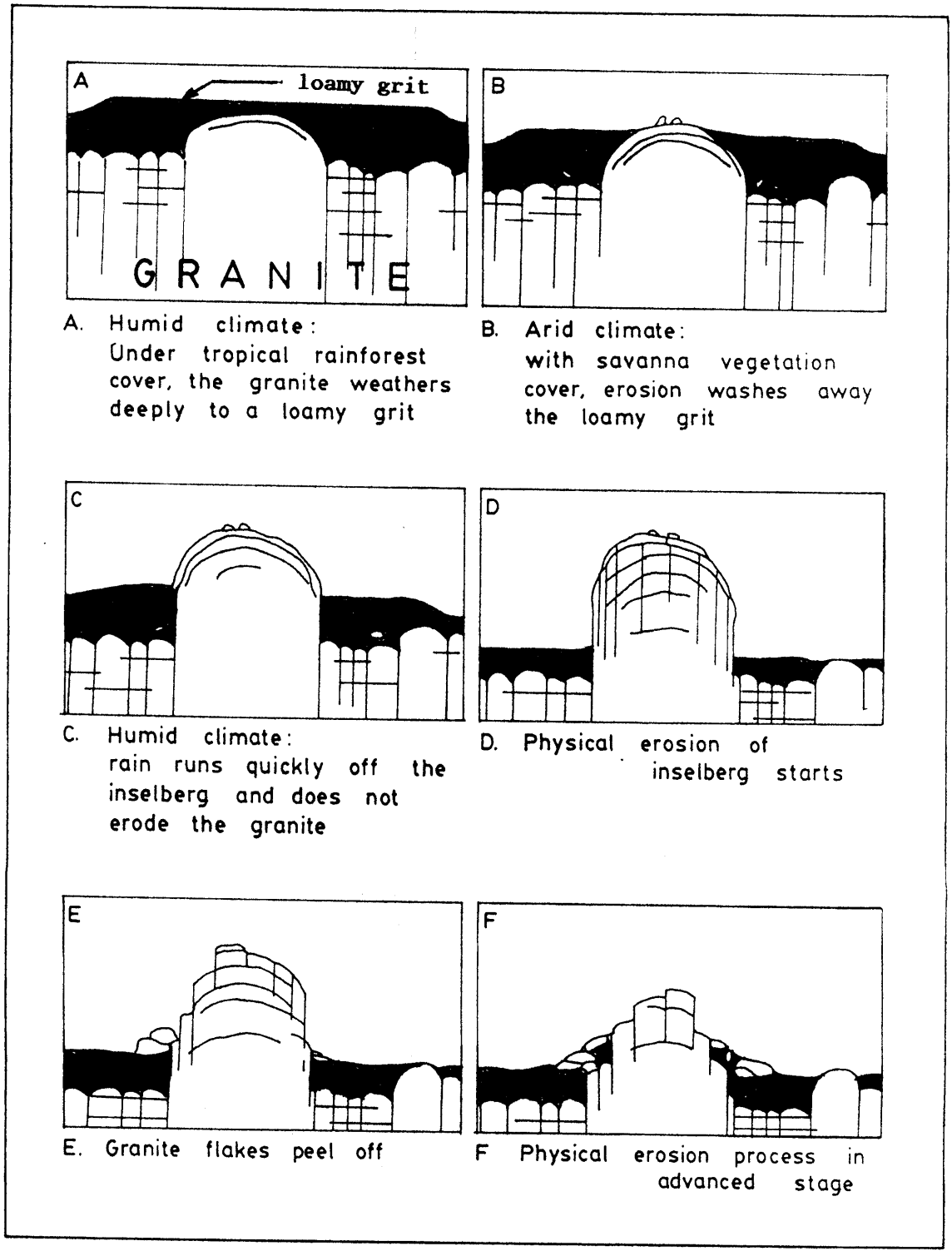
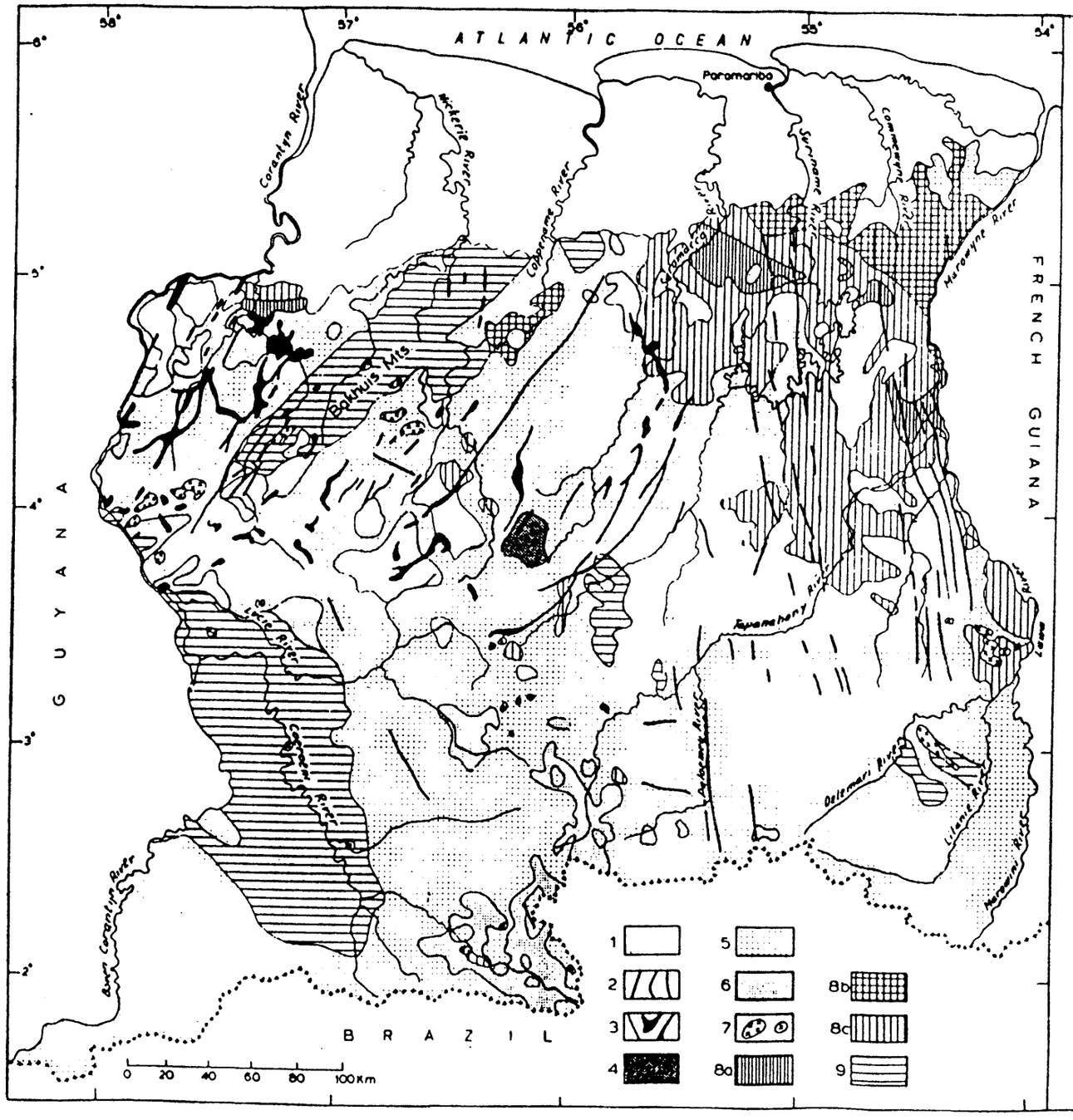


Figure 8 - The formation and erosion process of inselbergs (modified from: Leeflang et al, 1976)



Major stratigraphic units of Suriname.

1. CORANTIJN GROUP	Cretaceous to Recent	Paleocene tc Recent: unconsolidated sand and clays; Cretaceous: partly consolidated sands and clays; (unis 1-14)
2. APATOE DOLERITE	Permo - Triassic 230 ± 10 Ma K-Ar	Pigeonite dolerite dykes; strike mainly N-S (15)
Shearing and mylonitization of Nickerie Metamorphic Episode, about 1200 ± Ma		
3. AVANAVERO	Proterozoic 1638 ± 27 Ma Rb-Sr	Sills and dykes of hypersthene bearing pigeonite, gabbro and dolerite (18)
4. RORAIMA FORMATION DOLERTITE	1655 ± 18 Ma Rb-Sr	Subhorizontal quartzitic sandstones and conglomerates with local tuff intercalations (19)
ACIDIC PULTONIC-VOLCANIC MAGMATISM OF TRANS-AMAZONIAN OROGENIC CYCLE LOWER PROTEROZOIC		
5. GRANITOID ROCKS	1800-2000 Ma Rb - Sr	Biotite granites; in the Marowijne area tonalites and muscovite granites; pyroxene granites in Bakhuis Mts.; Leucogranites associated with Dalbana rhyolites (20-28)
6. DALBANA RHYOLITE	1800-2000 Ma Rb - Sr	Slightly metamorphosed rhyoliticdacitic lavas and tuffs including ashflow tuffs (29-30)
7. DE GOEJE GABRO	1818 ± 165 Ma Rb-Sr (Kabalebo area), 1845 ± 285 Ma Rb-Sr (Maskita area-Coppename)	Older gabbroic and ultrabasic intrusives (31)
SEDIMENTATION, FOLDING AND METAMORPHISM OF GEOSYNCLINAL STATE OF TRANS-AMAZONIAN OROGENIC CYCLE.		
8. MAROWIJNE GROUP	2020 ± 100 Ma 2000 ± 40 Ma	Geosynclinal metasediments and metavolcanics
a. Rosebel Formation Ston Formation	(Eastern Suriname) (Western Suriname)	Molasse type metasediments; quartztes, graywackes, subgraywackes and conglomerates mainly; greenschist facies (32)
b. Armina Formation		Flysch type metasediments mainly: schists and phyllites; greenschist and amphibolite facies (33-34)
c. Paramaka Formation Matapi Spilite	(Eastern Suriname) (Western Suriname)	Metavolcanics and metasediments: basic tuffs, rhyolites and dacites; schists, phyllites and quartzites; greenschist and amphibolite facies (35-43)
(Partly?) pre-trans-amazonian orogenic cycle: deposition of supracrstals, anatexis and metamorphism. The ages are again considered to reflect the main phase of metamorphism:		
9. COEROENI GROUP	2001 ± 97 Ma	Biotite gneisses, partly with sillimanite, hornblende gneisses and amphibolites; amphibolite facies (mostly) and granulite facies (43-46)
10. FALAWATRA GROUP	2026 ± 20 Ma	Charnockitic granulites in central Bakhuis Mts, sillimanite gneisses, pyroxene gneisses and biotite gneisses, amphibolites (47 and subordinate 46)

Figure 9 - Simplified geological map of Suriname (modified from: De Vletter, 1984)

1.3.4 Soils

The strong, chemical weathering over the ages has left the soils in the interior poor in nutrients. They consists mostly of quartz, ferrous oxides, aluminum oxides, and the clay mineral kaonite (Leeflang et al, 1976).

The soils in the Raleighvallen/Voltzberg region are generally the product of erosion on hilltops, plateaus, and slopes. They are generally mixed with (sandy) heavy loam and (sandy) clay, often gravelly. In many places they also contain stones at or near the surface (Anon., 1988a). Schulz (1960) gives a description and analysis of two soil profiles he made in the Voltzberg area.

Appendix F is a soils map of Northern Suriname, which includes the Raleighvallen/Voltzberg Nature Reserve.

1.4 Biological Features

1.4.1 Flora

Although the soils in the reserve are rather infertile, there is a luxurious vegetation. This apparent contradiction is mostly the result of the climate. The rainforest maintains itself by using its own waste products. There is only a limited amount of nutrients present in the dead plant material on the forest floor. This must be rapidly taken up in the nutrient cycle of the trees. Because of high temperature, high humidity, and high activity of organisms in the soil (such as worms, termites, and ants) dead plant material is broken down quickly. Consequently, there usually is little humus in the upper layer of the soil (Leeflang et al, 1976).

Lindeman and Mori (1989) classify the Surinam forest as seasonal evergreen forest. Within this general classification, however, several smaller forest categories can be recognized in the Raleighvallen/Voltzberg Nature Reserve. The following forest types can be found in the reserve (from an anonymous STINASU document):

Highland Forest

The vegetation of the Raleighvallen/Voltzberg Nature Reserve consists mostly of highland forest. This forest type is found on well-drained soils that do not periodically dry out: in other words, on the loamy-sandy soils of the Guayana Shield. This is the type of forest some 80% of Suriname is covered with. It is typified by the large variety of tree species, spread over some 4-5 storeys. The uppermost canopy is about 30 m high, with some emergent trees reaching 40-50 m. Occasionally a tree as tall as 60 m can be found.

The highest storey consists of large trees, such as the kankantri (Ceiba pentandra) and the ingipipa (Couratari spp.), which can attain a height of more than 40 m. The undergrowth consists mostly of palm species, such as paramacca (Astrocaryum paramacca), kumbumacca (Oenoecarpus bacaba), and maripa (Maximiliana maripa). Stilt roots are rare, but buttress roots are quite common.

The following forest types are found in relatively smaller areas within this highland forest:

Swamp Forest

This is a forest type that is inundated for most of the year. It is found on the lowest and wettest parts of river plains and in creek valleys. It has one or two storeys, with a height of 10-20 m.

Marsh Forest

This is a forest type that is periodically inundated. It can be found in river and creek valleys. It has two storeys: one between 15 and 25 m, and one between 5 and 15 m. The shrub layer is well developed and consists of, among others, palulu (Ravenala guianensis), and grasses.

Liane Forest

This forest type is characterized by the lack of storeys, and the presence of numerous, fallen trees. This forest is associated with shallow, rocky soils, and is found in some creek valleys.

Savanna Forest

This forest type is characterized by thin-trunked trees. It has one or two storeys. Its canopy height is about 10 to 20 m.

Mountain Savanna Forest

This forest type can be seen in the highest parts of the area. It consists of thin-trunked trees and an irregular tree canopy.

The vegetation of the inselbergs is unique, because it differs considerably from that of the surrounding forest. The inselbergs, and surrounding granite plateaus have a xerophytic vegetation, consisting mainly of plants in the families **BROMELIACEAE**, **POACEAE**, and **ORCHIDACEAE** (Lindeman and Mori, 1989). A number of very interesting epilytic (which means: growing on stones or rocks) orchids can be seen here. Descriptions of some of these can be found in Werkhoven (1986).

The composition of the highland forest in the area near the Voltzberg has been extensively described by Schulz (1960). The rather irregular forest canopy has a height of about 30 m, with Couratari species reaching to about 40 m. This highland forest has, especially in the lower storeys, a more open appearance than other forest types he studied. Schulz attributes this to the relatively low number in the small diameter class: about 500 trees per ha with a diameter of 5-25 cm, which is about half of the number which can be found in the other forest types he studied.

In addition, the bottom vegetation is very sparse, consisting here mostly of the fern Adiantum latifolium and the fern mosses Selaginella radiata and Selaginella epirrhizos. Schulz suspects that the lack of species at the lower levels and in the bottom vegetation can be attributed to the dominant presence of bugrumakka palms (Astrocaryum sciophylum), the leaves of which form a rather continous canopy at about 8 m height. Table 2 lists the composition of the trees in two sample plots of 0.3 ha each near the Voltzberg (Schulz, 1960). The table clearly shows the great diversity of tree species in a tropical forest.

Holthuyzen and de Jong (1977), Mittermeier (1977), and van Roosmalen (1985) each give a description of the vegetation in the Raleighvallen/Voltzberg Nature Reserve. Van Roosmalen (1979) also gives a detailed description of the fruits of the Surinam forest. The "bomenboek voor Suriname" (Lindeman and Mennega, 1963) is an excellent reference, including a dichotomous identification key and an analysis of wood anatomy, for a number of trees to be found in the Surinam rainforest. A popular STINASU publication "Fa joe kan tak' mi no moi" (Wessels Boer et al, 1976) describes some 200 indigenous plants of Suriname, many of which can be found in the reserve.

The substrate of the interior provides little in the way of nutrients that are necessary for plant life in the river. The river is poor in algae and other green plants, which are the basis of the foodweb in these communities. In spite of this, the vegetation of the Raleighvallen sula complex in the Coppename River is quite interesting. The characteristic plants that grow in the sulas are about five species of the family **PODOSTEMACEAE**. In Suriname, these are collectively called "kumarunyang" plants, indicating that they serve as food for the kumaru fish of the family **SERRASALMIDAE** (see section 1.4.2).

An item of interest is that the disease that broke out among the cultivated cacao trees (Theobroma cacao) around 1895, and which destroyed those coastal plantations, is supposed to have originated from wild cacao trees located along the Kwama Creek (STINASU doc.). The disease is caused by the fungus Colletotrichum luxificum which grows on wild cacao trees (Benjamins and Snelleman, 1981). Somehow this fungus was tranmitted to the cultivated trees, which had no resistance to it.

Scientific name	Local Name	Family	Sample Plot 1	Sample Plot 2
Upper and Middle Storey Species:			No. of Trees ≥ 25 cm dbh/ha	
Swartzia schomburgkii	blakabugubugu	Papil.	8	3
Pterocarpus rohrii	hoogland bébé	Pail.	4	6
Diplotropis purpurea	blakakabisi	Papil.	--	3
Couratari stellata	ingipipa	Lycyth.	8	3
Couratari pulchra	ingipipa	Lyceth.	8	+
Eschweilera corrugata	hl. umanbarkla	Lyceth.	16	6
Eschweilera longipes	hl. manbarklak	Lyceth.	+	+
Eschweilera poiteaui	titei-udu	Lyceth.	4	--
Inga alba	prokoni	Mimos.	4	13
Protium hostmannii	tingimoni	Burs.	+	10
Tetragastris altissima	redisali	Burs.	20	30
Licania soort	redikwepi	Chryso.	4	3
Couepia versicolor	anawra	Chryso.	8	6
Guarea soort	doifisiri	Mel.	24	--
7816	---------	Euph.	+	13
Conceveiba guianensis	---------	Euph.	+	3
Drypetes variabilis	---------	Euph.	+	3
Ecclinusa guianensis	batamballi	Sapot.	--	3
Bagassa tliaefolia	kaw-udu	Mor.	4	3
7848	---------	Mor.	+	6
Virola melinonii	hoogl. babun	Myrist.	+	6
Geissospermum sericeum	bergibita	Apoc.	4	--
Sterculia soort	okro-udu	Sterc.	4	6
Diospyros melinonii	blaka-uma	Eben.	4	+
7852	prasara-udu	Nyct.	4	+
Siparuna surinamensis	---------	Monim.	4	+
Lower Storey and Undergrowth Species:			No. of Trees ≥ 5 cm dbh/h	
Coussarea paniculata	busikofi	Rub.	20	10
Eugenia soort	busikersi	Myrt.	16	17
Bonafousia undulata	merkitiki	Apoc.	32	10
Talisia cf. hemidasya	mankrapa	Sapind.	--	23
Trichilia surinamensis	melisali	Mel.	8	23
Amphyrrhox surinamensis	---------	Viol.	4	13
Astrocaryum sciphilum	bugrumaka	Palm.	80	84
total no. trees ≥ 25 cm dbh.....			137	166
total no. trees ≥ 5 cm dbh.....			622	686
total no. trees of lower storey spp. ≥ 5 cm dbh			200	210

+ means: only individuals of < 25 cm dbh were observed.
dbh means: trunk diameter measured at breast height.

Table 2 -- Numbers of trees of selected species in two sample plots in a highland forest near the Voltzberg (modified from Schulz, 1960).

1.4.2 Fauna

Insects

A complete description of the insects occurring in the reserve is an impossible task. Data from researchers who have worked in the reserve give an indication of the diversity and richness of insect life. In a one-week study (8-15 February 1972), specimens belonging to the following insect orders were collected:

LEPIDOPTERA (butterflies, moths).....	244
COLEOPTERA (beetles).....	109
DIPTERA (flies).....	207
HYMENOPTERA (wasps, ants, bees).....	112
HEMIPTERA (leafcutters, scales).....	94
TOTAL.....	766

In addition, ten specimens of the class **ARACHNIDA** (scorpions, spiders, ticks, and mites) were caught (STINASU data).

This research showed that Foengoe Island was not particularly rich in insects, except with regard to the orders **DIPTERA** and **LEPIDOPTERA**; the latter especially with a number of moth families (**SATURNIDAE**, **CERATOCAMPIDAE**, **SPHINGIDAE**). In the forest on Foengoe Island, the most commonly occuring butterflies were those of the families **SATYRIDAE** and **ITHOMIIDAE**. On the other hand, the families **RIODINIDAE** en **LYCAENIDAE** were rare here. The forest and the vegetation of the plateau at the foot of the Voltzberg were very rich with butterflies, especially those of the family **SATYRIDAE**; the next most frequently seen family in this area was **NYMPHALIDAE** (including Aenea and Marpesia species). Butterflies of the families **RIODINIDAE** and **LYCAENIDAE** were seen the least here. For a general description and the taxonomy of butterflies see the illustrated publication by Smart (1977).

It must not be assumed that this is a typical representation of the insect fauna in the reserve and that these numbers can be seen all year long. Many insects depend on the flowering and the fruiting of plants; this is seasonal and insect presence, including their numbers, will therefore vary considerably during the year. A STINASU brochure, indicating the best seasons to see butterflies for instance, would be a useful publication for tourists.

Amphibians

The class **AMPHIBIA** is represented in Suriname by the order **ANURA** (frogs and toads). Only once has a salamander, Rhinatrema bivittatum, been found in Suriname, but that was in the Brownsberg Nature Park (Stumpel, 1976). It is likely that this salamander will eventually be found in the Raleighvallen/Voltzberg Nature Reserve also, but so far it has not yet been recorded there. The order **ANURA** is represented by 5 families in Suriname: **PIPIDAE**, **RANIDAE**, **BUFONIDAE**, **ATOLOPODIDAE**, and **HYLIDAE** (Hoogmoed, 1971). In general, frogs and toads are night animals, and are not easily observed.

Members of the genus dendrobates in the family **HYLIDAE** (tree frogs) are poisonous; they are recognized by their striking colors. These are considered to be a warning for potential predators. One species that is common in the reserve is Dendrobates trivittatus, which can be recognized by its black back with two green stripes. Its ventral side is also black but has some blue coloring in it. Another poisonous frog in this family is Phyllobates femoralis. This one is also black, but it has a red spot in the groins.

The poison secreted by frogs of this genus is used by indians to make arrow poison. The frog is killed by pushing a sharp stick through it, after which it is held over a fire. When, because of the heat, drops of liquid come to the surface of the skin, these are scraped off and put in a pot. After the liquid has fermented for awhile the arrowheads are dipped into it. When dry, the arrowheads are ready for use. The poison is a steroid-alkoloid which attacks the nerve and muscle activity with deadly results (Hoogmoed, 1971).

Although tree frogs are difficult to observe at night, they can usually be heard. A noisy one is Hyla boans, a tree frog with a length of about 15-20 cm. Another, but smaller one that croaks loudly at night is Hyla rubra. This tree frog is common and can also often be found in Paramaribo.

Goin (1971) describes twenty nine species of tree frogs from Suriname; many of these can be seen in the reserve. Hoogmoed (1971) gives some more details on the Dendrobates genus.

The largest toad that can be found in the reserve is Bufo marinus. A somewhat smaller species is Bufo guttatus. Another species that can be seen in the evening is Bufo granulosus, this is the only one of the three that can croak.

Appendix G includes some of the amphibians recorded for the reserve. The list is far from complete, and more will undoubtedly be found.

Reptiles

The class **REPTILIA** is represented in Suriname by two orders: **TESTUDINES** and **SQUAMATA**. The **TESTUDINES** (turtles) are represented in Suriname by two suborders: **CRYPTODIRA** (hidden-necked turtles), the most common turtles in the world today, and **PLEURODIRA** (side-necked turtles). Two species of tortoise (land turtles) can be seen in the reserve: the yellow-footed tortoise (Geochelone denticulata) and the red-footed tortoise (Geochelone carbonaria). Suriname has about ten species of freshwater turtles; some occur in the reserve, but at this time nothing definite is known about their presence. Pritchard (1979) and Ernst and Barbour (1989) give detailed descriptions on the turtles of the world, including taxonomic data.

The order **SQUAMATA** is represented in Suriname by three sub-orders: **SAURIA** (lizards), **AMPHISBAENIA** (legless lizards), and **SERPENTES** (snakes).

Lizards are the most commonly seen reptiles in the reserve. The families **GEKKONIDAE** (Geckos), **IGUANIDAE** (Iguanas), and **TEIIDAE** (Tejus) are well-represented. A number of the lizard species are diurnal and they are seen regularly in the reserve. The more recognizable species from the **TEIIDAE** family are Ameiva ameiva and Kentropix calcaratus. Ameiva ameiva is 10-15 cm long and has a cylindrical body. Depending on its age, the back of this lizard has a partially or completely grass green color. Kentropix calcaratus can be recognized by the yellow-green strip that runs from its snout to halfway down its back. Both species can often be seen in open places. Of the family **SCINCIDAE** only one species, the kamrawenke (Mabuya mabouya) occurs in Suriname. This lizard is shiny brown and has relatively short legs. This species can also be seen in open places in the forest.

Three species of legless lizards are known to occur in Suriname, Amphisbaena alba, Amphisbaena fuliginosa, and Amphisbaena vanzolinii. Of the last mentioned species it is not yet known if it occurs in the reserve. Hoogmoed (1968, 1973, 1975) gives a survey of the lizards and legless lizards to be found in Suriname; many of those mentioned can be seen in the reserve.

Snakes are widely feared by man, but are only occasionally seen in the reserve. Most snakes are not poisonous, but the few that are warrant caution when walking in the forest or on the trails. Moonen et al (1979) give an illustrated overview of the snakes in Suriname.

The anaconda (Eunectes murinus) lives in the water and along the banks of rivers and creeks. This snake kills its prey by means of suffocation, but it is not particularly dangerous for people.

Four poisonous species have been recorded for the reserve; they are: the bushmaster (Lachesis muta), the fer-de-lance (Bothrops atrox), the green tree viper (Bothrops bilineatus), and the coral snake (Micrurus psyches).

The bushmaster is the largest American poisonous snake, and can be recognized by the rough skin and diamond pattern on its back. This snake can reach a length of 3½ m. The fer-de-lance is the most common poisonous snake of Suriname and can grow to a length of about one meter. Its general color is brownish, and the animal blends in quite well with the fallen leaves that lie all over the forest floor, making it difficult to spot. Although often confused with each other, the poisonous green tree viper can be easily distinguished from the harmless emerald boa (Corallus caninus). The emerald boa is green with white spots or crosses on its back, whereas the green tree viper is completely green with a white tail tip.

The false coral snake (Erythrolamprus aesculapii) can also be found in the reserve, but is non-poisonous. Although often mistaken for poisonous true coral snakes, the various species can easily be distinguished from each other. False coral snakes have a single white ring inside the black bands, but the look-alike, true coral snakes have two white or yellow rings inside their black bands. The tip of the nose of the false coral snake is orange but in the true coral snake it is black.

There is no comprehensive checklist for the reptiles of the Raleighvallen/Voltzberg Nature Reserve, but Appendix G is a list of some of the reptiles that have been recorded there. Much work needs to be done to expand the herpetological checklist.

Birds

The Raleighvallen/Voltzberg Nature Reserve has a very rich avifauna, and is a birdwatcher's paradise. Close to 400 different species have already been recorded. Many of the smaller birds have protective coloration and live in the often dense undergrowth and are therefore not easily noticed. With the help of birdwatchers and visiting researchers, new species will undoubtedly be added to the checklist in the near future.

The tropical forest can be partitioned ecologically into several horizontal layers. Although there is considerable overlap, many birds have a preferential habitat where they can be seen more often than elsewhere. Knowledge of feeding ecology and reproductive behavior makes birdwatching a more rewarding experience. Some birds can be identified by their song alone, but it takes quite a bit of expertise to distinguish these bird songs from the sounds of other animals, especially those of insects and frogs.

A number of species live in the canopy. Although up high, they can still be seen or heard. The most famous inhabitants of the canopy are the members of the macaw family (**PSITTACIDAE**). They are easily located by their piercing, raucous cries. Scarlet macaws (Ara macao) are the most common macaws of the Surinam interior; they live in groups and are frequently seen in the reserve. The red-and-green macaw (Ara chloroptera) is also common and is usually seen in pairs. Blue-and-yellow macaws (Ara ararauna) feed in relatively large groups. They used to be abundant but, because of excess hunting pressure in all of northern Suriname, their numbers have dwindled to the point where they are no longer so common.

Parrots and parakeets are often noisy when flying through the canopy, and are then easily located. The ones most frequently seen are golden-winged parakeets (Brotogeris chrysopterus) and blue-headed parrots (Pionus menstruus). Both species live in flocks. The red fan parrot (Deroptyus accipitrinus) is seen more in pairs, or at most in small groups.

The fruit-eating toucans (family **RAMPHASTIDAE**) are other birds inhabiting the forest canopy. Seven species live in Suriname, but only two are commonly seen in the reserve. The white-throated toucan (Ramphostos tucanus) is Suriname's largest toucan; it is readily recognized by the dark bill and white throat section. The Guianan toucanet (Selenidera culik) is much smaller and moves about in small groups. The bill of a toucan looks like a formidable weapon but, in fact, the bird cannot exert enough force to crack the hard shells of the nuts that parrots and macaws feed on.

Birds of the family **COTINGIDAE** also live in the canopy. They feed mostly on fruits. A wellknown member of this group is the bellbird (Procnia alba). Although visually not so distinctive, its gong-like song is often heard in the reserve. Another one is the Capuchinbird (Periscephalus tricolor). This large bird lives in small groups in the treetops and feeds there on insects and fruits. Its song is a peculiar, drawn-out note that sounds like the mooing of a cow. Probably the best known member of the **COTINGIDAE** family is the screaming piha (Lipaugus vociferans). This about dove-sized, non-descript bird inhabits the middle storey of the forest, but its loud "peeepee-yo" call is the most typical sound one hears in the neotropical rainforest.

A woodpecker (family **PICIDAE**) is usually heard before it is seen. The sound of its bill hammering on a tree trunk in search of insects can be heard for some distance in the forest. Several species have been recorded in the reserve, the most common one being the rednecked woodpecker (Campephilus rubricollis). This bird can be recognized by its black-to-brown back and wings. The head of the male is red, and the female can be distinguished by its white cheeks. They live in pairs high up in the trees. The golden-green woodpecker (Piculus capistratus) is another common sight in the reserve. Its noisy behavior belies its small size. O'Brien (1977) studied some of the woodpeckers in the reserve, and shed more light on their behavior.

On Foengoe Island, or from the top of the Voltzberg, several raptors can usually be seen flying or hovering over the treetops of the forest. Of the family **ACCIPITRIDAE**, the swallow-tailed kite (Elanoides forficatus) is a common sight. This bird can easily be recognized by its pointed wings and deeply forked tail. The black-and-white hawk-eagle (Spizastur melanoleucus) of the same family is also present in the reserve, but in fewer numbers. Of the family **FALCONIDAE**, the noisy, red-throated caracara (Daptrius americanus) is probably the most frequently seen (or heard) bird of prey in the reserve.

Yellow-headed vultures are commonly seen scavenger birds in the reserve. The lesser yellow-headed vulture (Cathartes burrovianus) is the most abundant vulture of the interior, but in the air it cannot be distinguished from the greater yellow-headed vulture (Cathartes melambrotus).

The undergrowth is the habitat of birds belonging to a number of families. Some of the more numerous ones are antbirds (family **FORMICARIIDAE**). Already more than 40 species have been recorded for the reserve. These small songbirds feed on the insects that are being stirred up by trekking ant colonies. Other bird species living in the undergrowth are tanagers (family **THRAUPIDAE**), thrushes (family **TURDIDAE**), flycatchers (family **TYRANNIDAE**), and wrens (family **TROGLODYTIDAE**).

Some of the larger groundbirds to be seen in the undergrowth of the reserve are members of the famly **TINAMIDAE**. A common one is the variegated tinamou (Crypturellus variegatus), but the largest one is the great tinamou (Tinamus major). Both make a sound much like that of a bumblebee flying close by. Like all tinamous, they are more often heard than seen, but at times they are surprised on trails or when they cross open areas. Two other large birds living in the undergrowth are the black currasow (Crax alector), family **CRACIDAE**, and the grey-winged trumpeter (Psophia crepitans), family **PSOPHIIDAE**. All four species just mentioned are gamebirds in Suriname and are subjected to hunting pressure. Held (1984), in a comprehensive study of these birds in the Brownsberg Nature Park, gives a detailed description of their ecology and behavior. These data are most likely also valid for the Raleighvallen/Voltzberg Nature Reserve.

When walking the plateau near the Voltzberg at dusk, a hiker sometimes flushes a nighthawk of the family **CAPRIMULGIDAE** sitting in a depression on the granite surface. The colors of these birds are such that they blend in with the granite substrate and they very often remain seated until almost stepped on. Nighthawks are insectivores and many lay their eggs in shallow depressions on the ground. A study, done on the plateau near the Voltzberg by Ingels et al (1984), describes the interesting nesting behavior of the blackish nightjar (Caprimulgus nigriscens), one of the species in this family.

The Raleighvallen/Voltzberg Nature Reserve has many other bird species at intermediate tree levels: trogons (family **TROGONIDAE**), jacamars (family **GALBULIDAE**), hummingbirds (**TROCHILIDAE**), and finches (**FRINGILLIDAE**). Trogons and jacamars, with their bright metallic colors, are some of the more spectacularly colored birds to be seen in the tropical forests.

Probably the most spectacular bird to be seen in the reserve is the cock-of-the-rock (Rupicola rupicola). The rocky landscape, with its forest of stunted trees surrounding the Voltzberg, is the typical habitat for this bird. Considered rare and endangered over its entire South American range, this species is doing well in Suriname. There are several mating arenas (leks) in the immediate Voltzberg area, and it is not uncommon to see 30-40 males going through their ritualistic mating behavior. It is a major attraction for international nature tourism that has not yet been adequately capitalized on.

Several excellent bird studies have been conducted in the Raleighvallen/Voltzberg Nature Reserve, with the ones by Trail (1983, 1984, 1985) on the behavior of the cock-of-the-rock being the best known. The book "Birds of Surinam", by Haverschmidt (1968), is the best publication available for a review of all the birds that can be seen in Suriname.

Appendix H is a compendium of bird species that have been positively identified in the Raleighvallen/Voltzberg Nature Reserve by ornithologists, expert birdwatchers, and researchers. Their original checklists are on file at the LBB/NB and STINASU offices in Paramaribo. The checklist in Appendix H must not be considered as a complete list of all the bird species present in the reserve. As more birdwatchers visit the area, more species will undoubtedly be discovered.

Mammals

Mammal presence and distribution in the forest depends to a great extent on vegetation structure and species composition. Many fruit-eating mammals, such as monkeys, rodents, and bats, depend on the periodic blooming and fruiting cycles of trees and shrubs. Knowledge of these seasons will add to the chances of seeing such animals. Contrary to expectations of some visitors to the tropical rainforest, terrestrial mammals are not often seen during casual walks through the reserve.

The most visible mammals in the reserve are the monkeys (order **PRIMATES**). All eight primate species, seven in the family **CEBIDAE** and one in the family **CALLITRICHIDAE**, occurring in Suriname can be seen (and heard) in the reserve.

Red howler monkeys (Alouatta seniculus) are the largest of the New World monkeys. Adult males weigh about 10 kg, and females 6 kg. The red howler monkey (called "babun" in Suriname) is a common sight in the reserve. Its fur color varies from yellowish-brown to red brown. The deep-throated roaring of the males comes from the enlarged larynx, which functions as a soundbox and their communal roaring is a typical sound of the neotropical rainforest. They live in family groups of 2-8 animals, and they are mostly leafeaters.

The black spider monkey (Ateles paniscus) can be recognized by its large size, its reddish, fleshy face, and its long arms. This monkey (called "kwata" in Suriname) weighs about 7-9 kg. Its pelage is mostly black. When disturbed by people, black spider monkeys often throw branches or faeces at their beleaguerers. These monkeys are no longer a common sight in Suriname, which is probably due to hunting pressure. They feed primarily on ripe fruits but, like all monkeys, they are opportunistic eaters, feeding also on nuts, insects and small lizards. They are known to raid birdnests for the eggs and hatchlings.

Squirrel monkeys (Saimiri sciurius) are a common sight in the reserve. The squirrel monkey (called "monkimonki" in Suriname) weighs up to 1 kg. The fur of these monkeys has no specific, single distinguishing color, but the animals can easily be recognized by the creamy-white color of the face, and the black area around mouth and nose. These monkeys travel in groups of up to 50 individuals, and they feed on fruits and insects.

The brown capuchin (Cebus apella) occurs also in the reserve. It weighs between 3-5 kg. The color of the fur ranges through the greyish-browns. The brown capuchin (called "keskesi" in Suriname) has tufts of hair, which look like small horns, along the sides of the top of its head. These monkeys live in groups of 10-25 animals, feeding on fruits, flowers, seeds, leaves, and insects and small vertebrates. Especially this primate is known for raiding birdnests for eggs and hatchlings.

The weeper capuchin (Cebus nigrivittatus) looks very much like the brown capuchin, except that the weeper capuchin (in Suriname called "bergikeskesi") has no tufts of hair on its head. The weeper capuchin lives in the forest in the more mountainous areas. It may be the rarest and least known of the Surinam monkeys.

The pale-headed saki (Pithecia pithecia) is relatively rare in the reserve. Adults can weight 1.5-2.5 kg. The body is generally black, but the males and females can easily be separated from each other: the male has a striking white face, whereas the female only has a pale stripe on the side of each nostril. The pale-headed saki (in Suriname called "wanaku") travels in groups of 2-5 animals and are difficult to see because they move about quietly. Their diet consists of leaves, flowers, berries, mice, bats, and small birds.

Little is known about the black saki (Chiropotes satanas). This monkey (in Suriname called "bisa") weighs about 3 kg, and it lives mainly in the high forest. These animals travel in groups of 8-30 animals. The body is generally black. The face is bearded, and the tail is heavily furred. Black sakis are not often seen in the reserve anymore; they are probably becoming endangered. Their food consists of fruit, flowers, and unripe seeds.

Red-handed tamarins (Saguinus midas) are the only species of the **CALLITHRICIDAE** family occurring in Suriname. The red-handed tamarin (in Suriname called "saguwenke") is the smallest monkey in Suriname, with adults weighing from 0.7 to 1.0 kg. The color of its fur is brownish, and the hands are colored noticeably orange or red. These monkeys move about in groups of 5-15 individuals, feeding on fruits and insects.

Several extensive studies have been done on monkeys in the Raleighvallen/Voltzberg Nature Reserve. For more details on this, and general information on these Surinam primates, see Mittermeier (1977), Husson (1978), Mittermeier and Fleagle (1980) Fleagle and Mittermeier (1981), Mittermeier and van Roosmalen (1981), van Roosmalen (1981, 1985), Baal et al (1988).

Bats (order **CHIROPTERA**) are well represented in the reserve. It is difficult to identify the various species in flight and, for definite taxonomic identification, they will have to be captured. Although several studies on bats have been made in Suriname, few were done in the Raleighvallen/Voltzberg Nature Reserve. Husson (1962) gives a thorough review of the bats in Suriname, and a good number are mentioned in his checklist (Husson, 1973). It must not be assumed, though, that these all occur in the reserve. Bats are known to play an important role in the maintenance of tropical forest ecosystems, and it would be useful to conduct research in the reserve to establish species composition, and to find out what their specific niches are. Through the distribution of brochures, STINASU and LBB should publicize the fact that bats are very useful animals, and that the cultivated fear of people for these mammals is largely misplaced.

Of the order **EDENTATA**, three species of the **MYRMECOPHAGIDAE** family have been seen in the reserve: the lesser anteater (Tamandua longicauda), the pygmy anteater (Cyclopes didactylus), and the giant anteater (Myrmecophaga tridactyla). These sightings still need confirmation by experts.

Sloths (family **BRADYPODIDAE**) are represented in the reserve by the two-toed sloth (Choloepus didactylus) and the three-toed sloth (Bradypus tridactylus). Both species have three toes on their hind limbs, but the two-toed sloth has only two on the forelimbs.

Five species of armadillos (family **DASYPODIDAE**) occur in Suriname, and they are well represented in the reserve. It is not known, however, if all five species are present in the reserve. They are mostly nocturnal and therefore not easily seen, but fresh burrows are an indication of their presence.

The larger mammals of the tropical rainforest are rarely seen, but they are nevertheless there. The jaguar (Panthera onca), is the largest carnivore in the reserve and preys mostly on the larger herbivores. The slightly smaller puma (Felis concolor) is less common, but has been seen there. There are also a number of small carnivores in the reserve, some of the better known ones are: tayra (Eira barbara); margay (Leopardus weidii); ocelot (Leopardus pardalis); jaguarundi (Herpailurus yagouaroundi).

Some of the larger herbivores living in the reserve are: tapir (Tapirus terrestris); large red brocket deer (Mazama americana); brown brocket deer (Mazama gouazoubira); white-lipped peccary (Dycoteles pecari); collared peccary (Tayassu tajacu); capybara (Hydrochoerus hydrochaeris).

The giant otter (Pteronura brasiliensis), generally considered endangered throughout its South American range, can be found in the creeks of the Coppename River watershed. Duplaix (1980a, 1980b) has studied the species in Suriname, and observed viable populations in the Tanjimama Creek.

Appendix J is a list of mammals known to occur or expected to be found in the Raleighvallen/Voltzberg Nature Reserve; local names are included. Little is known about the mammals in the reserve, and the list should by no means be considered as being complete. For a treatise on the mammals of Suriname, see Husson (1962, 1973, 1978).

Fish

The Coppename River and its tributaries are rich in fish, but few studies are known regarding species composition. A number of them live off the aquatic vegetation. For instance, the kumaru (Acnodon obligocanthus) is a fish living near the rapids, where it feeds on the kumarunyang plant (see section 1.4.1). The color of this fish is darkgreen with some orange and silver markings. It can grow to a length of about 60 cm. The algae on the rocks in the rapids are grazed by several species of armored catfish, of which the kwana (Leporinus fasciatus) and the waraku (Leporinus frederici) are best known. Other fish living in the rapids are Hypostomus species, such as de kakaaku (Plecostomus emarginatus) and the warawara (plecostomus plecostomus). The mouth of these fish is located on the ventral side of the body which makes grazing with their thickened lips easier. The mouth also serves as a suction cup to keep the fish from being dragged away in the swirling water.

The kumaru, the kwana, and some other fish eat the flowers, fruits, and seeds that fall from the overhanging trees into the water. The kumaru prefers kupawa, the fruit of the upru-udu tree (Copaifera guianensis); the alampia (Chalceus macrolepidotus) prefers the flowers and fruits of the watra-kwari tree (Vochysia tetraphylla), although they also eat the fruits of the tapuripa tree (Genipa americana), kumbu tree (Oenocarpus bacaba), and mopé tree (Spondias mombin). The pakusi (Paramylopus ternetzi), which looks like a silver-white piranha, eats the above-mentioned fruits also. The moroko (Brycon falcatus) prefers seeds of the krapa tree (Carapa guianensis), and the kwana also likes the fruits of the awara palm (Astrocaryum vulgare). Indigenous people use this knowledge for catching them. In addition to these fish, there are numerous others living near the rapids, feeding on aquatic insects or on terrestrial and arboreal insects that fall into the water.

There are several predatory fish. Of these, the anyumara (Hoplias macropthalmus) is probably the best known one, sometimes attaining a weight of 15 kg and a length of 1 m. The anyumara is not only a source of food, but also a much sought-after game fish.

The most feared fish are piranhas (Serrasalmus species), and electric eels (Electrophorus electricus). There are at least four species of piranhas in the river, but they are not aggressive; one can safely swim or bathe. Only when water in the smaller creeks is low, and food is scarce, is caution required. Electric eels live in pools near the rapids and, in order to avoid possible shocks, it is better not to swim too close near the rapids.

The aquatic ecosystem of the Coppename River and its creeks is an important, but largely ignored part of the reserve. As shown above, this system is biologically rich and the interrelationship with components of the surrounding ecosystems is essential for maintaining the health of the entire region. So far, few studies (if any) have been conducted to get a better understanding of the role the river plays in the functioning of local ecosystems. It is recommended that the study of aquatic ecosystems in the Raleighvallen/Voltzberg Nature Reserve be actively promoted.

Appendix K is a list of the fish that have been observed in the reserve. The list is by no means complete. Heyde (1986) gives simple descriptions for many of the fish living in Surinam waters.

1.5 Human Population and Resource Use

Little is known about historical, human habitation of the Raleighvallen area. In fact, little is known about human habitation in the entire area between the Amazon and the Orinoco Rivers.

On the Padron Real (the official Spanish map) of 1536 the names: Rio Baxo, Rio Salado, Rio Verde, and Rio del Placel appear. According to de Goeje (1934), these were the Spanish names for what are now Marowijne River, Suriname River, Coppename River, and Corantijn River. Around 1595, the Englishman, Walther Raleigh, sailed along the socalled "Wild Coast" in search of "El Dorado", the land where gold could be found. In a report by Lawrence Keymis, a travel companion of Raleigh, English names are given for some of the rivers in the area that is now Suriname: Curitini, Marawini, Shuriname, and Cupanama (Wekker, 1983). According to Wekker, the names that Keymis used are of Arowak origin, because the suffix "nama" or "namo" is Arowak for "mouth" or "Bay", and the suffix "(w)ini" is Arowak for "flowing water" (STINASU data). The name "Northumbra", that Keymis originally had given for the Coppename River, had already disappeared from all maps by the end of the eighteenth century (de Goeje, 1934). On a map by Hondius, dated 1599, the name "Copanamo" appeared for what is now Coppename. On a map made around 1710-1726 by the Dutch cartographer Gerard van Keulen, some of the rivers are named as: Courantin, Suriname, Saramacca, Commewini, and Cupanama (Wekker, 1983). These were the names of the rivers that are now called: Corantijn River, Suriname River, Saramacca River, Commewijne River, and Coppename River.

Until the beginning of the 20th century, the Coppename River, upstream from the Raleighvallen rapids complex, had not yet been visited by Europeans. Even the well-known cartographer, Cato van Rosevelt, who traveled on all the rivers in the coastal area of Suriname, did not go beyond the rapids. He, however, is the one who introduced the name Raleighvallen (STINASU data) to honor the 17th century English explorer, Sir Walther Raleigh. The German geologist Voltz is the first European researcher who makes mention of the Voltzberg. In 1855, he traveled up the Coppename River as far as the Raleighvallen, but it is not known if he went to the (then nameless) inselberg.

Martin (1881) also went to the Raleighvallen and gave the bare dome he saw some kilometers to the east the name Voltzberg, to honor Voltz. Martin, however, did not go to the Voltzberg. Martin (1927) subsequently wrote (as translated from Dutch): "Above the Raleigh-vallen rises a for Suriname rather substantial mountain, which on my map (with qualification) should be considered a cretacious formation." He then writes that Voltz was the first European who has seen the mountain. Therefore, (translated): "in memory of this diligent and unfortunate pioneer of the scientific research in Suriname" Martin gave it Voltz's name. The first mention of the name "Voltzberg", however, is on a map by Bakhuis (Wekker, pers. comm.).

The first expedition to explore the area was not undertaken until 1901 (the socalled Coppename Expedition). This expedition started to do its surveying near Raleighvallen, specifically at the Voltzberg. The reason to use the Voltzberg as a starting point was that the bare granite dome enabled researchers to use a theodolite, with which an accurate topographic map of the entire region could be made (Bakhuis, 1902).

From the top of the Voltzberg, the Van Stockumberg and the Hendriktop of the Emma Range were measured (Van Stockum was a member of the Coppename Expedition which was led by Bakhuis). The Van der Wijcktop was named after the then chairman of the Joint Commission of the Royal Netherlands Geographic Society (K.N.A.G.) and the Union for Suriname (Vereniging voor Suriname). The result of the mountain triangulation during this first expedition was: establishment of the location, and description of the scenery of: Voltzberg, Van Stockumberg, Jan Basi Gado, Hendriktop, Van der Wijcktop, Hebiweri and Krutu (Wekker, 1983). The distance between the Voltzberg and the Van Stockumberg was determined to be about 4.8 km. From the top of the Voltzberg the highest mountain range in Suriname (the Wilhelmina Mountains) was discovered at that time (de Goeje, 1934). Bakhuis (1902) wrote an extensive report about this first expedition to Raleighvallen, and gives a good description of the plateaus and vegetation near the Voltzberg at that time.

1.5.1 Human Population

There are some indications that during pre-Columbian times people were living in the Raleighvallen/Voltzberg region, and that they used the Coppename River for traveling back and forth between the interior and the coast. Archaeological material found near the Raleighvallen and near the junction of the Linker-Coppename River and the Rechter-Coppename River showed that around 1400 ancestors of the current Carib indians lived there. These indians dwelled in small, temporary villages along the rivers and creeks; they lived mostly from hunting and fishing, but also practiced a primitive form of slash-and-burn agriculture, for which they needed stone axes. The importance stone axes had for these communities is apparent from the numerous axe-sharpening grinding grooves that can be found on many rocks in the Raleighvallen sulas. In addition, old shards and primitive utensils are sometimes found here and there.

In a small creek near the Voltzberg, petroglyphs have even been found (Schulz, pers. comm.). There are no indications, however, that during colonial times indian had permanent settlements in the area.

The only people now living in the region are members of the Kwinti bushnegro tribe, which settled along the Coppename River during the 17th Century. Bushnegroes living in the interior of Suriname are descendants of escaped slaves. Of the six bushnegro tribes in Suriname, the Kwinti are the smallest and least known. Figure 10 is a map showing the location of indian and bushnegro tribal settlements in the interior of Suriname.

Van der Elst (1975a) tells of three legends about the origin of the Kwinti as told to him by the villagers. Although considered somewhat contradictory, they are as follows:

-- The first one is that their ancestors fled from Berbice (a colony that is now Guyana) to the Corantijn River, and then by way of the Nickerie River traveled to the Coppename River.

-- The second one is that their ancestors fled westwards from Paramaribo. With rafts they crossed rivers and creeks. They eventually arrived in the forest east of the Saramacca River. When a quarrel broke out in their village, they split up: the Paramacca went east, the Dudo Lo (Lo means family group) went back to its owner, and the Kwinti went west, where they joined up with the Matuari (also called Matawai), who lived along the Saramacca River.

-- The third legend is that some Kwinti believe that the leader of their ancestral group was a certain Koffie, older brother of Bonni, the founder of the Boni (Aluku) tribe. Koffie and his group convinced Bonni to run away. Bonni fled by way of the Ndjuka territory to French Guiana. Koffie and his people fled westward and became the Kwinti.

Sometime during the second half of the 19th Century, after the Kwinti had joined the Matuari, friction came between the two tribes. The Matuari exposed the Kwinti to their own version of Christianity and subsequently accused them of witchcraft. The Kwinti were considered second-class citizens. As a solution to the problem, the then Governor of Suriname, Tonckers, gave the legendary Kwinti village chief, Alamu, the right to settle on the Coppename River, although he had to remain under the jurisdiction of the Matuari Granman (granman means supreme chief). To the dismay of the Kwinti, this authority of the Matuari over the Kwinti still exists (van der Elst, 1975a).

It was known at that time that the entire valley of the Coppename River was uninhabited, except for a small Ndjuka village at the mouth of the Tibiti River. Alamu and his people went there and built a small village, called Coppencrisie, which means "Coppename Christians."

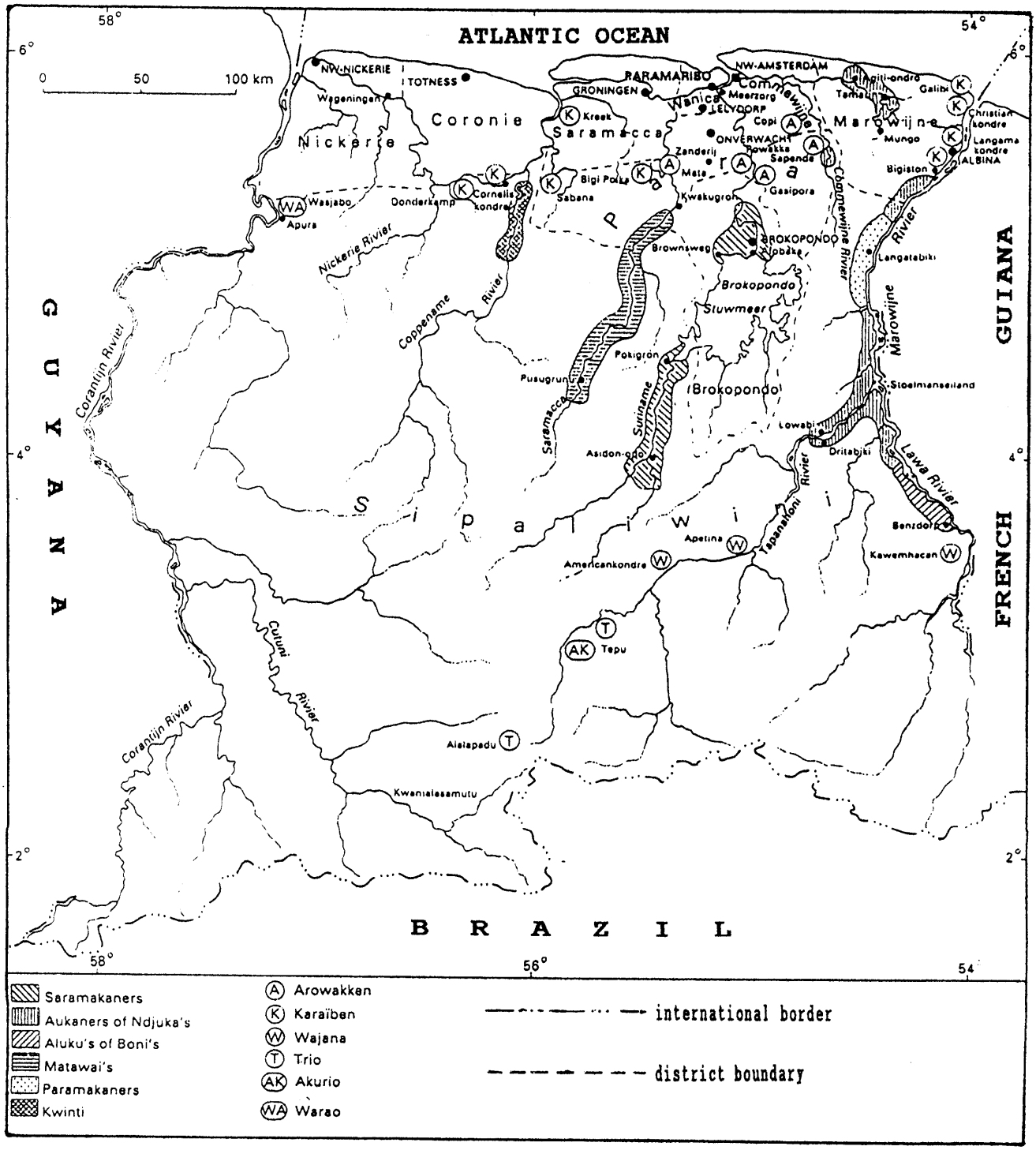


Figure 10 - Distribution of indigenous tribes in Suriname (modified from: Agerkop, 1992)

After internal conflicts, the village was abandoned and some of the people moved farther upstream on the Coppename River. Here they established two new villages: Bitagron and Kaaimanston. The exact date of this migration is not known, and each of the villages claims to be the oldest one. In this regard it must be mentioned that in his report over the Coppename Expedition, Bakhuis describes Kaaimanston and Coppencrisie, but Bitagron is not mentioned at all (Bakhuis, 1902), raising doubts about the claim of Bitagron being the oldest established village.

Another Kwinti village, that in the early 1930s was located some 15 km downstream from Bitagron, has since long been abandoned. Just like Coppencrisie, no trace of it can be found anymore.

Van der Elst (1975a) reports that from a census held in 1973, the population of Kaaimanston consisted of no more than 30 people. During that time, Bitagron had a population of some 143 people, and appeared to be a more dynamic village. A rough estimate at that time gives a total population of 200-225 permanent inhabitants for all Kwinti villages combined.

During the (recently ended) hostilities in the interior, Bitagron was completely destroyed by the army and many villagers fled to Paramaribo or farther upstream into the interior. The village of Kaaimanston is now practically abandoned -- only a few families still live there. A number of Kwinti, among whom the Chief Captain, settled in small communities farther upstream along the Coppename River (i.e. closer to the reserve). Village leaders have stated that they eventually would like to return to Bitagron and Kaaimanston, but there are no assurances that other refugees, especially those who went to Paramaribo, also want to return to their villages (Reichart, pers. data).

1.5.2 Tradition and Resource Use

As for relationships with other tribes, the Kwinti generally remain aloof and they do not readily cooperate with them (van der Elst, 1975b). In spite of this individualism, they consider themselves friends with all bushnegro tribes -- except the Matuari. They contend that their ancestors had to flee from the Matuari to save their lives. The fact that the Matuari Granman is also their Granman does not help matters either. Except for this legislative tie with the Matuari, the Kwinti have no traditional ties with other tribes -- there is no trade with them, nor any religious cooperation (van der Elst, 1975b).

The Kwinti have embraced Christianity, but to a great extent they practice their traditional belief of poly-deism. Along the Coppename River there are supposed to be some holy places where they worship their ancestors and a Supreme Being. Van der Elst (1975b) gives a detailed description of the role of religion in the life of the Kwinti.

The Kwinti are rather suspicious regarding the presence of other groups in their area, and there have been accusations that some of these people are practicing "Wisi" (witchcraft) in order to harm the Kwinti. This last aspect is important for the management of the Raleighvallen/Voltzberg Nature Reserve because for most of its existence reserve personnel consisted of bushnegroes from the Marowijne River (Ndjuka or Aucaner tribes), and there were always problems. The Kwinti accused these workers that they practiced wisi, that they mocked the Kwinti's holy places, and that they tried to court their women. That the Kwinti consider themselves friends with all the bushnegro tribes is therefore not entirely correct. During talks over the past few years, the Kwinti have clearly stated that they do not like to have Marowijne River tribesmen in their area (Reichart, pers. data).

The Kwinti are avid hunters and fishermen (van der Elst, 1975c). Some twenty five years ago that was primarily for their own consumption. After the construction of the Zanderij-Washabo road, however, they increased their hunting pressure for the sale of game and fish to dealers from Paramaribo, who could now easily reach the Kwinti area. These activites came to a stop because of the armed conflict, but now that there is peace, the Coppename River area is accessible again, and hunting and fishing pressure may increase.

At this time, the Kwinti are the only people living along that part of the Coppename River. The region has much wildlife and fish is relatively abundant in the creeks and rivers. Care must be taken that these resources do not becoming depleted to enrich the traders from Paramaribo. Besides, as the resources dwindle, fishermen and hunters are inclined to try their luck farther upstream -- closer to the reserve. An important task of the reserve management team must therefore be to monitor the fishing and hunting activities of the Kwinti, and others, on and along the Coppename River.

1.5.3 Minerals

There is virtually no information about the geology and the presence of minerals in the Raleighvallen/Voltzberg Nature Reserve area. There seems to have been only incidental geological fieldwork in the region. Maps do not show any valuable mineral deposits. There is a uranium exploration concession located along the Linker-Coppename River, some 100 km south of the reserve (Anon., 1988a), but at this time the concession lies idle. The management team should keep track of potential mining activites south of the reserve, because river water quality could be affected.

1.5.4 Water Catchment

The Coppename River basin is the third largest watershed area (after the Corantijn River and the Marowijne River) in Suriname, and it is currently not being used for large-scale projects, such as city drinking water, irrigation, or hydro-power generation. Figure 11 shows the watershed areas of Suriname's major rivers.

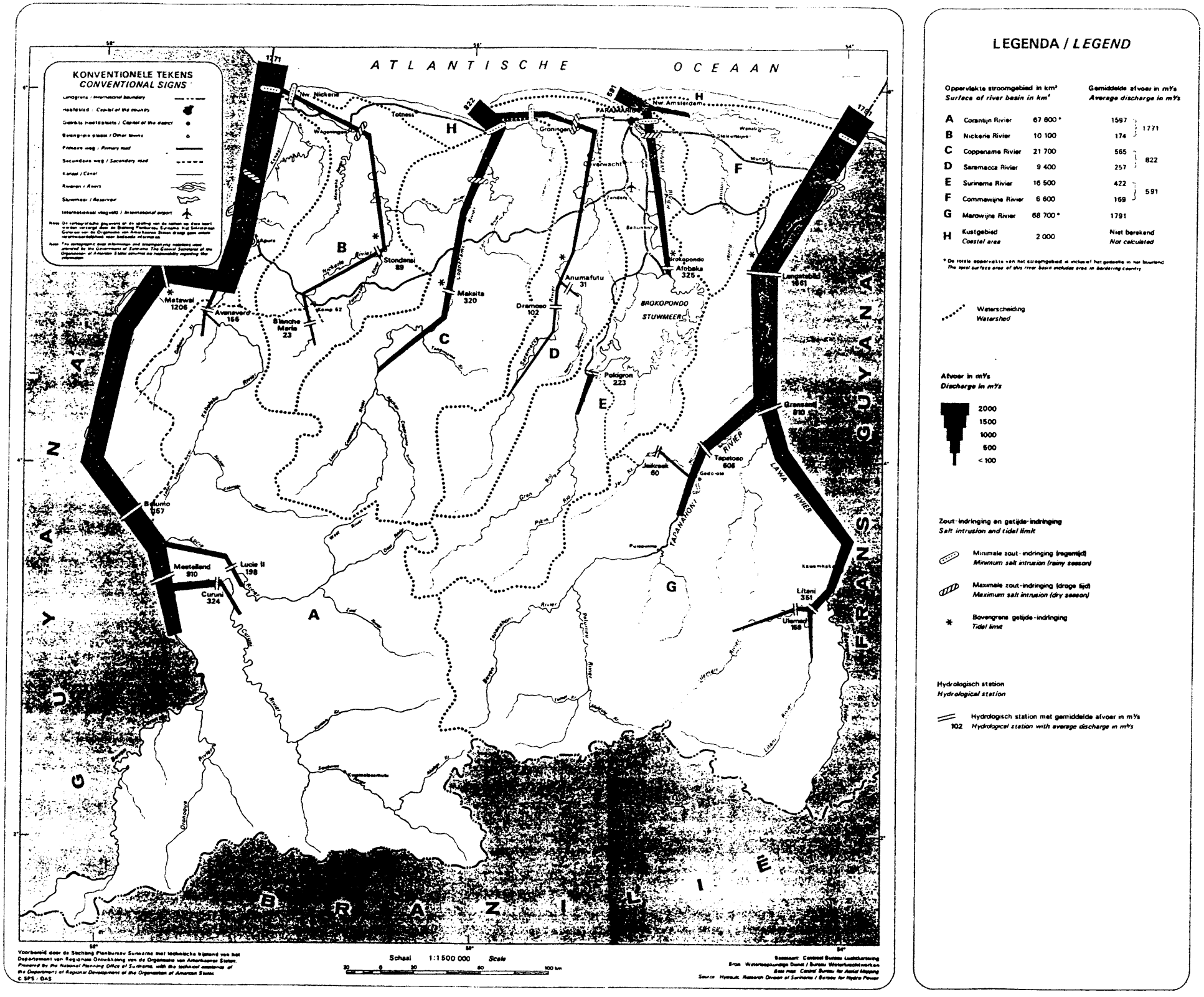


Figure 11 - Watershed areas in Suriname (source: Anon., 1988a)

The surface area of the Coppename River watershed basin is 21,700 km^2, and the average flow at the mouth of the river (before the Saramacca River enters the Coppename River) is 565 m^3. The average water flow, measured at the Maksita station (some 15 km north of Foengoe Eiland), is 320 m^3 (Anon., 1988a).

Upstream from the reserve, there are no permanent, human settlements. As a matter of fact, the region is seldom visited. Consequently, the quality of the water flowing through the reserve is excellent. One essential element in maintaining the health of the river is the amount of dissolved oxygen in the water. Under normal conditions, this is about 5.5 mg/liter near the surface of the river, but at Raleighvallen it is 7.5 mg/liter. This favorable level is caused by the mixing of water and air in the rapids.

The farthest place where ocean tide levels in the Coppename River are felt is near the Maksita station (Anon., 1988a). The water level of the river in the reserve is therefore not affected by ocean tides.

1.5.5 Cultural Resources

Cultural artifacts have been found which indicate that the area surrounding the Coppename River was inhabited by indians during pre-Columbian times (see section 1.5.1). Nothing is known, however, about the distribution of these settlements or how permanent they were. Petroglyphs found along a small creek near the Voltzberg show that the indians not only lived along the Coppename River, but that they also traveled more inland. In areas with liane forest, which are also rich in bamboe, and where a kankantri (Ceiba pentandra) stands, it is often a sign that indians used to live there. By digging here, stone axes, shards, or pieces of charcoal can sometimes be found (Bubberman, pers. comm.).

At this time, the Upper Coppename River basin is not inhabited by indians. Shards of relatively recent origin found in this area suggest that indians may have traveled (or still be traveling) back and forth from the border with Brazil through the forest to the Upper Coppename River (Reichart, pers. data). but this trekking has not yet been verified. It can safely be assumed that, except for an occasional exploration party, there are no human activities south of the reserve.

There must undoubtedly be a wealth of archaeological material in and around the reserve that could shed light on the presence of people in the area during pre-Colombian times. Because the area has never been developed, and human disturbance has been negligible, fruitful exploration work that could be important for Suriname's cultural heritage can be done. The Archaeological Service of the Ministry of Education and Culture should be approached to survey the Coppename River region systematically to look for artifacts and possibly locate ancient settlements. Part of the management of the reserve must be the identification and protection of immovable cultural objects, such as petroglyphs and stone axe grinding grooves against vandalism.

The Kwinti seem to have no strong historical or cultural ties with the Coppename River area, but it is necessary to verify this with their leaders. If it is found that they have secret places of worship in or near the reserve, these places should be identified by Kwinti leaders so that they can be fully protected for that purpose. Reserve management must then be aimed at keeping such areas off-limits for tourists.

1.6 History of Establishment and Legal Status

During the late fifties, the Coppename River, especially the area near Raleighvallen, was visited more and more by botanists and zoologists. As a result of their observations, it became clear that, because of the fascinating and unspoiled landscape, the area would be emminently suited for nature education and nature tourism. The spectacular waterfalls and rapids (sulas) of the Raleighvallen complex in the Coppename River, and the ecological studies done by Schulz (1960) in the area around the Voltzberg, were undoubtedly contributing factors in designating the area a nature reserve in order to protect these resources. The reserve fully satisfies the requirements of the Nature Protection Law of 1954 (Appendix A). In conformance with Articles 1 and 2 of this law, an area can be designated as nature reserve if it complies with the following prerequisites (as translated from Dutch): "that justifies Government protection because of diversity of natural communities and/or the presence of scientifically or culturally important objects of flora, fauna, and geology."

Consequently, the Nature Protection Law of 1954 (Appendix A) provided the legal basis, and with the Nature Protection Resolution of 22 April 1966 (Appendix B), the Raleighvallen/Voltzberg Nature Reserve was gazetted. In this resolution, the reserve borders were established as follows (as translated from Dutch):

> The area which includes the Raleighvallen, the Voltzberg, the Granmisiweri, the Granmisibergi, the Van Stockumberg, and the Mary-Josephine Mountain, and which is bordered:
>
> in the north:
>
> > by the left bank of the Kwama or Marame Creek;
>
> in the east:
>
> > by a line at a distance of 20000 m from the mouth of the Tanjimama Creek in the direction true north 35° east;
>
> in the south:
>
> > by the right bank of the Tanjimama Creek to the intersection with a line in the direction straight north, through the mouth of afore-mentioned creek;

in the west:

by the previously mentioned north-south line to the intersection with the left bank of the Coppename River; subsequently by the left bank of this river to the intersection with a line in the direction straight east at a distance of 5500 m from the mouth of the Tanjimama Creek; then by last-mentioned line in easterly direction to the intersection with the right bank of the Coppename River; finally by afore-mentioned right bank.

With the Nature Protection Resolution of 1986 (Appendix C), the Raleighvallen/Voltzberg Nature Reserve was enlarged with an area west of the Coppename River. Part d of article 1 of the Nature Protection Resolution of 1966 was changed as follows to indicate the new borders (as translated from Dutch):

in the north: by a line from the mouth A of the Kwama or Marame Creek in the direction true north 270° east to intersection G with the former border between the districts Nickerie and Saramacca, and in easterly direction from afore-mentioned mouth A through the Kwama or Marame Creek to the intersection B with the east border defined below;

in the east: by a line BC in the direction true north 35° east at a distance of 20,000 m from the mouth D of the Tanjimama Creek, which line runs from the Kwama or Marame Creek (point B) to the Tanjimama Creek (point C);

in the south: by the Tanjimama Creek from the point C described above to the mouth D and subsequently by the Coppename River to the mouth E of the Clements Creek;

in the west: by a line from the mouth E of the Clements Creek in the direction true north to the intersection of the former border between the districts Nickerie and Saramacca, then (in northerly direction) by aforementioned district border to the intersection G with the north border of the nature reserve as mentioned above.

1.7 Management History

During the early years of its establishment there were only few activities in the Raleighvallen/Voltzberg Nature Reserve. The reserve borders were visited, and a few signposts were placed to indicate boundaries. The reserve was checked occasionally by a game warden. Lack of facilities prevented the development of the reserve for tourism and scientific research.

In 1967, LBB placed a guesthouse along the left bank of the Coppename River across from Manarivallen. This is the present Lolopasi lodge (see figure 4). With the establishment of STINASU in 1969 (see section 2.2.4), the emphasis was placed on promoting the use of the reserve as a center for field research, nature education, and nature tourism (see section 3.6. through 3.6.3).

As a first step, Foengoe Island was prepared to be the reserve headquarters, and was permanently staffed with a manager and some fieldworkers. At the same time, the reserve infrastructure was developed to accommodate nature tourism. Gradually tourist lodges were built and trails were made to points of interest.

Since 1969, the reserve has attained a reputation with field researchers and tourists alike as a very interesting and valuable wildlands region. Tourism was on the rise until 1987, when an armed raid by the jungle commando forced abandonment of the reserve with the subsequent loss of all equipment and material. During a recent reconnaissance visit to the reserve it was discovered that much damage was sustained, and that all buildings and utilities will have to be rebuilt (Reichart, non-publ. LBB report, 1992).

1.8 Research

Even prior to its establishment as a protected area, the Raleighvallen/Voltzberg Nature Reserve was already being used as locale for field research. The geology and geography have been described by, among others, Martin (1888) and Bakhuis (1902).

Botanical fieldwork carried out in the reserve include subjects, such as: tropical rainforest ecology (Schulz, 1960), vegetation survey (Holthuizen and de Jong, 1977), forest fruits (van Roosmalen, 1979, 1985).

Zoological fieldwork done consists of studies on: monkeys by Mittermeier (1977), Mittermeier and Fleagle (1980), van Roosmalen (1985); nightjars by Ingels et al (1984); cock-of-the-rock by Trail (1983, 1984, 1985); woodpeckers by O'Brien (1977); reptiles by Goin (1971), Hoogmoed (1968); bees and wasps by Benno (1971).

This is by no means a full summation of the research that has been carried out in the reserve. The quality and diversity of the various projects clearly indicate that the Raleighvallen/Voltzberg Nature Reserve is an excellent site for nature studies. This underscores the need for a well-equipped research center in the reserve (see sections 3.6.1 and 3.9.1).

The literature resulting from the research projects done in the reserve are filed at various ministries, departments, and even with foreign institutions. One task of the management team must be to gather copies of all these publications and place them in a central file at the NB/STINASU offices in Paramaribo. A complete set of these publications must also be stored at the reserve headquarters for the convenience of fieldworkers looking for background information.

2. EVALUATION AND GENERAL CONCLUSIONS

2.1 Reserve Justification

The Raleighvallen/Voltzberg Nature Reserve is characterized by a high biodiversity. This can be attributed to the variety of plant communities in the reserve, such as tropical rainforest, xerophytic plant communities (on the granite plateaus), sub-montane plants communities, and aquatic plant communities. The region has barely been touched by human activities, and it is an excellent site for scientific research and nature tourism. By designating part of the region a nature reserve, a number of unique ecosystems can now receive optimal protection.

The reserve is in the interior of the country, but it is easy to reach. The Coppename River flows from south to north through the reserve all the way to the Atlantic Ocean, and from here the river is navigable for koriaals (native canoes) to Foengoe Island, where the headquarters of the reserve is located. The Raleighvallen sula complex is a roughly 2 km long stretch of river rapids just south of the island, effectively blocking water transport. Upstream from these rapids, however, the river becomes navigable again. Foengoe Island also has a good airstrip, and the flight from Paramaribo to the reserve takes less than an hour.

Biological diversity is a measure of the variey of plants and animals in an area. Species richness is only one aspect of this. Biological diversity is actually a more complicated ecological concept and can be expressed at different levels of biological organization; the more common ones being ecosystems, populations and genes. A negative impact at any one of these levels can cause a chain reaction, upsetting the balance of the entire ecosystem. This will then affect the welfare of people in a large part of the region. The natural flora and fauna of the world have co-evolved over millions of years, and they form the basis of the life support system of our planet. Where wildlands are still mostly undisturbed, biological diversity is optimal. The Raleighvallen/Voltzberg Nature Reserve is such an area. It is still in a pristine condition, and biological diversity is probably high. The reserve is a veritable storehouse of organisms yet undiscovered, which may someday make significant contributions to man's welfare in such fields as agriculture and pharmaceuticals.

The Coppename River watershed is the third largest in Suriname, after those of the Corantijn River and the Marowijne River (Anon. 1988a). It is also the least disturbed area. In order to maintain the integrity of this watershed it is essential that a large portion of the upland forest cover of the Coppename River basin is protected. The reserve management team must play a large role in this.

All these arguments more than suffice for the justification of making the Raleighvallen/Voltzberg region a nature reserve.

2.2 Management Constraints

The Raleighvallen/Voltzberg Nature Reserve is part of a much larger region. As such, it does not exist in isolation from its surroundings. The size and shape of the reserve are such that its borders cannot be fully protected from outside influences, be they nearby commercial development or subsistence activities of indigenous people. Currently, human presence near the reserve is a negligible factor in management constraints, but this could change in the future. The management authority of the reserve must therefore always be prepared to deal with this possibility.

The Kwinti were forced to leave their villages of Bitagron and Kaaimanston. Most of these people moved to Paramaribo, but some of them went farther upstream on the Coppename River, and now live in small settlements north of the reserve. One group has settled very close to the Kwama Creek, the north border of the reserve. These villagers undoubtedly have subsistence garden plots, and part of their activities may even be taking place inside the reserve (like hunting, poisoning creeks for fishing, logging). A rough estimate is that no more than 50 people are living there but, if no control is being exercised, these people could have a negative impact on the goals of the reserve. It is therefore important that meetings be held with the Kwinti in order to integrate their needs with those of the reserve. For one, the Kwinti should be given the opportunity to use the reserve sustainably; for instance through harvesting of secondary forest products, use of tribal medicinal plants, and conducting cultural or traditional activities. But the reserve may under no circumstances be used for hunting. Fishing with traps, nets, and phyto-chemical substances must also always be prohibited.

An often neglected part of protected area management is its coordination with regional development plans, and vice versa. LBB and STINASU must see to it that the management of the reserve is integrated with regional development plans, so that the objectives of the reserve are not compromised or sacrificed. STINASU and LBB must see to it that they have representation on the design team for such regional projects.

The far corners of the reserve are rather inaccessible, which limits effective control. For instance, the Kwama Creek (north border) and the Tanjimama Creek (south border), can be regularly patrolled by boat only during rainy seasons; the interconnecting land border much less so. All navigable creeks must be patrolled whenever possible, because intruders will use the same access routes. To effectively protect the reserve, cooperation has to be solicited from the local people. As indirect beneficiaries it is also in their interest to protect the reserve's natural resources.

2.2.1 Size and Isolation

Biological diversity is not just a matter of the presence of a large number of plants and animals. Biological diversity of a particular area is also a function of its size. There are no guarantees but, with 78,170 ha, the Raleighvallen/Voltzberg Nature Reserve is probably large enough to maintain its biological diversity through natural regeneration.

This argument is only valid if the reserve is protected from human disturbances. Should surrounding lands be logged, cleared for mining, converted to agriculture or settlements, the reserve will become more and more isolated from other natural areas. The results could manifest themselves quickly, and the reserve would lose its value as a source of biological diversity. Natural maintenance of biodiversity is an ongoing balance between random extinctions and immigration of species. According to the principles of island biogeography, area size and distance from immigration sources are important factors in determining species diversity (MacArthur and Wilson, 1967): the smaller the island and the more distant from immigration sources, the lower its species diversity. Therefore, as the reserve becomes more and more distant and isolated from other wildlands areas, immigration rates will decrease; and so will biological diversity, affecting the health of the reserve's ecosystems.

If regional development plans are prepared for the surrounding areas care must be taken that they do not contravene the objectives of the reserve. At this time there is no problem but, if a nearby part of the interior is earmarked for a quick-profit development project, the situation could change rapidly. To avoid potential problems, recommendations are made to install buffer zones around the reserve (see section 3.5.3).

2.2.2 Habitat Representation

The reserve has a wide range of tropical plant communities. They vary from tropical rainforest to xerophytic plants. For some of these habitats the ecological transitional areas are readily noticeable; in other places the transition is more subtle. Some of the biotic communities in the reserve have not yet been extensively studied but, because of access by way of the Coppename River, they can be reached relatively easily.

Various animal species, which are difficult to observe and study in other places, can be found in the Raleighvallen/Voltzberg Nature Reserve. Their presence often depends on the diversity of habitats. Some animals have specific feeding or reproductive behavior. This requires that they periodically travel to other areas. These aspects of their life cycle have hardly been studied, but it is known that diversity of habitats is an important factor in the well-being of these species. Protection of the habitats in the reserve must therefore have a high priority in the management task of the reserve.

2.2.3 Forest Service Resources

The Ministry of Natural Resources (NH) has delegated the responsibility for managing the country's nature reserves to the Surinam Forest Service (LBB). The Nature Conservation Department (NB) of LBB has been entrusted with the actual implementation thereof. In this capacity, NB oversees compliance with the laws concerning the management and protection of the nation's nature reserves. NB personnel consists of game wardens, field assistants, technical personnel, and various administrative people. Section 3.8 deals in more detail with personnel requirements.

The development and use of the reserves for research and education is done in cooperation with STINASU. Promotion of tourism to the reserves has been delegated to STINASU (see Introduction and section 2.2.4).

2.2.4 STINASU Resources

STINASU is a non-profit, semi-government agency founded in 1969 for the explicit purpose of stimulating and implementing the use of the reserves for scientific research, nature education, and nature tourism. More specifically, STINASU was founded for the following purpose, as stated in the foundation's statutes (as translated from Dutch):

1. to implement the goals aimed at with the designation of nature reserves as justified by the Nature Protection Law of 1954 ("Natuurbeschermingswet 1954");

2. to cooperate with the government to protect natural areas that do not yet (or insufficiently so) enjoy protection but which, because of the Nature Protection Law 1954, would be eligible for such status.

STINASU intends to attain these goals as follows:

a) to stimulate, coordinate, and (jointly) finance scientific exploration; to develop already existing nature reserves by:

   i) initiating and maintaining contacts with international conservation organizations;

   ii) obtaining financial and technical support from above-mentioned organizations;

   iii) programming and conducting scientific research in the reserves, and making the results of such research available through publications;

b) to develop the reserves for the recreational, educational, and economic purposes that they have been established, namely by means of:

   i) making the reserves accessible;

   ii) providing and maintaining transport to (and in) the reserves; constructing and exploiting lodging facilities in the reserves;

   iii) promotion in Suriname, as well as abroad, of the possibility to visit the reserves under the guidance of trained personnel;

   iv) printing publications and information material on nature conservation in general, and the flora and fauna of the reserves in particular;

c) to attempt to protect and utilize areas not yet protected, or those areas insufficiently protected, on behalf of science, recreation, and public education.

STINASU works in close cooperation with NB. Practically all full-time STINASU workers are LBB employees. The STINASU office in Paramaribo is located on the Forest Service Headquarters grounds. As such, STINASU receives an indirect, but substantial government subsidy. The foundation is nevertheless an autonomous organization within the framework of the Ministry of Natural Resources. It can conduct fundraising activities, and it may charge for the services it provides to tourists visiting the reserves. STINASU uses the income thus generated to improve facilities, support research, and finance education projects. A Managing Director supervises the day-to-day business of STINASU. He is responsible to a Board of Directors which is appointed by the Minister of NH on an annual basis.

These excerpt from the statutes clearly show that with the establishment of STINASU the Surinam Government is serious about developing the country's nature reserves for sustainable use.

2.2.5 Local Interests

For too long, conservation and rural development have been considered as being mutually exclusive. In almost all countries, protected areas have been set aside without much, if any, concern for the local people. There are no indigenous people living inside the Raleighvallen/Voltzberg Nature Reserve, but the area is within the sphere of interest of the Kwinti bushnegro tribe. The closest settlement is near the north boundary of the reserve, and the needs and aspirations of the Kwinti must be considered. In the recent past, some of their activities (hunting, fishing, plant collecting, and logging) must undoubtedly have taken place inside the reserve but, in view of the small size of the tribe and their limited tools of exploitation, any negative effects must be considered minimal.

For the management of the reserve more attention must be given to the value the Kwinti attach to the reserve. The Kwinti generally keep to themselves, and too little is known about their traditions in order to make specific concessions regarding their cultural use of the reserve in this management plan. Discussions with Kwinti leaders may provide a solution. There seem to be no insurmountable conflicts with them about the presence of the reserve, but there are two issues that they want to see resolved:

1. They wish to see more Kwinti tribesmen employed in the reserve.

2. They have specifically requested that the number of bushnegro workers in the reserve from other tribes, especially Aucaners, be limited.

For a successful management of the reserve it is imperative that attention be given to these two requests. The Kwinti, of course, cannot be allowed to dictate which employees of LBB and STINASU are permitted to work in the reserve, and which are not. But in view of the recently ended armed conflict in the interior, and the generally positive attitude of the Kwinti regarding the return of the reserve staff, it is recommended that their requests receive positive consideration.

Planning a protected area in isolation from its surroundings is a mistake. To be workable, a management plan must become an integral part of a regional land-use plan or, at the very least, it must be implemented in cooperation with Kwinti tribal leaders. LBB and STINASU should also establish a workgroup, whose task will be to promote greater cooperation with the local people. The workgroup should categorize the benefits that can be derived from living near the reserve and, together with Kwinti representatives, develop some appropriate projects.

Some direct benefits for the local people are:

-- An advisory voice in the management of the reserve

-- Employment opportunities in the reserve

-- Sale of locally made handicraft to tourists

-- Work as independent guides for nature tours

Some indirect benefits are:

-- Maintenance of the reserve's watershed gives clean water for use by the local people

-- The reserve functions as a reservoir of wildlife that can supply game for hunting outside the reserve

-- The reserve is a source for construction materials, food, and traditional medicinal plants

The workgroup should place special emphasis on the concept of social forestry (agroforestry) or other sustainable-use activities that can be conducted in the reserve's buffer zones. The strategy should be to work together with the local people, and not present them with already decided projects or plans. Suggestions for the type of projects to be implemented should preferably come from the local people themselves.

2.3 Environmental Awareness and tourism

Many tribesmen have good, practical knowledge about nature and they do not intend to degrade their environment willfully. Because of their (often self-imposed) isolation, however, they fail to see the long-term consequences of overexploitation and environmental degradation. Much work (and especially tact) is needed to explain the ramifications of excessive resource use.

Through a cooperative effort between LBB/STINASU and Kwinti leaders a program should be developed (at the local level, and if necessary in the local language) to explain the interrelationships and functions of regional ecosystems. Teaching environmental awareness to indigenous people is a sensitive issue; a patronizing attitude can be counterproductive. Many Kwinti are intelligent and knowledgeable about the environment and the exchange of information can be mutually beneficial. The format of the meetings should be one of small discussion groups. Ecological concepts and reserve management issues can be brought up during the discussions. There can be a beneficial interchange of ideas, which will foster a greater understanding by all of regional environmental issues and tribal concerns. The program must also deal with the justification for the reserve, and how the reserve can be of economic benefit to the local people in the long run (see section 2.2.5).

To further promote this cooperation, STINASU and LBB should invite groups of local people (especially young people) to visit the reserve as guests of STINASU. Nature films, slide shows, and guided nature walks will go a long way in obtaining appreciation and support for the reserve.

Community participation in some managerial aspects of the Raleighvallen/Voltzberg Nature Reserve can take several forms. It is proposed that the following possibilities be considered by STINASU, LBB, and the local communities:

a) establishment of a committee, consisting of Kwinti leaders and representatives from LBB and STINASU, to deal with matters of mutual concern and interest for the reserve.

b) Development of a joint scheme, whereby tourists may visit Kwinti settlements to purchase native handicraft.

c) Joint efforts to develop sustainable harvesting projects in the reserve's buffer zones.

d) Training of a number of Kwinti to be be able to serve as environmentally aware tour guides for forest and river trips.

3. MANAGEMENT PRESCRIPTION

Management of a nature reserve is part science and part art. A management program is based on ecological and sociological guidelines, but a considerable amount of common sense and insight is also required. There is not a specific, single formula that can be applied to the management of the reserve. Environmental as well as social parameters change, and conditions valid during some years may no longer be applicable in others.

Central to a good management plan is a statement of objectives and a strategy to implement these objectives.

3.1 Objectives

1. to develop and install a system of boundary markers (see section 3.3.1 and 3.3.2);
2. to protect the reserve's natural and cultural resources (see section 1.5.5);
3. to especially protect the unique flora and fauna elements;
4. to protect the reserve against unlawful encroachment (see section 3.4);
5. to involve local people in the management of the reserve (see section 2.2.5);
6. to improve research, staff, and tourist facilities (see section 3.9, 3.9.1, 3.9.2, and 3.9.3);
7. to promote research, education, and nature tourism (see section 3.6, 3.6.1, 3.6.2, and 3.6.3);
8. to improve and enlarge the system of marked nature trails (see section 3.6.3);
9. to provide appropriate training for field personnel see section 3.8.4 and Appendix L);
10. to construct one or more mini hydro-power installations for the reserve (see section 3.9.4);
11. to build an education and information center in the reserve (see section 3.9.1);
12. to build a biological field research center in the reserve (see section 3.9.1).

3.2 Strategy

In order to achieve these objectives, the management plan proposes the following strategy:

1. establishment of firm boundaries for the reserve;
2. establishment of usage zones inside and around the reserve;
3. establishment of a strong guard force;
4. improvement of relations with nearby Kwinti settlements;
5. maintenance and expansion of the nature trails network;
6. expansion of tourist facilities to other areas in the reserve;
7. establishment of a team of trained field personnel;
8. construction of mini hydro-power installations in the reserve;
9. development of an education and information center;
10. construction of a biological field research station.

3.3 Boundaries and Zoning

To avoid controversies regarding access and resource use, all borders and usage zones must be clearly and unambiguishly marked on large-scale maps as well as in the field.

3.3.1 Boundaries

Article 2 of the Decree of 26 August 1966 (G.B. No. 52) (Appendix C) gives the boundaries for the Raleighvallen/Voltzberg Nature Reserve, but these are not marked in the field. The borders defined by creeks are clear, but the inland boundaries are not. As long as there are no people living in the area, it is not essential to place border markers in inaccessible places. But it is necessary to erect suitable signs (stating the rules of the reserve) where such land borders cross navigable creeks.

The following procedure is proposed to set up the boundaries:

1. On a large-scale map of the reserve locate the left bank of the mouth of the Tanjimama Creek. From this location draw a 20 km (scaled) straight line in the direction 125° true north. At the end of this line draw a perpendicular line (i.e. 35° true north) until it intersects the right bank of the Kwama Creek (also called Maramé Creek). This is the northeast corner of the reserve. The northeast border is the course of the right bank of the Kwama Creek.

Draw the 35° true north line in the opposite direction until it intersects the left bank of the Tanjimama Creek. This is the southeast corner of the reserve. Personnel should travel up the creeks and place border signs on these corners. The signs should be oriented in the direction true north 35° east to indicate the direction of the east boundary of the reserve.

2. On the same map draw the former border between the Districts of Saramacca and Nickerie. Locate the mouth of the Kwama Creek. From the right bank of the mouth of this creek draw a straight line true north 270° east, to the intersection with above-mentioned districts border. This border also goes in an easterly direction by following the contour of the right bank of the Kwama Creek upstream until it intersects the true north 35° azimuth of item 1 (this is the same northeast corner mentioned in item 1).

3. From the left bank of the mouth of the Tanjimama Creek draw a perpendicular line to the left bank of the Coppename River and follow this bank upstream to the right bank of the mouth of the Clements Creek. From there draw a line true north until it intersects the district border mentioned above under item 2.

At the mouths of all rivers and creeks which lie within the reserve, or which serve as boundaries, signs must be placed to indicate the presence of the reserve. Aside from pertinent laws, the notices on these signboards must also prescribe some standards of conduct to be obeyed while in the reserve. The information must be written in Dutch and in Sranan Tongo.

In the Decree of 1966, the creek borders were identified as being either left or the right banks. The Decree of 1986, however, makes no mention of which bank of the creek is meant. For maximum protection all creeks mentioned in this section have been placed inside the reserve boundaries. This may not necessarily concur with the original intent but, as long as there is no definite ruling on this, protection of all creeks is assumed in this management plan.

3.3.2 Zoning

People will want to use the reserve in various ways, and it is necessary to ensure that their activities are not incompatable with the management goals. For example, during the breeding season of the cock-of-the-rock, visitors must not be allowed to freely move about in the lek areas. There must always be a staff member of the reserve present with a visiting party. It is important that all sensitive elements of the reserve receive optimal protection.

Establishing activity zones is a viable management technique to do so. Such zones must be clearly and permanently identified by signposts or other markers. Regardless of the type of activity zone, visitors are not allowed to do collecting of any kind (rocks, plant materials, animals, etc.) Animals in the reserve are also not to be disturbed intentionally. Furthermore, it must be prohibited to damage any part of the reserve, such as through the seemingly innocuous, but in fact despicable, act of carving trees or painting rocks. The following activity zones are proposed:

A **Intensive Use Zone**. Areas where personnel and visitors facilities are located, and where there will be moderate to heavy human use. Consequently, many activities take place here that require some measure of control. In general, for all the sub-zones mentioned below, the following rules must apply: respect for the privacy of other visitors and proper disposal of garbage. Noise is a major culprit in disturbing other people, and rules must be established to limit, or even prohibit, the use of radios or music instruments. Additional rules are required in the following sub-zones:

a) Headquarters Complex (Foengoe Island). Here are the LBB and STINASU staff buildings and various guest lodges located. Visitors arriving with their own boats must moor them at sites indicated by the reserve manager.

b) Airstrip (Foengoe Island). Aircraft, landing for whatever purpose on Foengoe Island, must comply with the air traffic regulations of Suriname; they must also obey the instructions of personnel of the Department of Air Transport stationed on Foengoe Island. In any case, though, the national conservation laws, and the specific rules for the Raleighvallen/Voltzberg Nature Reserve, may not be compromised.

c) Lolopasi Lodge. In the immediate vicinity of this lodge, built near the Praké Podo Sula (see figure 4), the same rules apply as for the Headquarters Complex mentioned under a).

B **Minimal use zone**. Areas that are also widely used by people, but where more harmony with nature must be observed than is possible in the above-mentioned High Intensive Use Zone. Additional rules are to be observed in the following places:

a) Hiking trails. i) The Foengoe Island trail that goes from the Headquarters Complex to the northernmost tip of the island; ii) the forest trail that goes from Manarivallen (also called Gordijnvallen) to the Voltzberg; iii) the trail that goes from the Lolopasi Lodge to the Moedervallen. When on these trails, garbage must not be thrown on the trail or in the forest. Noise must also be kept to a minimum. Such rules will also have to apply for any future trail to be developed.

b) Field Camps. In some places in the reserve there are camps that are to be used only temporarily, such as shelter against rain or resting during a hike. Garbage (plastic articles, bottles, cans and such) must not be left behind, but must be carried back to Foengoe Island for disposal in designated areas.

c) Scenic Views. At locations with scenic views, such as the Voltzberg, Granmisibergi, Granmisiweri, and the granite plateaus, garbage or other types of polluting materials must not be left behind. Especially these places must be protected against vandalism (such as through the painting of rocks).

d) Camp Sites. If tourists want to use their own lodgings (tents or houseboats), permission must first be obtained from the manager. Permission to be based on instructions the manager receives from the Head of NB or the Director of STINASU. These (temporary) shelters can only be placed at designated areas. Use of local materials (stones or plants) to build or improve the sites should not be permitted. The manager must also give specific instructions regarding the proper sanitary provisions to be made (latrine and bathing facilities). Garbage cannot be left behind, but must be taken to Foengoe Island for disposal. The camp site must always be policed before departure.

e) Waterfalls. At all waterfalls and sulas the main purpose of the reserve must be kept in mind. Bathing is allowed, but the water must not be polluted through excessive use of soap or detergents. The waterfalls and sulas should also not be used for toilets and the dumping of garbage or other harmful substances. Rocks and stones must not be dislodged or removed.

f) River and Creeks. The Coppename River and the creeks in the reserve may not be polluted through the excessive use of soap, the dumping of garbage or other harmful substances. Damage to the river and creekbanks (through mooring of boats or recreational uses) must be kept to a minimum. Fishing is permitted, but one rod and line per person and one fishhook per line. Fishing with nets, traps, or chemical means is prohibited at all times. Aquarium fish are not to be caught and taken out of the reserve.

C Wilderness Zone. Areas that are only open to the public under certain conditions, and then only with written permission from the manager. Visitors may not deviate from marked trails, unless accompanied by a STINASU or LBB staff member. There should be no development in these areas, except for cutting simple trails, building primitive shelters, and setting up animal blinds or viewing platforms. As an example of a wilderness zone: the areas where the leks of the cock-of-the-rocks are located.

D **Sanctuary Zone**. Areas where tourist access should be prohibited. These are areas of great vulnerability, such as breeding places of endangered wildlife species, or stands of rare plants. STINASU and LBB personnel has access only for managing and patrolling purposes. Researchers can enter only when they have written permission from the Head of NB or the Director of STINASU. No permanent structures are allowed. Some sanctuary zones may be temporary (for instance, the habitat around the nest of a rare bird during egg incubation and rearing time of its young).

E **Buffer Zone**. Areas bordering on the reserve to act as a safeguard against the effects of intensive human activities. Limited, but sustainable exploitation by local people can be permitted. Recommendations for buffer zones are given in section 3.5.3.

F **Rehabilitation Zone** - areas inside as well as outside the reserve which have been severely disturbed, and which could be either restored, or be converted to alternate, but sustainable use.

All zones, especially sanctuary and wilderness zones, have to be clearly marked to indicate their status. Sturdy, weatherproof signs with explanatory text must be installed at zone access routes and at strategic places inside the zone.

Rules, based on conservation ethics, must be developed for the reserve and be posted in tourist-frequented areas to see to it that the natural and cultural resources of the reserve are treated with utmost respect. A major complaint of nature tourism is noise. The reserve is not an amusement park, and it must be reiterated that unequivocal limits must be set for the use of musical instruments, radios, and noisy recreational activities.

The above-mentioned rules are general statements regarding the behavior that is demanded of visitors. The Director of STINASU and the Head of NB, in consultation with the reserve manager, should develop specific rules for each of the activity zones mentioned above, and inform the public about them through information boards or brochures.

3.4 Legal Status and Regulations

Although the literature is replete with categories and definitions for protected areas (MacKinnon et al, 1986; Reid and Miller, 1989), none of the Surinam areas fits exactly in one of these rather hypothetical classifications.

There are four categories of protected areas in Suriname:

a) Nature Reserve;
b) Forest Reserve;
c) Nature Park;
d) Multiple-Use Management Area.

Articles 1 and 2 of the Nature Protection Law of 1954 (see Appendix A) stipulate the conditions under which an area can be designated a nature reserve in Suriname. They translate as follows:

Article 1

For protection and preservation of the in Suriname present natural wealth, the Governor can, after having heard the Council of Advice, designate lands and waters belonging to the nation's domain as nature reserve.

Article 2

To be designated as a nature reserve, the area has to satisfy the following requirements:
that it deserves protection by the Government because of its varied nature and landscape beauty and/or because of the presence of, from a scientifically or culturally significant point of view, important flora, fauna, and geological objects.

Although the Nature Protection Ordinance was legislated in colonial times (when Suriname was part of The Netherlands), this broad but useful piece legislation is still the basis of nature conservation in the Republic of Suriname.

Forest reserves are not reserves in the sense that they have been legislated by the Government. Instead, forest reserves are assigned (in the form of concessions) to the Surinam Forest Service. These areas are not destined to be logged commercially, but rather to be protected. LBB will use these areas in various ways, such as for research, education, and training.

New forest legislation ("WET BOSBEHEER"), has been developed in which the Government gives specific definitions for various other land-use classifications. This legislation has already been ratified by the Surinam Parliament; The law will go into effect when it is published by the Surinam Government printing office. Baal (1991) gives an overview of the legal aspects of protected areas in Suriname.

3.5 Resource Management

The biological resources of the Raleighvallen/Voltzberg Nature Reserve must be monitored regularly in order to be forewarned of possible environmental problems should these surface. It is too cumbersome to do this for the entire nature reserve, but changes in certain key species or plant communities can presage a trend in the general condition of the reserve's ecosystems. These socalled "Indicator Species" should be identified and, by following their life cycle, the condition of other resources in the reserve can often be predicted. To gather the necessary information, personnel should go on periodic inspection tours. In addition, visiting educators and researchers should be requested to make their field notes available for analysis. Infra-red aerial photographs of the reserve are also an effective tool to monitor the vegetation.

There has been a lack of interaction between STINASU, LBB, and the people living in the surrounding area. Management of the nature reserve goes beyond its geographic boundaries and it must include a greater role for local people. Management must aim at integration of the reserve into an overall land-use plan for the region, not towards isolating it from people. If surrounding lands are being degraded through abuse, the reserve may eventually suffer also. It will benefit both the reserve and the local people if there is more cooperation between them (see section 2.2.5). STINASU and LBB must therefore play a more active role in resource development projects outside the reserve. Abused land does not automatically revert to its original cover when lying fallow but, with help from man, some degraded lands can be made productive again. Lovejoy (1985) gives an overview of various methods that can be used to rehabilitate degraded tropical forest lands.

3.5.1 Habitat Management

Habitat management in the reserve can be mostly a hands-off procedure: let nature run its course. Of course, the reserve must be protected from intentional human damage (such as that caused by logging and slash-and-burn agriculture). Where needed and where possible, steps must be taken to undo the damage.

The reserve's habitat status needs continual monitoring. Regular patrols must be made to ensure that roads and trails remain passable. Falling trees are an everpresent problem. Rainshowers with heavy winds (15-20 m/sec), called "Sibibusi" in Suriname, are known to cause great damage in the rainforest. The often suddenly changing winds are very destructive: trees are stripped of their leaves, big branches break off; at times entire trees are uprooted. In 1984, a Sibibusi felled some 302 large trees in the Brownsberg Nature Park (Van Troon, 1984). The tornado-like winds usually do not touch the ground but when they do they can destroy buildings. Because of its thin soil, the Raleighvallen/Voltzberg Nature Reserve is especially vulnerable. Where a tree-fall impedes access, the area will have to be cleared, but in other locations natural succession should be allowed to take place.

In several sites just outside the reserve boundaries, where some logging has taken place, or where there are abandoned garden plots, active treatment is needed. These logged and degraded areas need rehabilitation in order to function as productive buffer zones for the local people (see sections 3.5.3).

3.5.2 Wildlife Management

As long as the integrity of the habitat in the reserve is maintained, there is no need for an active wildlife management program, since wildlife (barring external forces) will generally stay in balance with its environment. Poaching, or alteration of habitat (for instance: destruction of feeding places, cover, or unique nesting sites), however, will affect some populations in a detrimental way.

Hunting and logging will eventually come closer to the reserve's boundaries and wildlife management must therefore be more a matter of people management. Consequently, some pertinent wildlife management activities that can be undertaken are:

a) Guarding against hunting, and all forms of collecting.
b) Avoiding the possible introduction of exotic species.
c) Removing feral animals (dogs, cats, etc.).
d) Guarding against habitat vandalism.
e) Protecing against illegal woodcutting.

The reserve's wildlife must be monitored on a routine basis. Noticeable changes in population densities can be harbingers of possible, not yet discovered, problems, such as environmental deterioration, overharvesting, or disease. Whereas vegetation is relatively easy to monitor, fluctuations in wildlife populations are more difficult to determine. A simple, yet effective method to get comparative data for this is by means of transects. A transect is a simple, small trail that is walked periodically at which time wildlife observations are recorded following a set procedure. Such a census does requires some training of personnel, but it is nonetheless an effective method to obtain comparative indices for assessing trends in wildlife population dynamics. The following procedure could be instituted:

1. Based on some exploratory hikes through the reserve, develop a network of census trails that does not coincide with tourist hiking trails. Construct the trails with minimal disturbance to the environment. Trails must cut across major habitats and, if possible, include a variety of altitudinal zones. Trails to be drawn accurately on a large-scale map of the area.

2. The length of each trail must be measured, and inconspicuous markers should be placed at every 100 or 200 meters.

3. Trails should be patrolled <u>at least</u> once per month. Sightings of animals (especially birds) to be recorded in a notebook, or a suitable form, noting the numbers of animals seen and their location. Notes must also be made of other items of interest, such as nests, mating, tracks, faeces, cadavers, or sounds.

4. These field observations must be transferred periodically to the above-mentioned map for subsequent analysis by a wildlife biologist.

Wildlife censuses should be done at times of greatest expected activity, i.e. during early morning or late afternoon. The above procedure is only a broad outline for a trail census. An exact method will have to be worked out when plans to undertake it are firmed up. After several censuses patterns of sightings will emerge for a number of species, which can be useful as indices for trends in their population status.

3.5.3 Buffer Zone Management

At this time, there are no buffer zones to protect the reserve from inadvertent or willful disturbances. Land-use activities, such as logging and slash-and-burn agriculture, can take place right up to the reserve's borders. To maintain the integrity of the nature reserve, buffer zones must be established along its outside borders (including the Coppename River, the Tanjimama Creek and the Kwama Creek). In these buffer zones only limited human activities should be allowed to take place. Besides protecting the reserve, buffer zones can be developed for sustainable land-use activities for local people (see section 2.2.5).

Buffer zones ought to retain their natural vegetation cover as much as possible; where disturbed (or even clear cut), regeneration of the original habitat should be attempted. Buffer zones can best be developed for sustainable-use projects to benefit local people. If the areas are public lands, the Government could manage them as Forest Reserves (see section 3.4), and start agroforestry projects. If the intended area is a private concession, the owner must be approached to arrive at a mutually acceptable use of the zone.

The following buffer zones are proposed:

Zone 1. A strip of at least 200 meter width along the outside of the reserve borders. Allowable activities are: limited logging (with a special LBB permits only), sustainable agroforestry, some cattle grazing, collecting of secondary forest products.

There is an existing Kwinti logging concession which lies along the east side of the Coppename River, and runs to the Kwama Creek. For the benefit of the reserve, as well as for the welfare of the local people, provisions should be made to make sure that only sustainable activities are conducted here. In any case, there must be no clear-cutting -- especially along the river and creek banks.

Bordering the left bank of the Coppename River lies a logging concession of the Bruynzeel lumber company. This concession runs to the north border of (and even partially inside) the western section of the reserve. There is an ongoing dispute about this concession between the Surinam amerindians and Bruynzeel. Irrespective of the outcome of the dispute, efforts must be made to eliminate the part of the concession that lies within the reserve, and to maintain the 200 m wide buffer zone limit here also.

Zone 2. A strip of at least 200 meter width and 0,5 km length along both sides of the Coppename River; upstream from the south border, as well as downstream from the north border.

Human activities can cause erosion along the banks of the rivers and creeks. To provide clean and unpolluted river water for the reserve facilities and downstream settlements, attention must be paid to maintaining the integrity of this water supply. In these buffer zones no agriculture, logging or cattle grazing may take place, nor should the strip be used as a disposal site for any type of garbage or waste products. The rules necessary to accomplish this will have to be discussed with representatives of the local population, so that there is concurrence regarding their necessity.

Management of the buffer zones can be a joint project of STINASU, LBB, and local people. Advice for the best, sustainable land-use applications may be sought from other Government agencies or Non-Government agencies (NGOs), but LBB must be the management authority. Local people should have a large voice in the selection of projects and must be the major beneficiaries. As such they must also take the responsibility for the day-to-day work to be done in the buffer zones. Buffer zones must be clearly demarcated by signs with the relevant rules posted in such a way that even illiterate people can understand them.

3.6 Research, Education, Tourism

Even though there is no direct, overland connection, the Raleighvallen/Voltzberg Nature Reserve is not difficult to reach from Paramaribo and other coastal population centers. The various ways to travel to the reserve are given in section 1.2. The reserve is virtually untouched by human manipulations and it has a number of plant and animal communities that make it an interesting site for research, education and tourism. During the seventies the reserve was increasingly being used for this purpose, but with the armed invasion by the jungle commando on 23 February 1987 it came to an abrupt halt. Now that peace prevails, and the interior of the country is freely accessible again, a new start can be made with these activities.

3.6.1 Research

Because of its location, the Raleighvallen/Voltzberg Nature Reserve provides an excellent opportunity to conduct a variety of biological research. The reserve has undisturbed tropical forest ecosystems, some of which are sharply delineated. Because of the richness of these biological communities, and their associated ecotones (border zones between different habitats), there is high biological diversity. During the seventies the reserve became more and more known as a superb place to do fieldwork in a variety of ecological and biological disciplines.

Before the outbreak of the armed conflict in the interior, there was a small meteorological field station on Foengoe Island for gathering climatological data. These data were not only useful for researchers working in the reserve, but they also provided comparative information for projects elsewhere in the country. The station has been destroyed, but LBB and STINASU should get together with the Meteorological Services in order to start up this important data gathering project again.

A well-equipped research center can make an important contribution to promoting scientific research in the reserve. The Raleighvallen/Voltzberg Nature Reserve offers the possibility of a broad spectrum of field studies and is extremely well suited for the establishment of such a center. If the center is constructed somewhere near the Raleighvallen sula complex in the Coppename River, a hydro-power installation can be built, which can provide all the necessary electricity needed for the center at little cost (see section 3.9.4).

3.6.2 Education

The Raleighvallen/Voltzberg Nature Reserve has been used much less for nature education than the Brownsberg Nature Park. This is in large part due to the Park being closer to Paramaribo. The reserve, however, has a number of tropical ecosystems that are different from those in the Park and it could play a much greater role in nature education projects. By building an education and information center, the visiting public can become better informed about the general goals of nature conservation and the specific functions of the reserve (see section 3.9.1).

3.6.3 Tourism

The Raleighvallen/Voltzberg Nature Reserve is eminently suited for nature tourism. There are only few places in the world where undisturbed tropical rainforest can be found in such splendor and which are so readily accessible (see section 1.2). The reserve's potential as a center for nature tourism has so far not been fully realized. At present, only the area around the Raleighvallen rapids complex and the immediate area around the Voltzberg are being used for tourism. It is only a rare occurrence when a visitor has the opportunity to travel to the Van Stockumberg, the Tanjimama Creek or the Kwama Creek. Furthermore, the area with which the reserve was enlarged in 1986, has not even been opened to tourism yet. Hikes to some of the remote areas in the reserve will not be without hardship, but they fit perfectly in nature travel programs that are currently being advertised by travel agencies under the euphemistic oxymoron of "eco-tourism."

It would be extremely useful to build a jeeptrail between the Zanderij to Washabo road (see figure 2) and the left bank of the Coppename River near Foengoe island. This jeeptrail can provide a substantial savings in the operating costs of the reserve for LBB and STINASU. Personnel and supplies can come by road, which would eliminate the difficult and costly water transport. Tourists will also have the option of traveling overland with their own car. This is not only cheaper for them, but also for STINASU, since fewer boats and less personnel will be needed.

In the vicinity of the Manarivallen there are a number of waterfalls where one or more hydro-electric installations can be set up. Heights of some of these waterfalls vary between 4-10 m, even in the dry seasons. This is more than enough capacity to supply the facilities at Foengoe Island with electricity all year long (see section 3.9.4). The installations need not be expensive. Construction costs increase exponentially with demands for high efficiency, but the abundance of hydro-power potential in the area is such that efficiency of a mini hydro-power installation plays a minor role here. As a matter of fact, running a centrifugal pump in reverse (as a turbine) may already give enough power for Foengoe Island. Several simple systems are known, which can be constructed in-house by LBB (Stoner, 1974; Anon., 1985).

At several locations along the approximately 7½ km long trail to the Voltzberg (see figure 3), shelters should be built where personnel and tourists can rest or hide from the rain. As much as possible, these shelters should be built near creeks with potable water (see section 3.9.5).

There are excellent sites in the Raleighvallen/Voltzberg Nature Reserve for birdwatchers. Ecotones (border zones between different plant communities) are usually richer in birds and other wildlife species than the more homogeneous areas. By the same token, some seasons are better than others to observe wildlife. For instance, September and October are excellent months to look for nectar-feeding and seed-eating birds because many of the trees are in bloom or produce seed at that time. The best places and seasons to observe certain bird species should be identified, marked, and published in brochures to attract more nature tours, especially those with foreign birdwatchers.

The system of nature trails in the reserve must be upgraded and expanded. Where present (especially near inselbergs) trails should lead to panoramic views. In addition, the new, western part of the reserve must be surveyed in order to develop a system of nature trails which lead to interesting sites. This expansion is useful for the following reasons:

a) it wil make new areas available for scientific research, nature education, and nature tourism;

b) it will enable STINASU to build tourist facilities in the new, western part of the reserve;

c) it will increase the potential for nature tourism in Suriname.

During the development of new trails, consideration must be given to the needs of handicapped people, and the limited hiking capabilities of older visitors. Therefore, some trails should be laid out on fairly level terrain and loop back to their starting points. Walking time of such trails to be no more than 60 minutes. For instance, the current trail that runs the length of Foengoe Island is a good example of a path that can easily be made smoother to accommodate people with a physical disability.

Other new trails can be made to go to more adventurous, and distant places, such as the Van Stockumberg or the Tanjimama Creek. Along these paths (and near sites with potable water) shelters or simple overnight huts must be built. These shelters must also have a latrine nearby. All trails must be patrolled regularly in order to cut well-marked detours around fallen trees. Trails can be identified by color codes, names, or both. One attractive method is to name them after legendary or historical figures, animals, or plants.

Tourism is currently the most thriving industry in the world, For a growing number of countries it has become the most important source of foreign currency income. Nature tourisme is increasingly focusing in on tropical rainforest, something Suriname still has an abundance of. The rainforest in the Raleighvallen/Voltzberg Nature Reserve is virtually undisturbed; it is relatively easily to reach, which means that the reserve provides a great opportunity for the development of this type of tourism.

To keep pace with this trend, STINASU has developed several posters and brochures over the years to promote the attractions Suriname has to offer nature tourists. The result has been that Suriname has gained a reputation with birdwatchers and other nature lovers as an excellent place to visit. The Raleighvallen/Voltzberg Nature Reserve has become internationally known. Since its opening to the public the numbers of visitors increased steadily. Only because of the problems in the interior did these numbers decrease. Table 3 gives an indication of this growth for the various nature reserves (including the STINASU-owned Brownsberg Nature Park) in Suriname for the period 1973-1987.

Now that peace has been obtained, and the situation in the interior is becoming normalized, nature tourism can once again make an important contribution to the foreign currency component of the Surinam economy. But to develop this type of tourism, an extensive promotion program is needed to advertise Suriname for the unique country that it is for tourism. Brochures of good quality, showing the attractions Suriname has to offer, must be produced. Examples are: undisturbed tropical rainforest, pristine beaches, where four species of marine turtles come to nest, thousands upon thousands of migratory shorebirds, unique bushnegro cultures in the interior. No other country in the region can offer all this. STINASU already has top quality brochures, but they must be updated before they can be reprinted. The next step must be to develop working relationships with a number of tourist bureaus in other countries in order to promote Suriname as a desirable place to visit.

YEAR	BEACHES*	BROWNSBERG	RALEIGHVALLEN	TOTAL
1973	510	2101	1988	4599
1974	500	4032	1923	6455
1975	526	4428	3049	8003
1976	619	4910	2629	8158
1977	1117	6662	3054	10833
1978	1500	7782	4726	14008
1979	2640	8405	6882	17927
1980	2087**	7076	4499	13662
1981	2950	7063	4669	14682
1982	2022	9292	4471	15785
1983	1531	7025	2239	10795
1984	1131	5771	1766	8668
1985	----	----	----	5127
1986	----	----	----	5186
1987	----	----	----	532

Notes: * = Matapica + Galibi.
** = visitors to Galibi during May, June, and July are not included.

1986: because of armed conflicts, Galibi closed in July and Brownsberg closed in December.

1987: because of armed conflicts, Raleighvallen closed in February.

Table 3 - Annual Numbers of Visitors to the Nature Reserves for the Period 1973-1987 (Source: STINASU).

The important tourist markets are in Europe and North America. A significant limiting factor in attracting tourists from these two regions is the route monopoly of Surinam Airways (SLM) and Royal Dutch Airlines (KLM). The unreasonably high travel costs and the unreliability of flight schedules make people reluctant to fly to Suriname for recreation. Another problem is in getting dependable reservations because of the favoritism shown by SLM personnel to friends and relatives. These must not be considered minor problems. There are numerous complaints from abroad about this, and about the service extended to foreign visitors. If Suriname is serious about trying to promote international tourism, especially nature tourism, a radical change is needed in customer service, flight schedules, and prices. Suriname is located within only a few hours flighttime from the richest source of tourists available, namely the USA. Tourism from the USA to the Caribbean region is a multi-million dollar industry. If international tourism is indeed to be encouraged, the Government will have to establish open competition on its airline routes, and sanitize the favoritism practices by personnel of its national carrier.

3.7 Administrative Structure

The responsibility for the country's system of protected areas rests with the Ministry of NH, which has given the responsibility for managing the nature reserves to LBB. The day-by-day management of the reserves is carried out by personnel of NB of LBB. The development and exploitation of the nature reserves for tourism is in the hands of STINASU.

The Raleighvallen/Voltzberg Nature Reserve must have a resident manager and a chief game warden; these functions may be held by one and the same person. The reserve's administration is to be maintained by the manager, who must report periodically to his superior in Paramaribo. Figure 12 is a proposed organizational chart for managing the Raleighvallen/Voltzberg Nature Reserve.

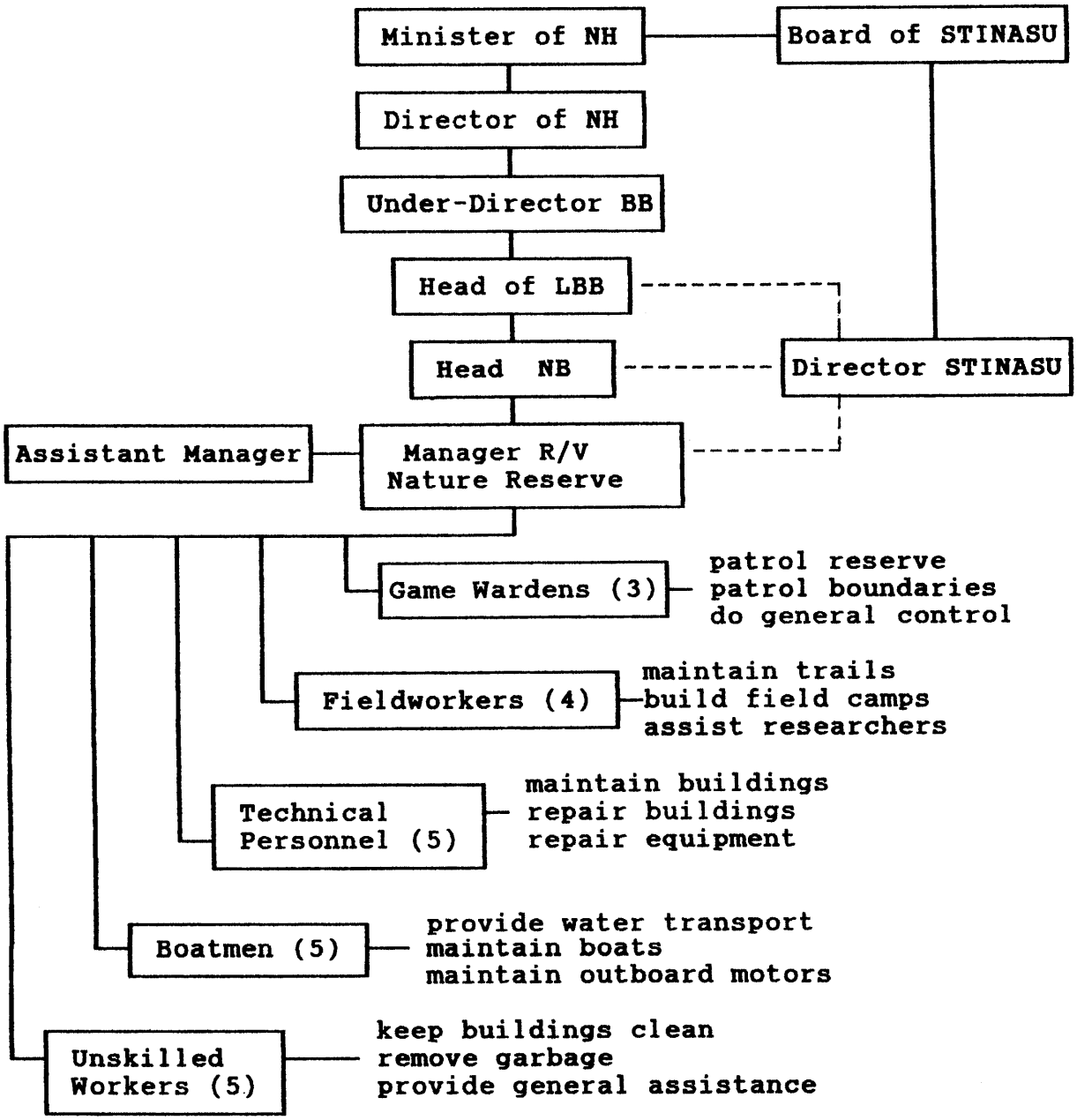
3.8 Personnel

For the proper management of the reserve, a team of qualified and motivated personnel is required. Workers should be carefully selected, not only for their skills, but also for their character. A poor relationship among a few employees can affect the morale of the entire staff, something that can have an adverse effect on the implementation of management tasks.

Reserve personnel should wear recognizable clothes. This means that, when on duty, all reserve personnel must wear a uniform with the reserve logo sewn on the upper left sleeve of the outer garment. Each worker must also wear a name tag that is clearly visible. To attain an adequate level in field skills, and to ensure that visitors are treated in a cordial manner, all staff members must follow a training course (see section 3.8.4 and Appendix L).

3.8.1 Recruitment

The current 5-year management plan recommends the quick establishment of a full complement of reserve personnel. Whenever possible, workers should be recruited from the local population. Knowing the language and being intimately familiar with the local traditions will help immeasurably towards sound management of the reserve. It cannot be emphasized enough that the support of local people is essential for the successful management of a protected area that lies within their sphere of interest (see section 2.2.5).



BB	= Forestry Sector of NH
LBB	= Surinam Forest Service
NH	= Ministry of Natural Resources
NB	= Department of Nature Conservation of LBB
RV	= Raleighvallen/Voltzberg
STINASU	= Foundation for Nature Preservation in Suriname
————	= lines of direct communication
-------	= lines of indirect communications
(x)	= number of required persons

Figure 12 - Organization chart for the Raleighvallen/Voltzberg Nature Reserve

3.8.2 Line Management and Reporting

The reserve can only be effectively managed when clear lines of responsibility have been established. The ones proposed in figure 12 should be followed as closely as possible. Game wardens and fieldworkers have to record the events of the day (such as wildlife sightings and observed violations) in field notebooks. A standard format of reporting ought to be developed. The manager is to review and evaluate the reports and submit them -- including his own overview for this period -- every three months to his superior in Paramaribo. The reserve manager receives instructions from Paramaribo, but he must have broad authority to deal with urgent matters on his own.

3.8.3 Terms of Reference and Workplans

Each worker must be given a statement of responsibilities and within this framework perform the tasks assigned by the reserve manager or his designated substitute.

3.8.3.1 Reserve Manager

The key to success in running the reserve is the managerial capability and the diplomatic skill of the person in charge. The reserve manager is an important link between higher authorities and the public. It is essential that the manager is familiar with the goals of the reserve, its history, and its future development. He must have a good understanding of the principles of conservation, and be able to answer questions posed by tourists, researchers, or local people. The manager must see to it that transgressions into the reserve are prevented or, at least, remain limited. He must therefore have a clear mandate from his superiors to take the necessary steps to do so.

The manager should be a mid-staff level person with at least the equivalent of a Junior College education, and must have some conservation and personnel management experience. He will have to be proficient in Dutch and Sranan Tongo. A working knowledge of English is desirable. He will be responsible for the day-by-day activities necessary for an efficient management of the reserve. The manager must stay in touch with reserve visitors to ensure their comfort and safety. He is to be kept informed by his superior on all proposed fieldwork and research activities to be undertaken in the reserve. The manager will periodically accompany guards and fielworkers on patrols or visit projects to check work habits of field personnel. The manager must submit quarterly reports of his activities to his superior, the Head of NB in Paramaribo.

Specific terms of reference are as follows:

-- Supervise all reserve personnel and make out work rosters

-- Establish and maintain project schedules

-- Maintain contact with regional government officials

-- Maintain a good relationship with Kwinti leaders

-- Coordinate and facilitate tourist activities

-- Take appropriate action on reported violations of regulations

-- Take periodic inspection tours through the reserve

-- Prepare quarterly reports on reserve-related activities

3.8.3.2 Assistant Manager

The assistant manager is to assist the manager in the execution of his duties and, during the latter's absence, will take on the duties of the reserve manager. He will then be the acting reserve manager. The assistant manager must be proficient in Dutch and Sranan Tongo. A working knowledge of English is recommended. He must see to it that all workers assigned to the reserve's workforce perform their duties. The assistant manager reports to the reserve manager, or in his absence to the Head of NB in Paramaribo.

Specific terms of reference as are follows:

-- Assist the reserve manager as required

-- Supervise workers and work activities as assigned by manager

-- Maintain workers schedules as assigned by manager

-- Take periodic inspection tours

-- Report any violations of regulations to the reserve manager

-- Receive and accommodate tourists and other visitors

-- Maintain a diary on reserve-related happenings

-- Prepare and submit monthly report to the reserve manager

3.8.3.3 Game Wardens

Game wardens are the key workers for the protection of the reserve. Poaching of wildlife, collecting of plants, and logging must be prevented as much as possible. Lack of properly trained personnel is the major reason that protection of the reserve is inadequate at this time.

Game wardens are required to patrol the reserve regularly in accordance with a rotation schedule prepared and approved by the manager. They must patrol the reserve's borders, note any evidence of infringements, inspect markers and signposts, and arrange for repairs if needed. Patrols are to be performed frequently, but at irregular periods to avoid providing potential tresspassers with a predictable patrol pattern. They must also patrol buffer zones for possible problems. If some local people have permission to use the buffer zones, game wardens must control their activities to ensure that these are sustainable and that they do not impinge on the integrity of the reserve. They must guard against intrusions into the reserve of activities such as subsistence agriculture, hunting, fishing, camping, or illegal logging. Game wardens, when on duty, must wear a uniform (see section 3.8), and carry a sidearm.

Game wardens must be periodically reviewed on their knowledge of the laws and regulations as these relate to the reserve. They must also be taught some basic ecology (see section 3.8.4 and Appendix L). They should know something about the reserve's history and its salient features. Game wardens must be kept informed about developments, research projects, and education activities going on in the reserve. They should never be placed in a position where they may appear ignorant to the public.

Terms of reference are as follows:

-- Patrol reserve boundaries, inspect markers, report deficiencies

-- Patrol reserve trails in assigned section

-- Take appropriate action on observed violations of regulations

-- Ensure that visitors do not abuse the reserve's resources

-- Maintain notebook on reserve-related activities

-- Submit monthly reports on reserve-related events to manager

3.8.3.4 Fieldworkers

The importance of fieldworkers must never be underestimated. Personnel from elsewhere is often assigned to a less well-staffed area without regard to the individual's ability or experience. No nature reserve should be used as a catch-all reservoir for excess field personnel. An experienced fieldworker is as valuable as a game warden. Standards must be set to measure the ability of an individual to qualify as a fieldworker. They should be taught the basics of ecology, biological diversity, and conservation (see section 3.8.4 and Appendix L). Fieldworkers must be able to answer questions from visitors on these subjects. These workers are in daily contact with reserve visitors; they not only represent LBB and STINASU, but their country as well. A correct and positive attitude will help in promoting a good reputation for Suriname.

Fieldworkers are to perform the duties assigned to them by the reserve manager. As deemed necessary by the manager, fieldworkers will also assist researchers and guide tourists or other visitors. Fieldworkers should, especially during the low-season, accompany game wardens on patrols in order to become familiar with the entire reserve, and to record interesting biological and ecological phenomena. During patrols, trails and associated markers should be inspected for needed repair. Minor repairs to be made at that time, and major problems to be conveyed to the manager or assistant manager. When on duty, fieldworkers must wear proper uniforms with insignia and name tag (see section 3.8).

Terms of reference are as follows:

-- Patrol the assigned reserve section as scheduled by the manager

-- Assist or accompany researchers and tourists as directed

-- Accompany game wardens on patrols and boundary inspections

-- Maintain trails, trailmarkers, and information signs

-- Maintain a field notebook on reserve-related observations

-- Submit monthly reports on reserve-related events to the manager

3.8.3.5 Technical Personnel

Technical personnel consists of skilled workers who are responsible for the proper functioning of all reserve facilities. This category includes carpenters, plumbers, mechanics, and other craftsmen who are necessary to keep the reserve facilities in good running order. Carpenters and plumbers will maintain the buildings; mechanics are responsible for ensuring that all reserve equipment: vehicles, motors, power generators, pumps, and such remain in good running order.

When necessary, technical personnel must make repairs to equipment and facilities. Mechanics must prepare the maintenance schedules for all equipment that need them. These schedules must have the approval of the reserve manager before being used. To limit the number of skilled workers needed for the reserve, a person experienced in several of the above-mentioned categories is to be preferred.

Terms of reference are as follows:

-- Maintain all reserve facilities and equipment in good condition

-- Perform periodic maintenance procedures on equipment

-- When necessary, arrange for equipment transport to Paramaribo

-- Operate equipment (if qualified) as assigned by the manager

-- Inform manager timely when supplies or parts are needed

-- Report defective equipment immediately to the manager

3.8.3.6 Boatmen

Boatmen are responsible for the STINASU and LBB transport of personnel, tourists, researchers, and materials over water to and from the reserve. They must see to it that their boats, motors, lifesaving gear, and other equipment necessary for travel over the river are readily available and in impeccable condition.

Boatmen are responsible for loading and fueling their boats. They are to perform all routine maintenance duties on the equipment assigned to them. Defects beyond their capability to correct should be reported to the manager. During the river trip boatmen must wear a uniform with the reserve logo sewn on it (see section 3.8).

Terms of reference are as follows:

-- maintain boats and outboard motors in optimal condition

-- be responsibility for the proper loading of baggage and persons

-- make sure that all life-saving gear is in good condition, and that it is on board during the trip

-- perform routine maintenance on boats, motors, and related gear

-- report major equipment problems immediately to supervisor

3.8.3.7 Unskilled Workers

Unskilled workers are those people primarily assigned to keeping the reserve headquarters facilities clean. They will also assist other workers in a variety of menial duties as assigned by the manager. Although no specific skills are required of them, they should receive training in dealing with the public. These workers do not necessarily need a uniform but, when on duty, they must be properly dressed and wear a tag identifying them as a member of the reserve's workforce.

Terms of reference are as follows:

-- Inspect and clean all sanitary facilities; report deficiencies

-- Sweep out all buildings daily; report defects

-- Keep headquarters area, trails, shelters, and field camps clean

-- Remove garbage daily, and dispose of it in designated areas

-- Perform other general tasks as assigned by manager

3.8.4 Training

Prior to manning their posts, all workers assigned to the reserve should receive training in regulations and legislation concerning hunting and conservation. Training for guards should include the proper use of firearms. All reserve personnel should be taught some basic skills in ecology, in wildlife recognition, history of the reserve, and in dealing with the public. Appendix L is an outline for such a training course. As a minimal alternative, some of the workers could receive on-the-job training. This should be done as early as possible after their arrival in the reserve.

3.9 Facilities in the reserve

After the raid by the jungle commando in 1987, all personnel and researchers working in the reserve were chased off and there was no time to prepare equipment and facilities for the long-term absence of maintenance that would follow. Members of the raiding party stole the boats and outboard motors that were part of the reserve inventory, and they went as far as stealing the personal belongings and food supply of personnel, researchers, and visitors.

In subsequent months, virtually all corrugated roofplates were removed by unknown persons. Besides damage done through vandalism, all reserve buildings were destroyed because of exposure to the weather. A recent visit to the reserve (in September 1992) showed that the framing of most of the damaged buildings is still strong, and that some of these structures could be made serviceable again within a short time by using locally available materials (Reichart, internal LBB report, 1992).

3.9.1 Buildings

The buildings that stood on Foengoe Island were good. They had been built with the primary requirements of nature tourism in mind: comfort and hygiene. When reconstruction of the facilities is being considered, or replacement planned, it is recommended to maintain the same infrastructure. The only change suggested here is to use roofing of locally available, natural materials rather than the corrugated, galvanized roof plates that have been used in the past. Buildings with wooden shingles are not only cooler, but also more attractive; and such buildings fit better in the environment of a nature reserve. Wooden shingles can be made from the walaba tree (Eperua falcata). Another attractive style is to use thatched roofs made of tas (Geonoma baculifera). These small palms grow profusely in the reserve, especially on Foengoe Island. Roofs made of tas keep buildings cool. A tas roof is prone to insect deterioration but, if periodically fumigated with campfire smoke, or treated in other ways, it will stay serviceable for many years. For buildings where rain must be used for the water supply, preference should be given to corrugated metal roof plates in order to catch the rain.

New buildings can also be constructed from rocks. There are many, medium-sized rocks near Foengoe Island, and a relatively small amount of cement is needed to stabilize the stone walls. Construction is labor-intensive, but the material (except for the cement) is virtually free. The result will be a building that fits in the environment and is virtually indestructable. Removal of the rocks should be from nearby areas not frequented by tourists.

Where cement buildings are being planned, consideration can be given to the use of earthen building blocks made with the socalled CINVA-RAM. This is a wellknown construction technique that has been especially developed for the construction of low-cost buildings in remote areas (Anon., 1988b). These building block require 8 - 10% cement to be added to sand and clay -- materials locally available. Such buildings are not only cheap, but also lasting and easy to keep clean. Construction is labor-intensive, but inexpensive in material costs.

It is recommended not to deviate from the current lay-out of the emplacement on Foengoe Island; in other words: reconstruct the damaged buildings in the same location where they are now and use the same interior divisions.

Education and Information Center

The only new building that should be constructed on Foengoe island is an education and information center. This center is needed to provide visitors with information about the reserve and to increase their knowledge about the goals of nature conservation. The center can also be used for workshops, seminars, films and slide shows. The center should be designed with at least the following spaces:

a reception area - where visitors can get verbal, printed, or visual information about the reserve; where they can purchase items such as T-shirts, posters, cards, books, maps, and art objects made by local artisans.

a display room - where visitors can look at displays on the natural history and archaeology of the reserve, such as feathers, animal tracks, skins, skulls, indian artifacts. Options to be considered for future additions can be a diorama of the entire reserve and an aquarium showing some of the locally occurring ornamental fish.

a lecture room - where films, slide shows, workshops, and seminars can be held.

The center should also have an added space (such as a veranda) where visitors can relax, and where informal nature talks can be given. A small restaurant, managed by local people, is an option.

The right location for this center must be carefully chosen. It must fit in the current infrastructure on Foengoe island, and provisions must be made for easy access by visitors, especially physically handicapped ones.

Research Center

The Raleighvallen/Voltzberg Nature Reserve is an excellent place for scientific investigations in all facets of the natural sciences. A fully equipped research center would not only be an asset for the reserve but it will attract researchers from all over the world to do their projects in Suriname. For many years pleas have been made to set up a research and training center in the Raleighvallen area. Countries like Costa Rica and Panama have such institutes and have derived considerable benefit, financial as well as scientific, from fieldwork done there. Foreign researchers doing fieldwork here can give seminars, workshops, or training courses for Surinam students. The Conservation Action Plan for Suriname (CAPS) gives further information on this (Mittermeier et al, 1990).

The center must be located far away from the part of the reserve that is frequented by tourists. It must be built near the Coppename River so that the hydro-potential of nearby waterfalls can be used for the generation of the electrical power that will be needed on a 24 hour per day basis.

The research center can be designed only after its location along the river has been determined, but the following, general lay-out can already be considered:

Laboratory - this is the most important part of the center; it must be fully equipped for analysis, preservation, and storage of organic and anorganic materials. This implies, among others: cold rooms, freezer spaces, microscopes, electronic equipment.

Library - this should be a secure space for storing scientific literature, and be comfortably equipped as a study hall, and a reading and writing room.

Conference Room - this space must be fully equipped for conducting seminars, workshops, conferences, and other meetings.

Living Quarters - these are individual cottages for housing the principal investigators (and family) working in the reserve. Each cottage should be self-sufficient in household equipment.

Group Accommodation - This is a dormitory-type building for housing research assistants and visiting students attending field courses. The building must have a large dining room and communal kitchen.

Animal housing - these are spaces for the temporary housing of live animals needed for research purposes. These spaces must comply with all requirements of sanitary and humane treatment of the animals. The most stringent regulations must be imposed to ensure the proper care, treatment, and subsequent release of the animals.

When plans to develop a research center in the reserve become more concrete, information should be obtained about the experience Costa Rica and Panama have had with their centers in order to learn from possible mistakes made, and improvements suggested.

3.9.2 Water Supply

Cleanliness and hygiene are the most important requirements of tourism. The Raleighvallen/Voltzberg Nature Reserve has adequate facilities for this, but improvements are necessary and can easily be made. The first improvement concerns the potable water supply. Nature tourists generally do not impose unreasonable demands for comfort, but the quality of drinking water must be above reproach. That can not be guaranteed at this time.

The water supply for most buildings (for human consumption as well as flush toilets) on Foengoe Island is periodically pumped out of the Coppename River and stored in large, concrete storage tanks. Although the water from the river looks unpolluted and very clean, provisions must be made to guard against possible contamination. The water must be checked for pollution that, for instance, could be caused by a dead animal lying nearby in the river. Such control is currently not present. The water storage tanks are also not adequately protected against pollution, The covers of these tanks consist of corrugated metal roof plates that do not close properly. Small animals, such as bats, mice, rats, reptiles, and insects can easily get in. Their faecies or cadavers falling into the water can cause diseases. Rain falling on the tank covers absorbs airborne pollutants, animal droppings, and rotting plant material; through leakage it runs into the tanks. This rainwater then flows through underground pipes to the buildings for consumption and bathing.

Because of erosion, some plastic water pipes on Foengoe island have come to the surface. When exposed to ultra-violet lightrays, these plastic pipes become brittle and crack, adding to the threat of pollution.

For some buildings rain collected on their roofs is the source for consumption water. During this collecting process, the rain absorbs pollutants, animal droppings, and rotting plant materials lying on the roof; it then runs through unprotected plastic pipes into galvanized storage tanks.

These are all worst-case scenarios, and during the history of the reserve there have been no problems with polluted water. On the other hand, an outbreak of waterborne disease could seriously affect the reserve's reputation with nature tourists. Pumping all the water from the Coppename River is recommended. The quality of this water is probably better than anywhere else in the country. There is virtually no human presence upstream from the reserve and pollution is almost nil; but unforeseen events can happen, though. There should be provisions for periodically checking water quality and, if needed, to treat it chemically to keep it suitable for human consumption. To provide an reliable potable water supply for the reserve, the following recommendations are made:

Foengoe Island Facilities

1) Upstream from the southermost building on the island build a supply sump along the shoreline of the Coppename River and install a suction line (with foot valve and mechanical filter) to pump river water to existing storage tanks on the island.

2) Build a waterpump installation on the island as close as possible to the inlet sump. This installation must be either floating or adjustable in elevation to allow for varying water levels in the river. When in due time the river is used for electrical power generation (see section 3.9.4), a hydrophore can be installed for a fully automatic water supply. Another option is a solar-powered waterpump.

3) In a suitable location on Foengoe island, but near the storage tanks, build a sand-and-gravel filtration pit to purify the water organically before storing it in the reservoirs.

4) Install a small auxiliary tank where this water can be checked for possible pollution and where it can be treated chemically, if necessary.

5) Renew all covers on the existing watertanks and construct covers for new tanks in such a way to ensure that no polluting materials can enter, especially rainborne pollutants.

6) For buildings where rain is to be the source of the potable water supply, the roofs must be regularly cleaned. Gutters, pipes, and storage tanks must be carefully protected against possible pollution.

Lolopasi facilities

Rain is used for the potable water supply of the Lolopasi lodge. During the dry seasons there is usually not enough water for human consumption. A year-around water supply could easily be provided by the Coppename River. Although the same system as indicated by points 1 through 5 for the Foengoe Island supply could be used, there are simpler ways for Lolopasi.

a) The rapids at Lolopasi are strong enough to pump water to the lodge by the river's own power through the use of a so-called "Hydraulic Ram" (Inversin, 1987). No external power source is needed. Appendix M gives construction details for the ram.

b) A solar-powered waterpump could be installed to pump water to the storage tank near the lodge. Acquisition cost is high, but the pump will operate continually during daylight hours and is practically maintenance free. A storage battery is not needed, unless the generated electric power is also intended to be used for lighting.

Voltzberg Camp

In this camp there is often a shortage of water, especially during the dry seasons. The creek running nearby usually has not enough water to provide clean water for visitors to the Voltzberg camp. During the long dry season (see section 1.3.2) the creek is practically dry. In the creekbed, near the camp, there appears to be a small artesian well. For a more reliable and regular water supply this well should be tapped, and the water pumped and stored in a well-protected tank.

3.9.3 Sanitary Facilities

Some of the buildings have flush toilets, where the discharge flows into a septic tank. Because of the long period of inactivity, these systems should be inspected for proper functioning before being put to use again.

On Foengoe Island, and in some other places in the reserve, there are latrines. The sanitary conditions of these leave a lot to be desired. The existing latrines in the reserve are usually dirty and have almost always a bad odor. This last aspect can easily be remedied by adding a ventilation pipe. The building of latrines is often left to unskilled workers with the result that only little attention is given to proper sanitary requirements. There are all kinds of simple designs available (Anon., 1988b, 1991), and there is no reason why latrines should be uncomfortable, unhealthy, and smelly. The camp at the Voltberg, although frequently visited by tourists, does not even have a latrine. It is important that at least two units be built there. All latrines must be located some distance downstream from potable water sources and supply lines.

3.9.4 Electrical Facilities

To provide electrical power for the headquarters facilities is the biggest problem on Foengoe Island. Diesel fuel has to come from Paramaribo by road to Bitagron, and from there by boat to Foengoe Island. The loading, transfer, and unloading of fuel drums is troublesome, and damaging to trucks and boats. At times, personnel is injured during the transfer from truck to boat and from boat ashore. The cost of fuel keeps increasing; add to this the cost of vehicles and personnel. The maintenance of the power generators is costly and leaves a lot to be desired. A rational solution to these problems is the use of hydro-power. Foengoe Island lies amid a huge complex of rapids and waterfalls. Without adversely affecting the goals of the nature reserve, and its scenic beauty, hydro-power installations can be constructed to provide electricity to Foengoe Island. Electricity can be available 24 hours per day making, among others, the use of refrigerators and freezers possible.

Even though the building of a hydro-power installation has construction costs, these would be insignificant when compared to the continuous, and increasing costs of the fuel and its transport. Construction costs generally become exorbitant when high efficiency is demanded.The hydro-power potential of the Foengoe Island area is such that efficiency plays a minor role. A socalled "high-Tech" installation, with its accompanying high costs should, and can, be avoided, especially when appropriate technology is used (Meier, 1981). A Mitchell (Banki) turbine (Anon., 1985) is an excellent example of this. In fact, using a good-sized centrifugal waterpump, and running it in reverse direction as a turbine, would probably already be adequate. LBB and STINASU could build a simple installation themselves. If the power installation is close enough to Foengoe Island, a direct current system (DC) may be used. If alternating current (AC) is desired, simple regulator designs are available to maintain a constant AC output. The greatest cost will be the aquisition of transmission cables. To disturb the scenery the least, these cables should be placed underground. This requires insulated cables that are more expensive than above-ground cables (which usually do not need insulation). Underground cables will in the long run be cheaper anyway, because an above-ground cable system is often damaged by falling trees. Underground cables should be placed in trenches of about 30 cm deep; where the ground is excessively rocky, a shallower depth can be used. It is nonetheless advisable to have a stand-by power generator for emergencies.

3.9.5 Guard Posts and Shelters

If a jeep trail is constructed to the reserve (see section 3.6.3), a well-equipped guard post must be built at the start of the road, and must be staffed 24 hours per day. This guard post should have a small office space, living quarters for at least two persons, including all necessary living facilities. The guard post must have a 2-way radio connection with the headquarters on Foengoe Island and with all other LBB field stations in the region.

The jeep trail to the reserve must not become a public road, but should only be a service road for the reserve. The danger is that hunters and loggers could use the jeep trail for access to a pristine area. Access must therefore remain limited to reserve personnel, LBB/STINASU officials, and tourists with an admission pass. Where the jeep trail ends at the bank of the Coppename River across from Foengoe island, a small guard house should be set up for arriving visitors. This station to be staffed only during the day with personnel stationed on the island.

In certain, strategic locations, such as along hiking trails in the reserve, or at boat landing places, shelters must be built. These can serve as refuges against inclement weather or as resting places for hikers. These shelters can be of simple design, built along local, traditional lines. It must be clearly indicated that they are the property of STINASU/LBB, and that they are not to be used for other than stated purposes. When game wardens or other reserve workers are out on long patrols, somewhat more comfortable shelters, suitable for overnight stays, should be built.

3.9.6 Information Boards and Markers

Information boards of about 1.5 x 1.0 m should be set up at various strategic locations in the reserve. The information boards must have a map of the area (with a "you are here" marker), purpose of the reserve, regulations, and other general information useful for visitors. Information boards must be made from durable wood, with small, pitched roofs to protect them against the weather.

Boundary markers should be placed at all access routes into the reserve, such as where the Coppename River, creeks, and trails enter the reserve. These markers must be large enough to show the name of the reserve, some pertinent regulations, and a notice to abide by these rules. All hiking trails must be clearly marked by direction signs (see section 3.6.3).

Markers to be made of durable materials, and to be inspected regularly for possible damage. The writing on trail markers to be in Dutch and in English. Boundary markers to be in Dutch and Sranan Tongo. Some local people may be illiterate, and boundary signs should express messages also pictorially.

3.9.7 Equipment

To run the Raleighvallen/Voltzberg Nature Reserve properly requires almost the same utilities and logistics as for a small community. A certain amount of equipment and material is necessary for its proper operation. To develop a complete list of items goes beyond the scope of this management plan. Table 4 lists only some of the basic items recommended. A full inventory will have to be developed by the reserve manager in cooperation with pertinent personnel. That list must be submitted to the Head of NB and/or the Director of STINASU for follow-up.

ITEM	NO. REQ'D.
1000 kg pickup truck, 4-wheel drive *	2
2500 kg double cabin truck, 4-wheel drive *	1
7.5 KVA diesel power generator (120VAC)	2
large korjaal (45 feet, incl. all equipm.) **	4
small korjaal (30 feet, incl. all equipm.) **	3
40 HP outboard motor	4
25 HP outboard motor	5
12 VDC CB radio	2
12 VDC lead-acid battery	3
solar battery charger (12 VDC)	3
portable typewriter (non-electric)	2
35 mm camera	2
7 x 35 binoculars	4
airtight box (optics storage)	3
first aid kit	4

** trucks are for overland transport Paramaribo-Bitagron

** koriaal is local name for a native dugout canoe. Large ones to be used for river transport between Bitagron and Foengoe Island; smaller ones for local transport and for smaller loads to Bitagron.

The reserve must also have an assortment of the following items: life preservers, raincoats/ponchos, machetes, shovels, compasses, silica gel (for optical equipment), snakebite kits.

Table 4 - Basic Equipment necessary for the proper functioning of the Raleighvallen/Voltzberg Nature Reserve

3.9.8 Maintenance:

Maintenance of equipment and facilities should not be a haphazard activity -- to be undertaken after a problem has already surfaced. For the proper functioning of the reserve it is essential that a preventive maintenance program be set up. This implies the development of, and adherence to, a checklist giving maintenance instructions for tools and equipment. Pertinent personnel must be instructed in the proper use of each tool or piece of equipment they use. As such, the user is responsible for its maintenance.

The reserve manager is responsible to see to it that the proper usage and maintenance instructions are available, and that the correct operating procedures are being followed. The manager must make a masterlist of operating and maintenance instructions for the equipment that is being used in the reserve. He should also establish and control equipment service schedules, such as periodic oil changes and lubrication.

3.10 Implementation and Review of Management Plan

This management plan must not be considered as a final stage. Without its implementation it has no useful purpose. The document gives guidelines for the management and the development of the Raleighvallen/Voltzberg Nature Reserve for the period 1993-1997. The Ministry of NH must now make financial as well as technical assistance available to implement the tasks proposed in this management plan. Figure 13 proposes a time schedule of the major tasks to be carried out for implementating this management plan. Based on the goals set for the reserve, the manager should prepare annual workplans, including budgets to perform those tasks.

Due to changing circumstances, and because of progress in management techniques, necessary changes will indubitably become evident. These should be recorded and at the proper time be incorporated into the management plan document.

Toward the end of the current 5-year management period, a review of this entire project is necessary to evaluate its measure of success in developing and managing the reserve. The document should then be updated, revised, or expanded as needed.

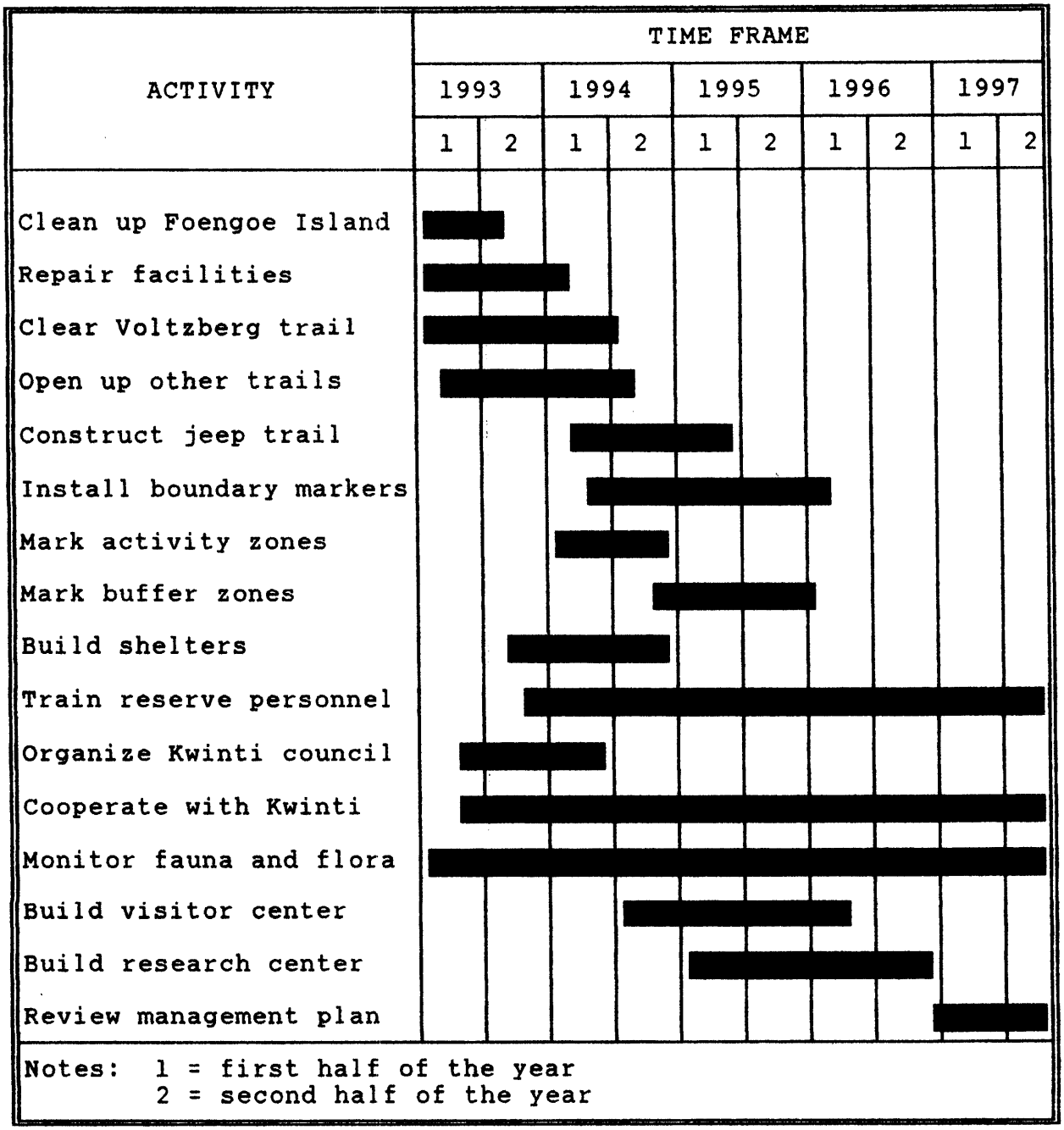


Figure 13 - Time schedule for the implementation of the Raleighvallen/Voltzberg Nature Reserve Management Plan

4. BIBLIOGRAPHY

Agerkop, T. 1992. Sranan, cultuur in Suriname. In: SRANAN cultuur in Suriname. Samenstelling en redactie: Chandra van Binnendijk en Paul Faber. Kon. Inst. voor de Tropen - Amsterdam/Mus.voor Volkenkunde - Rotterdam. 159pp.

Anon. 1980a. Woordenlijst Sranan Nederlands English, met een lijst van planten- en dierennamen. Stichting volkslectuur. 203pp.

Anon. 1980b. World conservation strategy. Living resource conservation for sustainable development. IUCN-UNEP-WWF.

Anon. 1985. Small Mitchell (Banki) turbine: A construction manual. Volunteers in technical assistance. Arlington, Virginia 22209, USA, 81p.

Anon. 1988a. Suriname planatlas. De stichting planbureau Suriname (SPS) afdeling regionale planning en ruimtelijke ordening (HARPRO).

Anon. 1988b. Village technology handbook. Volunteers in technical assistance. Arlington, Virginia 22209, USA, 422pp.

Anon. 1991. Privaten. Milieu informatie series. PAHO/WHO en het Ministerie van Volksgezondheid, Paramaribo, Suriname. Vol. 1. no. 9.

Axelrod, H.R., W.E. Burgess, N. Pronek, J.G. Walls. 1989. Dr. Axelrod's atlas of freshwater aquarium fishes, 3rd. Ed. T.F.H. Publications, Inc., Neptune City, NJ, USA. 797pp.

Baal, F.L. 1991 Legal aspects of protected areas in Suriname. Report prepared for the IV World Congress on National Parks and other protected areas, Caracas, Venezuela, February 1992. 30pp.

Baal, F.L., R.A. Mittermeier and M.G. van Roosmalen. 1988. Primates and protected areas in Suriname. Oryx, Vol 22 No. 1:7-14.

Bakhuis, L.A. 1902. Verslag der Coppename-Expeditie (met een kaart en 31 illustratiën). Overgedrukt uit het: "tijdschrift van het Koninklijk Nederlands Aardrijkskundig Genootschap, jaargang 1902." E.J. Brill, Leiden. 158pp.

Benjamins, H.D. en J.F. Snelleman. 1981. Encyclopaedie van Nederlandsch West-Indië. Met drie kaarten. Unchanged reprint of the original edition The Hague-Leiden, 1914-'17. Emmering, Amsterdam. 782pp.

Benno, P. 1971. Bijen en wespen verzameld in Suriname door fr. Solanus Essers. Raleighvallen aan de Coppename Rivier -22/23-IX-1971. STINASU rapport. 3pp.

Bruijning C.F. en J. Voorhoeve. 1977. Encyclopedie van Suriname. Elsevier. 716pp.

Duplaix, N. 1980a. Observations on the ecology and behavior of the giant river otter *Pteronura brasiliensis* in Suriname. Rev. Ecol. (terre Vie), Vol. 34:495-620.

---------- 1980b. Giant Otters: "Big Water Dogs" in Peril. National Geographic Magazine, 158:130-142.

Elst, D.H. van der, 1975a. The Coppename Kwinti: Notes on an Afro-American tribe in Surinam. I. History and development. Nieuwe West-Indische Gids No. 1, 50ste jaargang: 7-17.

---------- 1975b. The Coppename Kwinti: Notes on an Afro-American tribe in Surinam. II. Organization and development. Nieuwe West-Indische Gids No. 2 en 3, 50ste jaargang: 107-122.

---------- 1975c. The Coppename Kwinti: Notes on an Afro-American tribe in Surinam. III. Culture change and viability. Nieuwe West-Indische Gids No. 4, 50ste jaargang: 200-211.

Ernst, C.H. and R.W. Barbour. 1989. Turtles of the world. Smithsonian Institution Press. 313 pp.

Fleagle, J.G. en R.A. Mittermeier. 1981. Differential habitat use by *Cebus apella* and *Saimiri sciureus* in central Surinam. Primates, 22(3):361-367.

Goeje, C.H. de, 1934. Suriname ontdekt. Tijdschrift van het Koninklijk Nederlands Aardrijkskundig Genootschap, jaargang, deel I no 1. E.J. Brill, Leiden:51-89.

Goin, C.J. 1971. A synopsis of the tree frogs of Suriname. Annals of Carnegie museum, Vol.43: 1-23.

Haverschmidt, F. 1968. Birds of Surinam. Oliver and Boyd Ltd. Edinburgh and London. 445pp.

Held, M.M. 1984. Ecologisch onderzoek aan enkele bejaagde bosvogels in Suriname. Instit. voor de opleiding van leraren, Paramaribo, 102pp. + appendices.

Heyde, H. 1986. Surinaamse vissen. Drukkerij Westfort, Paramaribo Suriname. 154pp.

Holthuizen, A.M. en B.H. de Jong. 1977. Vegetatiekundig onderzoek in het Natuurreservaat Raleighvallen/Voltzberg. CELOS rapport 122:33pp.

Hoogmoed, M.S. 1968. Enige opmerkingen over herpetologische fauna van het Raleighvallen-Voltzberg Natuurreservaat. STINASU rapport. 4pp.

---------- 1971. Dendrobates, een kleurrijk genus. Het aquarium 41(8): 182-189.

---------- 1973. Notes on the herpetofauna of Surinam IV. The lizards and amphisbaenians of Surinam. Junk, Den Haag. 419pp.

---------- 1975. De hagedissen en wormhagedissen van Suriname. Overdrukken uit Lacerta 1974-1975.

Husson, A.M. 1962. The bats of Suriname. Zool. verhand. van het rijksmus. van nat. hist., Leiden: 282pp. + 30 pl.

---------- 1973. Voorlopige lijst van de zoogdieren van Suriname. Zool. bijdragen no. 14. Rijksmus. van nat. hist. Leiden. 15pp.

---------- 1978. The mammals of Suriname. Zool. Monogr. van het rijksmus. van nat. hist. no.2, Leiden: 569pp. + 151pl.

Ingels, J., J. Ribot en B. de Jong. 1984. Vulnerability of Eggs and Young of the Blackish Nightjar (*Caprimulgus nigrescens*) in Suriname. The Auk 101 (2):388-391.

Inversin, A. 1987. Hydraulic ram. Illustrated by G.R. Clark. Volunteers in Techn. assist. (VITA). 55pp.

Leeflang, E.C., J.H. Kolader en S.B. Kronenberg. 1976. Suriname in geografisch perspektief. Bolivar Editions. Paramaribo, Suriname. 120pp.

Lindeman, J.C. en A.M. Mennega. 1963. Bomenboek voor Suriname. Met tekeningen van W.H. Hekking. Dienst 's Lands Bosbeheer Suriname. 312pp + 96pl + 96 foto's.

Lindeman, J.C. and S.A. Mori. 1989. The Guianas. In: Floristic inventory of tropical countries, D.G Campbell and H.D. Hammond, Eds. N.Y. bot. garden sc. publ. dept.: 375-390.

Lovejoy, T.E. 1985. Rehabilitation of degraded tropical forest lands. IUCN commission on ecology occasional paper number 5. 8pp.

MacArthur, R.H. and E.O. Wilson. 1967. The theory of Island Biogeography. Monographs in population biology 1. Princeton University Press. 203pp.

MacKinnon, J. and K., G. Child, and J. Thorsell. 1986. Managing protected areas in the tropics. International union for conservation of nature and natural resources. 295pp.

Martin, K. 1888. Aantekeningen bij eene geognostische overzichtskaart van Suriname (Kaart VIII). In West-Indische Gids, achtste jaargang 1926/1927, negende deel: 444-453.

---------- 1927. De waardering van Voltz als pionier voor Suriname. In de West-Indische Gids., achtste jaargang 1926/1927, negende deel: 533-538.

Meier, U. 1981. Harnessing water power on a small scale: local experience with micro-hydro technology. Swiss Center for Appropriate Techn. St. Gall Univ. Switzerland. SKAT publ. No. 11, Vol 1. 169pp.

Mittermeier, R.A. 1977. Distribution, synecology and conservation of Surinam monkeys. Unpublished Ph.D. thesis in biological anthropology. Harvard University. 816pp.

Mittermeier, R.A. en J.G. Fleagle. 1980. Locomotor behavior, body size and comparative ecology of seven Surinam monkeys. Am. J. Phys. Anthrop. 52:301-314.

Mittermeier, R.A. en M.G. van Roosmalen. 1981. Preliminary observations on habitat utilization and diet in eight Surinam monkeys. Folia primatol. 36: 1-39.

Mittermeier, R.A., S.A. Malone, M.J. Plotkin, F. Baal, K. Mohadin, J. MacKnight, M. Werkhoven, T. Werner. 1990. Conservation action plan for Suriname. World Wildlife Fund. 50pp.

Moonen, J., W.Eriks, en K. van Deursen. 1979. Surinaamse slangen in kleur. Kersten en Co. 119pp.

O'Brien, P.A. 1977. Notes on the woodpeckers (Aves, Picidae) of Foengoe-Island. Dept. of Psychol. Univ. of Oregon. Non-published report. 4pp.

Pritchard, P.C. 1979. Encyclopedia of turtles. T.F.H. Publications, Inc.Ltd. 895pp.

Reichart, H.A. 1993. Raleighvallen/Voltzberg Natuurreservaat Beheersplan 1993 - 1997. WWF Project no. 6538. 162pp + 1 map.

Reid, W.V. and K. Miller. 1989. Keeping options alive, the scientific basis for conserving biodiversity. World Resources Institute. 128pp.

Roosmalen, M.G. van, 1979. Surinaams vruchtenboek. Instituut voor systematische plantkunde transitorium II. deel 1 (beschrijvingen) 326pp; deel 2 (platen) 230pp.

---------- 1981. De sociale organisatie van zwarte slingeraap in Suriname. De Levende Natuur 83(4): 169-177.

---------- 1985. Habitat preferences, diet, feeding strategy and social organization of the black spider monkey (*Ateles paniscus paniscus* Linnaeus 1758) in Surinam. Acta Amazonica, 15(3/4):Supplemento, Set/Dez. 238pp. illustr.

Scherpenzeel, C.W. 1977. Klimaat. In: Encyclopedie van Suriname, C.F.A. Bruijning en J. Voorhoeve, red. Elsevier: 338-347.

Schulz, J.P. 1960. Ecological studies on rain forest in Northern Suriname. Mededelingen van het Bot. Mus. en Herb. van de Rijksuniv. te Utrecht No. 163. 267pp.

Smart, P. 1977. The illustrated encyclopedia of the butterfly world. The Hamlyn Publishing Group. 275pp.

Staffeleu, P. 1975. Surinaamse zoogdierennamen. Zool. bijdragen No. 18. Rijksmus. Nat. Hist. Leiden. 74pp.

Stoner, C.H. 1974. Producing your own power. How to Make Nature's Energy Sources Work for You. Rodale Press, 322pp.

Stumpel, A.H. 1976. Herpetologische waarnemingen in Suriname. Rijksinstituut voor Natuurbeheer, intern reisrapport, Leersum. 16pp.

Trail, P.W. 1983. Cock-of-the-rock. Jungle Dandy. National Geographic Magazine 164(6): 830-839.

---------- 1984. The Lek mating system of the Guianan cock-of-the-rock: a field study of sexual selection. Ph. D. thesis presented to the faculty of the Grad. School of Cornell Univ. Univ. Microfilms Int'l. Ann Arbor, Mich. 262pp.

---------- 1985. Courtship Disruption Modifies Mate Choice in a Lek-Breeding Bird. Science, Publ. of the Am. Assoc. for the Adv. of Science, Vol. 227: 778-780.

Troon, F. van, 1984. Door een sibiboesi omgevallen bomen in het Natuurpark Brownsberg. STINASU Mimeograph. 9pp.

Vletter, D.R. de, 1984. Contributions to the geology of Suriname 9. Geologische Mijnbouwkundige Dienst van Suriname, mededeling 28-1984. 143pp.

Walker, E.P. 1975. Mammals of the world. Vol. I and II. 3rd. Ed. Johns Hopkins University. 1500pp.

Wekker, J.B. 1983. Historie, technieken en maatschappelijke achtergronden der karteringswerkzaamheden in Suriname sinds 1667. Rijkscommissie voor Geodesie, Delft, The Netherlands. 143pp. + Appendices.

Werkhoven, M.C. 1986. Orchideeën van Suriname Orchids of Suriname. Vaco Uitgeversmaatschappij. 256pp.

Werkhoven, M.C. and M.M. Held. 1989. Conservation of natural ecosystems versus land-use in Suriname. 62pp.

Wessels Boer, J.G., W.H. Hekking and J.P. Schulz. 1976. Fa joe kan tak' mi no moi, inleiding in de flora en vegetatie van Suriname. Deel I flora (plantenbeschrijvingen). Onder redactie van A.M. Mennega. STINASU natuurgids serie B no. 4. 293pp.

APPENDIX A

1954 No. 26

GOUVERNEMENTSBLAD

VAN

SURINAME.

LANDSVERORDENING van 3 April 1954, houdende voorzieningen tot bescherming en behoud van de in Suriname aanwezige natuurmonumenten.

IN NAAM DER KONINGIN!

DE WAARNEMENDE GOUVERNEUR VAN SURINAME,

In overweging genomen hebbende, dat het in het belang van wetenschap, recreatie en opvoeding, alsmede uit overwegingen van ethische, aesthetische en economische aard wenselijk is voorzieningen te treffen tot bescherming en behoud van natuurmonumenten in Suriname;

Heeft, de Raad van Advies gehoord, met gemeen overleg der Staten, vastgesteld onderstaande landsverordening:

Artikel 1.

Tot bescherming en behoud van de in Suriname aanwezige natuurlijke rijkdommen kan de Gouverneur, de Raad van Advies gehoord, bij besluit gronden en wateren behorende tot 's Landsdomein als natuurreservaat aanwijzen.

Artikel 2.

Om aangewezen te worden als natuurreservaat moet een gebied voldoen aan de volgende eisen:

dat het bescherming van overheidswege verdient uit hoofde van afwisselend natuur- en landschapsschoon en/of door de aanwezigheid van in wetenschappelijk of cultureel opzicht belangrijke flora, fauna en geologische objecten.

Artikel 3.

Het algemeen beheer over de natuurreservaten berust bij het Hoofd van 's Lands Bosbeheer, die daartoe het advies inwint van de Natuurbeschermingscommissie.

De Natuurbeschermingscommissie bestaat uit tenminste zeven leden.

Ambtshalve hebben als lid zitting:

1o. De Directeur van de Landbouw;
2o. Het Hoofd van 's Lands Bosbeheer;
3o. De Entomoloog bij het Landbouwproefstation;
4o. Het Hoofd van de Geologisch Mijnbouwkundige Dienst.

De overige leden, waarvan tenminste een Districts-Commissaris is, worden benoemd en ontslagen door de Gouverneur.

De Gouverneur wijst uit de leden de voorziter en secretaris aan.

Voorzover nodig wordt voor ieder reservaat een plaatselijk beheerder aangewezen.

Artikel 4.

Het Hoofd van 's Lands Bosbeheer kan, op advies van de Natuurbeschermingscommissie een natuurreservaat geheel of gedeeltelijk voor het publiek sluiten.

Het is verboden een krachtens het vorig lid gesloten gebied te betreden, tenzij met schriftelijke vergunning van het Hoofd van 's Lands Bosbeheer en met inachtneming van de daarin gestelde voorwaarden.

Artikel 5.

Het is verboden in een natuurreservaat:

a. met opzet of door onachtzaamheid schade toe te brengen aan de bodemgesteldheid, het natuurschoon, de fauna, de flora of handelingen te verrichten, waardoor afbreuk wordt gedaan aan de waarde van het reservaat als zodanig;

b. te kamperen, vuur te maken, hout te kappen of houtskool te branden, tenzij met een daartoe door het Hoofd van 's Lands Bosbeheer verkregen schriftelijke toestemming en met inachtneming van de daarin gestelde voorwaarden;

c. te jagen, te vissen en bij zich te hebben, zonder vergunning van het Hoofd van 's Lands Bosbeheer een hond, een vuurwapen of enig jacht- of vangmiddel.

No. 26

1954

Artikel 6.

De in de artikelen 4 en 5 bedoelde verbodsbepalingen zijn niet van toepassing op door het Hoofd van 's Lands Bosbeheer aangewezen personen, aan wie een speciale vergunning is verleend of opdracht is gegeven om, met inachtneming van de door dat Hoofd gestelde voorwaarden een of meer der in het genoemde artikel bedoelde handelingen te verrichten ten behoeve van wetenschappelijke, opvoedkundige, culturele of andere doeleinden.

Artikel 7.

Het Hoofd van 's Lands Bosbeheer kan schriftelijk vergunning verlenen aan bepaalde personen om overeenkomstig een door hem goedgekeurd plan in een niet afgesloten gedeelte van een natuurreservaat een bedrijf uit te oefenen, of aan de uitoefening van een bedrijf mede te werken, onder uitdrukkelijk voorbehoud, dat door deze personen of bedrijven generlei schade of afbreuk wordt gedaan aan het reservaat alszodanig.

Het Hoofd van 's Lands Bosbeheer kan schriftelijk vergunning verlenen aan bepaalde personen, om onder door hem gestelde voorwaarden in bepaalde door hem aangewezen gedeelten van natuurreservaten bos- en bosbijproducten in te zamelen, vee te weiden, dan wel de visserij uit te oefenen.

Artikel 8.

Overtreding van het bij of krachtens deze verordening bepaalde wordt gestraft met hechtenis van ten hoogste 3 maanden of geldboete van ten hoogste duizend gulden.

Artikel 9.

De voorwerpen of dieren waarmede de in artikel 8 bedoelde overtreding is begaan, of welke hebben gediend om deze overtreding voor te bereiden, te vergemakkelijken, te bevorderen of tot stand te brengen, met uitzondering van middelen van vervoer, worden zo spoedig mogelijk in beslag genomen en kunnen worden verbeurd verklaard.

De dieren, planten en voorwerpen die door middel van enige in artikel 8 bedoelde overtreding zijn verkregen, worden in beslag genomen en verbeurd verklaard.

Artikel 10.

De in of krachtens deze verordening strafbaar gestelde feiten worden beschouwd als overtredingen.

Artikel 11.

Met het opsporen van de bij of krachtens deze verordening strafbaar gestelde feiten zijn, behalve de in artikel 8 van het Surinaams Wetboek van Strafvordering aangewezen personen belast de daartoe door het Hoofd van 's Lands Bosbeheer aan te wijzen personen, die hun processen-verbaal opmaken op de eed afgelegd bij de aanvaarding hunner bediening.

Artikel 12.

Bij de aanwijzing van de natuurreservaten kunnen verdere voorschriften tot uitvoering van deze verordening worden gegeven, bij of krachtens besluit van de Gouverneur, de Raad van Advies gehoord.

Artikel 13.

Het toezicht op de uitvoering van de bij of krachtens deze verordening gestelde bepalingen en de behartiging van alle zaken op het gebied van natuurbescherming worden opgedragen aan het Hoofd van 's Lands Bosbeheer, die advies vraagt aan de Natuurbeschermingscommissie.

Artikel 14.

Deze landsverordening kan worden aangehaald als „Natuurbeschermingsverordening 1954" en treedt in werking op een nader door de Gouverneur te bepalen tijdstip.

Gegeven te Paramaribo, de 3de April 1954.

M. DE NIET.

De Landsminister van Landbouw, Veeteelt en Visserij,

F. A. LANGGUTH OLIVIERA.

Uitgegeven te Paramaribo, de 7de April 1954.

De Landsminister van Binnenlandse Zaken,

A. CURRIE.

APPENDIX B

1966 No. 59

GOUVERNEMENTSBLAD
VAN
SURINAME

LANDSBESLUIT van 22 april 1966 tot aanwijzing van tot 's Landsdomein behorende gebieden als natuurreservaat. („Natuurbeschermingsbesluit").

IN NAAM DER KONINGIN!

DE WND. GOUVERNEUR VAN SURINAME,

Overwegende, dat ter uitvoering van de artikelen 1 en 2 van de „Natuurbeschermingsverordening 1954" (G.B. 1954, no. 26) het nodig is het navolgende vast te stellen:

Heeft, de Raad van Advies gehoord, besloten:

Artikel 1

Tot bescherming en behoud van de in Suriname aanwezige natuurlijke rijkdommen worden de navolgende tot 's Landsdomein behorende gebieden aangewezen als natuurreservaat, te weten:

a. het gebied gelegen aan de Atlantische Oceaan begrensd:

ten Noorden:
door de laagwaterlijn langs de kust;

ten Oosten:
door een Noord-Zuidlijn op een afstand van 35000 m van de monding van de Oranjekreek;

ten Zuiden:

door een lijn, uitgaande van een punt op 2500 m Noord van de uitmonding van de Oranjekreek in de Cotticarivier en lopende vanuit dit beginpunt naar het Oosten in de richting ware Noorden 96° Oost tot een punt gelegen op een afstand van 31250 m;
Vanuit dit laatste punt in de richting ware Noorden 126° Oost tot het snijpunt met de Noord-Zuidlijn lopende op een afstand van 35000 m van de monding van de Oranjekreek; vervolgens door een lijn vanaf het beginpunt naar het Westen in de richting ware Noorden 276° Oost tot aan de Motkreek;

ten Westen:

door de Motkreek:

b. het gebied, gelegen aan de Atlantische Oceaan, ten Oosten van de Coppenamemonding en begrensd als volgt:

ten Westen en ten Noorden:

door de laagwaterlijn langs de kust;

ten Oosten:

door een Noord-Zuidlijn vanuit een punt, gelegen op 1000 m Oostelijk van de monding van de Tonihollokreek tot een punt op een afstand van 2000 m;

ten Zuiden:

door een lijn, vanuit laatstbedoeld punt in Westelijke richting evenwijdig aan de kust;

c. het gebied, waarbinnen gelegen de Lobles, de Klaiber- en de Brinckheuvel en begrensd als volgt:

ten Noorden:

door een lijn, vanuit een punt, gelegen op een afstand van 2500 m recht-Zuid en 2000 m, recht-Oost van de monding van de Miendrinetiekreek, in de richting ware Noorden 135° Oost tot een punt op een afstand van 11000 m;

ten Oosten:

door een lijn, vanuit laatstbedoeld punt in de richting ware Noorden 225° Oost tot een punt op een afstand van 5500 m;

ten Zuiden:

door een lijn vanuit laatstbedoeld punt, evenwijdig aan de Noordgrens tot een punt op een afstand van 11000 m;

ten Westen:

door een lijn vanuit laatstbedoeld punt evenwijdig aan de Oostgrens;

d. het gebied, waarbinnen gelegen de Raleighvallen, de Voltzberg, de Granmisiweri, de Granmisibergi, de van Stockum en de Mary-Josephineberg en begrensd:

ten Noorden:

door de linkeroever van de Kwama- of Maramekreek;

ten Oosten:

door een lijn op een afstand van 20000 m van de monding van de Tanjimamakreek in de richting ware Noorden 35° Oost;

ten Zuiden:

door de rechteroever van de Tanjimamakreek tot het snijpunt met een lijn in de richting recht-Noord, door de monding van voormelde kreek;

ten Westen:

door laatstgemelde Noord-Zuidlijn, tot het snijpunt met de linkeroever van de Coppenamerivier; vervolgens door de linkeroever van deze rivier tot het snijpunt met een lijn in de richting recht-Oost op een afstand van 5500 m van de monding van de Tanjimamakreek; verder door laatstbedoelde lijn in Oostelijke

richting tot het snijpunt met de rechteroever van de Coppenamerivier; tenslotte door voormelde rechteroever;

e. het gebied, rondom de Tafelberg en begrensd als volgt:

ten Noorden:

door een lijn, vanuit het astronomisch punt K aan de linkeroever van de Rechter-Coppename recht-Oost tot een punt op een afstand van 40000 m;

ten Oosten:

door een lijn, vanuit laatstbedoeld punt recht-Zuid tot een punt op een afstand van 36000 m;

ten Zuiden:

door een lijn, vanuit laatstbedoeld punt recht-West tot een punt op een afstand van 40000 m;

ten Westen:

door een lijn, vanuit laatstbedoeld punt recht-Noord tot voormeld astronomisch punt K;

f. het gebied, ten Noorden van het Kaysergebergte en begrensd als volgt:

ten Noorden:

door de linkeroever van de Lucierivier vanaf de monding van de Zuidrivier;

ten Oosten:

door de linkeroever van de Lucierivier en de waterscheiding tussen het Kaysergebergte en het Eilerts de Haangebergte;

ten Zuiden en ten Westen:

door de rechteroever van de Zuidrivier.

Artikel 2

Voor zover in de bij dit landsbesluit als natuurreservaat aangewezen gebieden in allodiale eigendom en erfelijk bezit, in erfpacht, in huur, in gebruik, in vergunning of in concessie uitgegeven percelen gelegen zijn, worden de uit kracht daarvan verkregen rechten geëerbiedigd.

Artikel 3

Dit landsbesluit laat, mede gelet op de artikelen 6 en 12 van de „Natuurbeschermingsverordening 1954" (G.B. 1954, no. 26), onverlet de mogelijkheid om in de bij artikel 1 van het onderhavige landsbesluit aangewezen natuurreservaten exploratie-werkzaamheden naar de mogelijkheden tot benutting van natuurlijke hulpbronnen, met inachtneming van door de Minister van Opbouw te geven aanwijzingen, te doen verrichten door daartoe van Landswege aangeduide instanties.

Artikel 4

1. Bij de inwerkingtreding van dit landsbesluit vervallen de resolutie van 5 februari 1953, no. 332, (G.B. 1953, no. 12) en het landsbesluit van 9 november 1961 (G.B. 1961, no. 164).
2. Dit landsbesluit, dat als „Natuurbeschermingsbesluit" kan worden aangehaald, treedt in werking met ingang van de dag, volgende op die der uitgifte van het Gouvernementsblad, waarin het geplaatst is.

Gegeven te Paramaribo, de 22e april 1966.

F. HAVERSCHMIDT.

De Minister van Opbouw,
J. RENS.

De Minister van Landbouw,
Veeteelt en Visserij,
HARRY S. RADHAKISHUN.

De Minister van Justitie
en Politie,
JAN H. ADHIN.

Uitgegeven te Paramaribo, de 22e april 1966.

De Minister van Binnenlandse Zaken,

J. A. PENGEL.

APPENDIX C

1986 No. 52

STAATSBLAD
van de
REPUBLIEK SURINAME

STAATSBESLUIT van 26 augustus 1986, houdende wijziging van de "Natuurbeschermingsbesluiten" van 22 april 1966 (G.B. no. 59) en van 23 mei 1969 (G.B. 1969 no. 47) en houdende de aanwijzing van tot Staatsdomein behorende gebieden als natuurreservaat ("Natuurbeschermingsbesluit 1986").

DE PRESIDENT VAN DE REPUBLIEK SURINAME,

Overwegende, dat, ter uitvoering van de artikelen 1, 2, 6, 7 en 12 van de "Natuurbeschermingswet 1954" (G.B. 1954 no. 26) in werking getreden bij G.B. 1954 no. 105, het nodig is het volgende vast te stellen;

Heeft, na goedkeuring door de Raad van Ministers, besloten:

Artikel 1

Ter uitvoering van artikelen 6, 7 en 12 van de "Natuurbeschermingswet 1954" wordt:

1. in artikel 3 van het "Natuurbeschermingsbesluit" van 22 april 1966 (G.B. 1966 no. 59) in plaats van de "Minister van Opbouw" gelezen "de Minister onder wie het bosbeheer ressorteert";
2. in artikel 3 van het "Natuurbeschermingsbesluit" van 23 mei 1969 (G.B. 1969 no. 47) in plaats van de "Minister van Mijnbouw, Bosbouw en Domeinen" gelezen "de Minister onder wie het bosbeheer ressorteert";

Artikel 2

In het Staatsbesluit van 22 april 1966 (G.B. 1966 no. 59), houdende aanwijzing van tot het staatsdomein behorende gebieden als natuurreservaat, wordt lid d van artikel 1 gewijzigd en als volgt gelezen:

Natuurreservaat Raleighvallen met de grenzen die hierna zijn omschreven en die op de bijgevoegde kaart — welke een integrerend deel vormt van dit Staatsbesluit — zijn getekend:

ten noorden: door een lijn vanaf de monding A van de Kwama- of Maramekreek in de richting ware noorden 270° oost tot het snijpunt G met de voormalige grens tussen de distrikten Nickerie en Saramacca, alsmede in oostelijke richting vanaf genoemde monding A door de Kwama- of Maramekreek tot het snijpunt B met de hieronder omschreven oostgrens;

ten oosten: door een lijn BC in de richting ware noorden 35° oost op een afstand van 20.000 m van de monding D van de Tanjimamakreek, welke lijn loopt vanaf de Kwama- of Maramekreek (punt B) tot aan de Tanjimamakreek (punt C);

ten zuiden: door de Tanjimamakreek vanaf het bovenomschreven punt C tot aan de monding D vervolgens door de Coppenamerivier tot de monding E van de Clementskreek;

ten westen: door een lijn vanaf de monding E van de Clementskreek in de richting van het ware noorden tot het snijpunt met de voormalige grens tussen de distrikten Nickerie en Saramacca, verder (in noordelijke richting) door vermelde distriktsgrens tot het snijpunt G met de noordgrens van het natuurreservaat als bovenvermeld.

Artikel 3

Tot bescherming en behoud van de in de Republiek Suriname aanwezige natuurlijke rijkdommen worden als natuurreser-

vaat aangewezen de navolgende tot het Staatsdomein behorende gebieden met de grenzen die hierna zijn omschreven en die op de bijgevoegde kaarten — welke een integrerend deel vormen van dit Staatsbesluit — zijn getekend:

1. Natuurreservaat PERUVIA en begrensd alsvolgt:

ten zuiden: door een lijn vanaf de rechteroevermonding A van de Peruviakreek recht-west tot een punt B op een afstand van 16.000 m;

ten westen: door een lijn vanuit laatst bedoeld punt B recht-noord tot het punt C op een afstand van 16.500 m;

ten noorden: — door een lijn (van ongeveer 22.500 m) vanaf punt C in de richting WN 107° oost tot het snijpunt D met de lijn DE;

— door een lijn (van ongeveer 3.300 m), die op een afstand van 1.500 m van de kreekmonding nabij de veerstoep van Jenny verloopt, vanaf het snijpunt D met de zoëven genoemde lijn CD tot aan het snijpunt E met de linkeroever van de Coppenamerivier;

ten oosten: door de linkeroever van de Coppenamerivier vanaf laatstgenoemd snijpunt E tot aan de rechteroevermonding A van de Peruviakreek.

2. Natuurreservaat WANEKREEK en begrensd alsvolgt:

ten zuiden: — door een lijn BC op een afstand van 3.000 m ten zuiden van de monding A van de Wanekreek in de richting recht-west vanaf het snijpunt B met de linkeroever van de Marowijnerivier tot een punt C op een afstand van 19.500 m;

— door een lijn (van ongeveer 3.000 m) vanaf punt C in de richting recht-noord tot het snijpunt D met de Wanekreek;

— door een lijn vanuit snijpunt D in de richting recht-west tot een punt E op een afstand van 6.900 m;

ten westen: door een lijn vanaf punt E in de richting recht-noord tot een punt F op een afstand van 23.250 m;

ten noorden: door een lijn (van ongeveer 25.600 m) vanaf punt F tot het punt G van de oostgrens;

ten oosten: — door de linkeroever van de Marowijnerivier vanaf snijpunt B tot snijpunt I van de lijn HI met de zoëven genoemde linkeroever;

— door een lijn op een afstand van 4.000 m ten noorden van de monding A van de Wanekreek vanaf snijpunt I in de richting recht-west tot een punt H op een afstand van 2.200 m;
door een lijn vanaf punt H in de richting recht-noord tot een punt G op een afstand van 12.200 m.

3. Natuurreservaat BOVEN-COESEWIJNE
en begrensd alsvolgt:

ten noorden: door een lijn in de richting WN 117° oost vanaf de monding H van de Boven Bradimofokreek tot een punt I op een afstand van 7.000 m;

ten oosten: — door een lijn vanaf punt I in de richting WN 207° oost tot een punt J op een afstand van 15.000 m;

— door een lijn vanaf punt J in de richting recht-oost tot een punt K op een afstand van 3.300 m;

— door een lijn vanaf punt K in de richting recht-zuid tot het snijpunt L met de rechteroever van de Coesewijnerivier;

ten zuiden: door een lijn vanaf het snijpunt L in de richting recht-west tot het snijpunt M met de linkeroever van de Coesewijnerivier;

— door de linkeroever van de Coesewijnerivier tot aan de rechteroevermonding A van de Goliathkreek;

— door de rechteroever van de Goliathkreek vanaf punt A tot het snijpunt B met het verlengde van de rechteroever van de hierna bedoelde kreek zonder naam;

— door de rechteroever van de hierna bedoelde kreek zonder naam vanaf punt B tot het snijpunt C met de lijn DC;

— door de lijn DC vanaf punt D in de richting recht-oost tot het snijpunt C met de rechteroever van de kreek zonder naam op een afstand van ongeveer 2.300 m;

ten westen: — door een lijn vanaf de monding H van de Bradimofokreek in de richting WN 207° oost tot een punt G op een afstand van 22.600 m;

— door een lijn vanaf punt G in de richting recht-zuid tot een punt F op een afstand van 1.500 m;

— door een lijn (van ongeveer 500 m) vanaf punt F in de richting recht-oost tot het snijpunt E met de oostelijke zijde van de bosontsluitingsweg zonder naam;

— door de oostelijke zijde van deze weg tot het punt D, welk punt D op een afstand van 12.000 m verwijderd ligt van het punt G.

4. Natuurreservaat COPI en begrensd alsvolgt:

ten oosten: — door een lijn (van ongeveer 12.200 m) vanaf de rechteroevermonding A van de Sarwakreek in de richting recht-noord tot een snijpunt Q met het verlengde van de zuidgrens van plantage Quapibo;

ten noorden: — door de zuidgrens van de plantage Quapibo en het verlengde van deze zuidgrens in oostelijke richting tot het zoëven bedoeld snijpunt Q;

— door de westgrens PONM van de plantage Quapibo tot het punt M op een afstand van 1.500 m vanaf de rechteroever van de Casewinica-kreek;

— door een lijn vanaf punt M in de richting recht-west tot een punt L op een afstand van 2.750 m;

— door een lijn vanaf punt L in de richting recht-zuid tot een punt K op een afstand van 750 m;

— door een lijn vanaf punt K in de richting recht-west tot een punt J op een afstand van 1.250 m;

— door een lijn vanaf punt J in de richting recht-zuid tot een punt I op een afstand van 5.000 m;

— door een lijn (van ongeveer 6.700 m) vanaf punt I in de richting recht-west tot het snijpunt H met de linkeroever van de zijtak van de Surnau-kreek;

ten westen: — door een lijn DF op een afstand van 400 m ten oosten van het snijpunt E van de Blakawatra-kreek met de bosontsluitingsweg naar Nieuw Java, welke lijn DF begint bij het snijpunt D met de noordelijke grens van de zoëven bedoelde weg en in de richting recht-noord verloopt tot het punt F op een afstand van 6.700 m;

— door een lijn (van ongeveer 3.250 m) vanaf punt F in de richting recht-oost tot het snijpunt G met de linkeroever van de zijtak van de Surnau-kreek;

— door de linkeroever van deze kreek tot het snijpunt H;

ten zuiden: — door de noordelijke grens van de bovenbedoelde bosontsluitingsweg vanaf het snijpunt D tot het punt C welke op 5.400 m afstand gelegen is van punt E;

— door de lijn (van ongeveer 2.250 m) vanaf punt C in de richting recht-oost tot het snijpunt B met de rechteroever van de Sarwakreek;

— door de rechteroever van de Sarwakreek vanaf punt B tot de rechteroevermonding A van de Sarwakreek;

Artikel 4

Voor zover in de bij dit Staatsbesluit als natuurreservaat aangewezen gebieden op de datum van inwerkingtreding van dit Staatsbesluit in allodiale eigendom en erfelijk bezit, in erfpacht, in huur, in gebruik, in vergunning of in concessie uitgegeven percelen, evenals dorpen en nederzettingen van in stamverband levende boslandbewoners gelegen zijn, worden de uit kracht daarvan verkregen rechten geëerbiedigd.

Artikel 5

Dit Staatsbesluit laat, mede gelet op de artikelen 6, 7 en 12 van de "Natuurbeschermingswet 1954", onverlet de mogelijkheid om in de bij artikelen 2 en 3 van het onderhavige Staatsbesluit aangewezen natuurreservaten exploratiewerkzaamheden naar de mogelijkheden tot benutting van natuurlijke hulpbronnen, met in achtneming van de door de Minister onder wie het bosbeheer ressorteert te geven aanwijzingen, te doen verrichten door daartoe van Staatswege aangeduide instanties.

Artikel 6

Dit Staatsbesluit, dat kan worden aangehaald als "Natuurbeschermingsbesluit 1986", wordt in het Staatsblad van de Republiek Suriname bekend gemaakt.

Het treedt in werking met ingang van de dag volgend op die van zijn bekendmaking.

Gegeven te Paramaribo, de 26ste augustus 1986.

L. F. RAMDAT MISIER.

De Minister van Natuurlijke Hulpbronnen en Energie,

H. S. KENSMIL.

Uitgegeven te Paramaribo, de 26ste augustus 1986.

De Minister van Binnenlandse Zaken, Districtsbestuur, Volksmobilisatie en Justitie,

J. A. WIJDENBOSCH.

1986 No. 52

STAATSBESLUIT van 26 augustus 1986, houdende wijziging van de "Natuurbeschermingsbesluiten" van 22 april 1966 (G.B. 1966 no. 59) en van 23 mei 1969 (G.B. 1969 no. 47) en houdende de aanwijzing van tot Staatsdomein behorende gebieden als natuurreservaat. (Natuurbeschermingsbesluit 1986).

NOTA VAN TOELICHTING

Artikelen 1 en 5:

De Minister onder wie het bosbeheer ressorteert.

Aangezien het Hoofd van Lands Bosbeheer het algemeen beheer over de natuurreservaten voert (artikel 3 van de "Natuurbeschermingswet 1954") is het gewenst dat aanwijzingen voor exploratie-werkzaamheden in de natuurreservaten geschiedt door de Minister onder wie het bosbeheer ressorteert. Deze formulering is beter aangezien de Dienst 's Lands Bosbeheer in de afgelopen jaren onder verschillende Ministeries heeft geressorteerd, namelijk:

— tot ultimo december 1980 onder het Ministerie van Mijnbouw, Bosbouw en Domeinen en van Opbouw.

— vanaf 1 januari 1981 tot 31 maart 1982 onder het Ministerie van Landbouw, Veeteelt, Visserij en Bosbouw.

— van 31 maart 1982 tot 31 maart 1983 onder het Ministerie van Natuurlijke Hulpbronnen en Energie.

— van 31 maart 1983 tot 1 februari 1985 onder het Ministerie van Landbouw, Veeteelt, Visserij en Bosbouw.

— en vanaf 1 februari 1985 onder het Ministerie van Natuurlijke Hulpbronnen en Energie.

Artikel 2:

Uitbreiding van het natuurreservaat Raleighvallen.

Ter stimulering van het natuurtoerisme is het van belang dat een deel van de westelijke oever van de Coppenamerivier en het gebied daarachter ook wordt opgenomen in het natuurreservaat Raleighvallen.

Daarenboven zal door de uitbreiding van voormeld natuurreservaat, dit bij uitstek geschikt worden om daarin een veldstation te plaatsen ten einde biologische onderzoekingen van grote zoogdieren te kunnen verrichten.

Het bovenstaande maakt het noodzakelijk dat de aangegeven grenzen in het Natuurbeschermingsbesluit (G.B. 1966 no. 59) voor het natuurreservaat Raleighvallen (zie artikel 1 lid d) worden verlegd. Gezien het feit dat er in het voorgestelde gebied geen ontwikkelingen gaande zijn of gepland zijn, is uitbreiding van het natuurreservaat zonder meer mogelijk.

Artikel 3:

Instelling natuurreservaten.

Natuurreservering maakt deel uit van het ontwikkelingsbeleid van de Surinaamse Overheid, die in de wetgeving (o.a. natuurbeschermingswet 1954 en Planwet 1973) vele argumenten voor natuurbehoud en -beheer opsomt. In de niet-brakke kustvlakte en de aangrenzende savannegordel komt een groot aantal unieke natuurlijke levensgemeenschappen van planten en dieren voor, die elders op de wereld ontbreken en nooit eerder werden gereserveerd.
Deze gebieden komen bovendien het meest voor natuurreservering in aanmerking, omdat het merendeel van de bevolking er is geconcentreerd en de meeste ontwikkelingsprojekten er werden en worden gepland resp. uitgevoerd; hierdoor wordt het steeds moeilijker representanten van en overgangen tussen bovengenoemde levensgemeenschappen te reserveren.

Op verzoek van de Dienst 's Lands Bosbeheer, die belast is met het beheer van de natuurreservaten, en de Stichting Natuurbehoud Suriname (STINASU) werd een drie jaar durende inventarisatie en kartering van de levensgemeenschappen van het Surinaamse laagland uitgevoerd. In 1978 kwam een overzicht voor dit gebied gereed alsook een ecosystemenkaart, schaal 1 : 200.000. In 1979 volgde de Nota "Aanbevelingen tot uitbreiding van het systeem van NATUURRESERVATEN en

BOSRESERVES in het Surinaamse laagland, Tweede, opnieuw bewerkte en aangevulde uitgave, Paramaribo, 1 oktober 1979 Dienst 's Lands Bosbeheer en Stichting Natuurbehoud Suriname".

Op grond daarvan en van tevoren zorgvuldig gekozen criteria (zie Hfst. III.5 van bovengenoemde Nota) voor de selectie van natuurgebieden werden tien gebieden geselecteerd, welke voor reservering in aanmerking komen. Deze gebieden liggen verspreid door het Surinaamse laagland, tussen of aansluitend op de uitgevoerde en geplande ontwikkelingsprojekten en tevens op openbaar domeinland. Tezamen met de eerder ingestelde reservaten in de brakke kuststrook omvatten ze alle nu bekende laagland levensgemeenschappen, inclusief de belangrijkste populaties van lokaal of internationaal bedreigde diersoorten.

Door de selectie van maximaal gevarieerde gebieden kon daarbij het totale areaal zo klein mogelijk worden gehouden. In Hfst. V van eerdergenoemde Nota worden de voorgestelde natuurgebieden besproken. De vier geselecteerde bosreserves zullen volgens de gebruikelijke procedure worden aangevraagd. De karakteristieken van de vier nieuwe natuurreservaten zijn alsvolgt:

1. Natuurreservaat Peruvia:

   Ritsengebied met afwisselend "natuur- en landschapsschoon" (gedeeltelijk reeds bosreserve): possentribossen, maurisibossen, blauwe raven.
   Cultureel erfgoed: sporen van pré-columbiaanse bewoning en drainagelandbouw.

2. Natuurreservaat Wanekreek:

   Oude ritsen- en schollenlandschap met afwisselend "natuur- en landschapsschoon": enige Surinaamse witzandsavannes op oude ritsen, drasse klei-savannes, Wanekreek en omgeving is rijk aan wild.
   Cultureel erfgoed: sporen van pré-columbiaanse bewoning drainage-landbouw en waterloopkundige werken.
   Sporen van eerste Marronvestigingen.

3. Natuurreservaat Boven-Coesewijne:

Schollen- en zanderijlandschap met afwisselend "natuur- en landschapsschoon": best bewaarde vertegenwoordiger der Surinaamse bruinzand-savannes. Coesewijnerivier met reuzenotters, zeekoeien en kaaimannen.
Cultureel erfgoed: sporen van pré-columbiaanse bewoning op residuaire heuvels.

4. Natuurreservaat Copi:

Schollen- en zanderijlandschap met afwisselend "natuur- en landschapsschoon": enige reserveerbare droge kleisavanne in Suriname. Casewinicakreek met kaaimannen.
Cultureel erfgoed: sporen van pré-columbiaanse bewoning, Cordonpad met oude militaire posten, kanonnen, begraafplaatsen, verlaten plantages.

Artikel 4:

"Traditionele" rechten en belangen van op- en omwonende boslandbewoners.

Bij de selectie van de natuurgebieden was het niet geheel te voorkomen dat er terreinen werden gekozen waarop op- of omwonenden "traditionele" rechten en belangen claimen. In verband hiermede werden er besprekingen gevoerd door functionarissen van de Dienst 's Lands Bosbeheer met het Bestuur en de adviseur van de "KANO" (de Vereniging van Indianen in Suriname) en met de plaatselijke dorpsbesturen en bewoners. Deze gesprekken hebben geresulteerd in een samenvatting van de sociale aspekten (zie Hfst. IV van bovengenoemde nota "Aanbevelingen tot uitbreiding van het systeem van natuurreservaten en bosreserves.....") en in de afspraak dat de op- en omwonende boslandbewoners die in stamverband leven hun "traditionele" rechten en belangen in de nieuw in te stellen natuurreservaten zullen behouden:

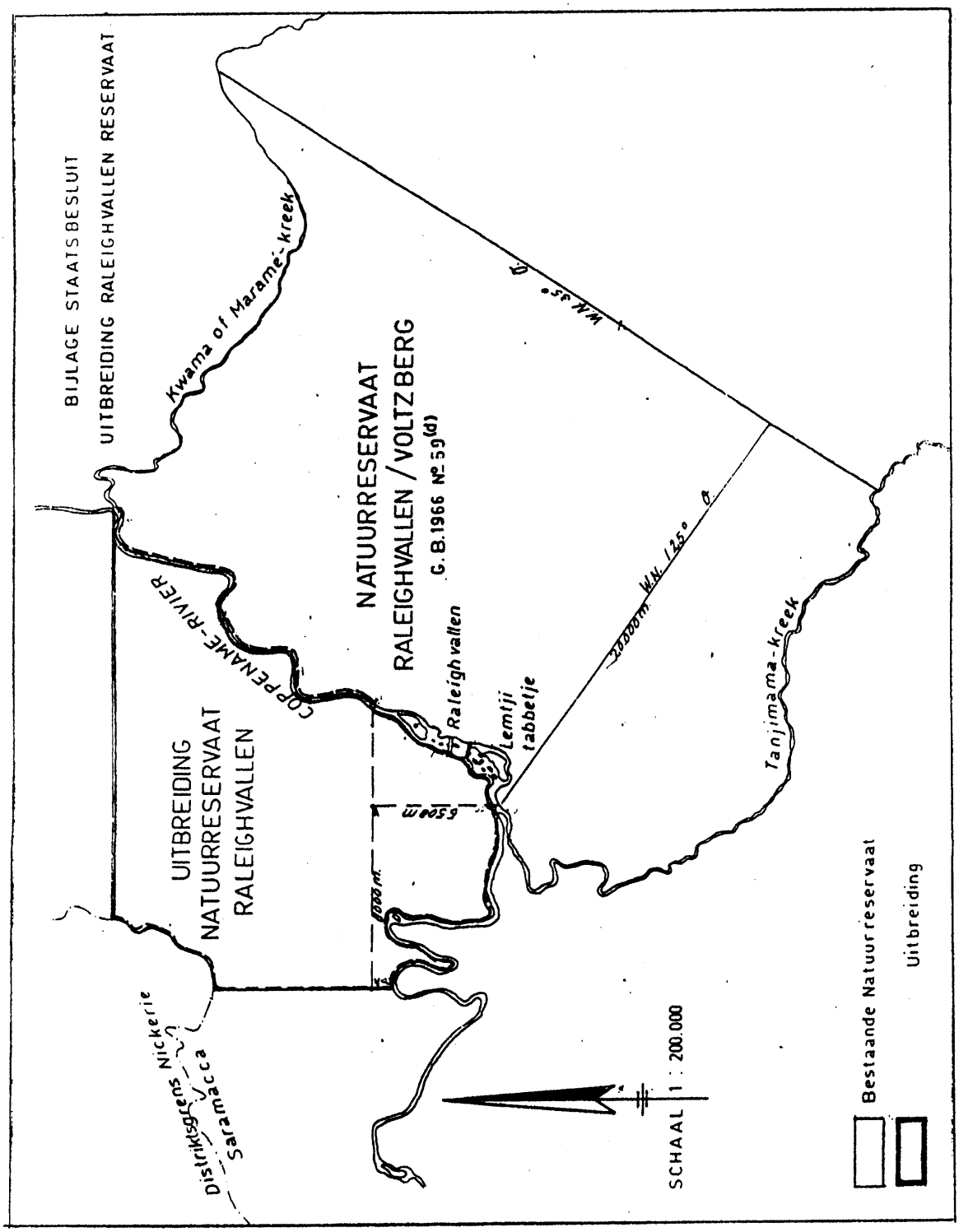
a. zolang er geen afbreuk wordt gedaan aan het nationale doel van de voorgestelde natuurreservaten;

b. zolang de motieven voor deze "traditionele" rechten en belangen nog gelden;

c. en gedurende het proces van toegroeien naar één Surinaams burgerschap.

De Minister van Natuurlijke Hulpbronnen en Energie,

H. S. KENSMIL.


BIJLAGE STAATSBESLUIT
UITBREIDING RALEIGHVALLEN RESERVAAT
Kwama of Marame-kreek
NATUURRESERVAAT
RALEIGHVALLEN / VOLTZBERG
G.B. 1966 Nº 59(d)
COPPENAME-RIVIER
UITBREIDING
NATUURRESERVAAT
RALEIGHVALLEN
Raleigh vallen
Lemtji tabbetje
Tanjimama-kreek
Distriktsgrens Nickerie
Saramacca
SCHAAL 1 : 200.000
Bestaande Natuurreservaat
Uitbreiding

APPENDIX D

1977 No.45

S T A A T S B L A D

van de

R E P U B L I E K S U R I N A M E

W E T van 3 augustus 1977 No.8821, tot wijziging van de op het tijdstip van inwerkingtreding van de Grondwet bestaande Rijkswetten en Algemene Maatregelen van (Rijks)bestuur, die in Suriname gelden, alsmede de landsverordening en de overige deze staat bezittende verordeningen.

DE PRESIDENT VAN DE REPUBLIEK SURINAME,

In overweging genomen hebbende, dat het wenselijk is de op het tijdstip van de inwerkingtreding van de Grondwet bestaande Rijkswetten en Algemene Maatregelen van (Rijks)bestuur die in Suriname gelden, alsmede de landsverordening en de overige deze staat bezittende verordeningen te wijzigen en in overeenstemming te brengen met de Grondwet voor de Republiek Suriname;

Heeft, de Raad van Advies gehoord, in gezamenlijk overleg met het Parlement, bekrachtigd de onderstaande Wet:

Artikel 1.

Overal waar in de op het tijdstip van inwerkingtreding van de Grondwet bestaande wettelijke regelingen staat:

a. "Landsverordening", "Verordening", "Algemene Verordening", "(Koninklijk)Besluit", "Rijkswet", of "Algemene maatregel van (Rijks)bestuur", respectievelijk "Landsverordeningen", "Verordeningen", "Algemene Verordeningen", "(Koninklijke) Besluiten", Rijkswetten" of "Algemene Maatregelen van (Rijks)bestuur", wordt voorzover nodig onder aanpassing van het op het Koninklijk Besluit betrekking hebbend lidwoord of voornaamwoord zomede het zelfstandig-naamwoord of het betreffende deel van het samengesteld zelfstandig naamwoord, gelezen: "Wet" respectievelijk "Wetten".

b. "Landsbesluit", "Besluit van de President" of "door de President bij besluit", wordt gelezen: "bij Staatsbesluit".

Artikel 2

1. In de op het tijdstip van inwerkingtreding van de Grondwet bestaande Rijkswetten en Algemene Maatregelen van (Rijks)bestuur die in Suriname gelden, alsmede de landsverordeningen en de daarmede gelijk te stellen verordeningen en besluiten worden, voorzover betrekking hebbend op het Surinamerschap en ingezetenschap de volgende wijzigingen aangebracht:

a. het woord "Nederlander" respectievelijk "Nederlanders" wordt vervangen door: "Surinamer" respectievelijk "Surinamers";
b. het woord "Nederlanderschap" wordt vervangen door: "Surinamerschap";
c. het woord "Nederlands" wordt vervangen door: "Surinaams ";
d. het woord "Nederlandse" wordt vervangen door: "Surinaamse".
e. de woorden "Nederlands onderdaan" respectievelijk "Nederlandse onderdanen" worden vervangen door: "Surinamer respectievelijk Surinamers";
f. de woorden "Nederlands onderdaanschap worden vervangen door "Surinamerschap";
g. de woorden "het Rijksdeel Suriname" respectievelijk" het Gebiedsdeel Suriname worden vervangen door: "de Staat".

2. De wijzigingen, zoals genoemd in het vorige lid, worden alleen aangebracht, indien uit de inhoud of context van de wettelijke regeling kan worden afgeleid, dat die wijzigingen niet in strijd komen met de strekking van deze wet.

Artikel 3.

Deze wet treedt inwerking met ingang van de dag volgende op die van haar afkondiging en werkt terug tot 25 november 1975.

Gegeven te Paramaribo, 4 augustus 1977

JOHAN H. FERRIER

De Minister van Justitie
en Politie,

E.A.HOOST

Uitgegeven te Paramaribo, 4 augustus 1977

De Minister van Binnenlandse Zaken.

C.D.OOFT

APPENDIX E
(as translated from Dutch)

MINISTRY OF ECONOMICS

AERONAUTICAL SERVICES DEPARTMENT

AERONAUTICAL INFORMATION SERVICE

AIRPORT ZORG EN HOOP

PARAMARIBO - SOUTH

POB: 1981

MAL NO: 73/81
d.d. 23 nov.'81

NOTICES TO AIRMEN

Preparatory to a Government resolution, whereby the airstrip at the RALEIGHVALLEN (MERA) in the district SARAMACCA is being designated as an airfield, in accordance with the applicable text of the Surinam Aeronautical Decree 1953 G.B. 102, G.B. 1955 No.69, it is herewith announced that since 2 September 1962 this airstrip, within the indicated limits, has been found suitable for landings and take-offs of aircraft.

NAME OF AIRFIELD	:	FOENGOE (MERA)
Geographic location	:	On the south side of the Foengoe Island near the Raleighvallen
Azimuth of landing strip	:	± 60°
Available length at		
Landing strip 24	:	480 M
Overrun	:	50 M
Available length at		
take-off strip 06	:	530 M
Overrun	:	Zero
Width	:	20 M
Approach sector	:	East 1:27 West 1:30
Carrying capacity	:	Greater than 15 Kg/cm²
Soil type	:	Sand; partially Sand/Clay
Height above sea level	:	- -
Slope	:	Max 2%

APPENDIX G
(see section 1.4.2)

AMPHIBIAN AND REPTILE CHECKLIST OF THE RALEIGHVALLEN/VOLTZBERG NATURE RESERVE

This list has been compiled from various publications regarding observations in the Raleighvallen/Voltzberg Nature Reserve, and from recorded sightings by visiting biologists. The original data and species lists are on file at STINASU and NB. Most Sranan Tongo names for animals were obtained from a Sranan Tongo-Dutch-English language dictionary (Anon., 1980a).

c = common
d = usually seen during daytime
n = usually seen at night
p = poisonous snake species
r = rare
? = presence not yet verified

TAXON	ENGLISH NAME	SRANAN TONGO	STATUS
CLASS AMPHIBIA			
Order GYMNOPHIONA			
Family: RHINATREMATIDAE	(worm salamanders)		
Rhinatrema bivittatum	worm salamander	-----	?
Order ANURA			
Family: PIPIDAE	(toads)	(todo)	
Pipa pipa	Surinam toad	pipatodo or swamptodo	c,n
Family: DEDROBATIDAE	(true frogs)	(todo)	
Colostethus spp.	-----	-----	c,n
Phyllobates femoralis	-----	-----	c,n
Phyllobates brunneus	-----	-----	c,n
Dendrobates trivittatus	-----	-----	c,n
Dendrobates tinctorius	-----	-----	---

Family: BUFONIDAE	(true toads)	(todo)	
Bufo marinus	giant toad	bigitodo or krastodo	c,n
Bufo guttatis	-----	-----	c,n
Bufo granulosus	-----	-----	c,n
Bufo typhonius	toad	-----	c,n
Atelopus pulcher	-----	-----	c,d
Family: HYLIDAE	(tree frogs)		
Hyla boans	reuzenboomkikker	-----	n
Hyla rubra	-----	-----	n
Phyllomedusa bicolor	-----	-----	n
Phyllomedusa hypochondrialis	-----	-----	?,n
Family: LEPTODACTYLIDAE	(whistling frogs)		
Leptodactylus mystaceus	whistling frog	-----	?,n
Eleutherodactylus spp.	-----		c,n

CLASS REPTILIA

Order TESTUDINES

Suborder CRYPTODIRA	(side-necked turtles)		
Family: EMYDIDAE	(freshwater) turtles)	(watrasekrepatu)	
Rhinoclemmys punctularia	Guiana wood turtle	(peni-ede) arakaka	?
Family: KINOSTERNIDAE	mud turtles)		
Kinosternon scorpioides	scorpion mud turtle	arakaka	?
Family: TESTUDINIDAE	(land tortoises)		
Geochelone carbonaria	red-footed tortoise	sabana-sekrepatu	?
Geochelone denticulata	yellow-footed tortoise	busi-sekrepatu	?

Suborder PLEURODIRA	(side-necked turtles)		
Family: CHELIDAE	(side-necked turtles)		
Phrynops nasutus	common toad-headed turtle	kron-neki, skoifineki	?
Phrynops gibbus	South American keelback turtle	kron-neki, skoifineki	?
Phrynops geoffroanus	Geoffroy's side-necked turtle		
Platemys platycephala	flat-headed flat-shelled turtle	kron-neki, skoifineki	?
Chelus fimbriatus	-----	-----	
Order SQUAMATA			
Suborder SAURIA	(lizards)	(lagadisya)	
Family: GEKKONIDAE	(geckos)		
Hemidactylus mabouia	-----	kamrawenke	n
Coleodactylus amazonicus	-----	-----	c,d
Gonatodes boonii	-----	-----	r
Gonatodes humeralis	-----	kamrawenke	c,d
Gonatodes annularis	-----	-----	d
Thecadactylus rapicauda	-----	kwakwasneki	c,n
Family: IGUANIDAE	(iguanas)	(legwana, legu)	
Tropidurus torquatus	-----	agama	c,d
Uracentron azureum	-----	-----	r,d
Uranoscodon superciliosa	-----	agama	c,d
Plica plica		agama	c,d
Plica umbra	-----	agama	c,d
Iguana iguana	-----	legwana	c,d
Anolis chrysolepis	-----	-----	c,d
Anolis punctatus	-----	-----	r
Anolis fuscoauratus	-----	-----	d
Family: SCINCIDAE	(skinks)		
Mabuya mabouya	skink	kamrawenke	c,d
Family: TEIIDAE	(tejus)	(lagadisya)	
Alopoglossus angulatus	-----	-----	c,d
Ameiva ameiva	-----	lagadisya	c,d
Arthrosaura kockii	-----	lagadisya	d
Tupinambis nigropunctatus	-----	sapakara	c,d

Family: TEIIDAE	(cont'd)		
Gymnopthalmus lineatus	-----	lagadisya	r
Gymnopthalmus underwoodi	-----	lagadisya	c,d
Bachia cophias	-----	lagadisya	r
Cercosaura ocellata	-----	-----	r
Kentropyx calcaratus	-----	lagadisya	c,d
Leposoma guianense	-----	lagadisya	c,d
Leposoma percarinatum	-----	-----	
Neusticurus bicarinatus	-----	-----	c,d
Neusticurus rudis	-----	-----	r,d
Tretioscincus agilis	-----	-----	r,d
Suborder AMPHISBAENIA			
Family: AMPHISBAENIDAE	(legless lizards)	(tu-ede-sneki)	
Amphisbaena alba	-----	tu-ede-sneki	n
Amphisbaena fuliginosa	-----	krarasneki	n
Suborder SERPENTES	(snakes)	(langaman)	
Family: TYPHLOPIDAE	(blind snakes)		
Typhlops reticulatus	blind snake		?
Family: LEPTOTYPHLOPIDAE	(thread snakes)		
Leptotyphlops tenella	-----	-----	c
Family: BOIDAE	(constrictors)		
Boa constrictor	boa constrictor	daguwesneki, gadosneki	c
Eunectes murinus	anaconda	aboma,boma	d
Epicrates cenchria	rainbow boa	eigron-aboma	r
Corallus caninus	emerald boa	popokaisneki, kadasneki	p

Family: COLUBRIDAE	(pseudo coral snakes)		
Oxyrhopus petola	-----	-----	n
Chironius fuscus	-----	ingibangi, lektere	d
Erythrolamprus aesculapii	false coral snake	krarasneki	r
Oxybelis argenteus	vine snake	titeisneki	c
Oxybelis aeneus	whip snake, ashy vine snake	titeisneki, busiswipi	c
Oxyrhopus petola	false coral snake	-----	c
Philodryas olfersii	-----	popokaisneki	?
Philodryas viridissimus	-----	popokaisneki	d
Family: ELAPIDAE	(coral snakes)	(krarasneki)	
Micrurus psyches	coral snake	krarasneki	c,p
Family: CROTALIDAE	(vipers)		
Bothrops atrox	fer-de-lance	owrukuku, labaria	c,p
Bothrops bilineatus	green tree viper	popokaisneki	c,p
Lachesis muta	bushmaster	makasneki kapasisneki	c,p

Order CROCODILIA

Family: ALLIGATORIDAE	(caimans)		
Paleosuchus trigonatus	smooth-fronted caiman	blakakaiman	c

APPENDIX H
(see section 1.4.2)

BIRD CHECKLIST OF THE RALEIGHVALLEN/VOLTZBERG NATURE RESERVE

This list has been prepared from the recorded observations of ornithologists, researchers, and expert birdwatchers, who have visited the Park over the years. Their checklists are on file at the offices of the Conservation Department of the Surinam Forest Service and STINASU. Some of the records have been obtained from Haverschmidt (1968). Most Sranan Tongo names for the birds were obtained from a publication called "Woordenlijst Sranan Nederlands English" (Anon., 1980a).

Status Code

c = common, usually noted daily in appropriate habitat.
h = heard only.
n = not common, often not observed on a daily basis.
r = rare, not expected to be seen in a week's time.
? = might occur, but presence has yet to be verified.

SPECIES	ENGLISH	SRANAN TONGO	REMARKS
Family: TINAMIDAE	(tinamous)	(anamu's)	
Tinamus major	great tinamou	mamafowru-anamu	c
Crypturellus soui	little tinamou	pikin-anamu	n
Crypturellus variegatus	bonte timanoe	redi-anamu	h
Crypturellus noctivagus	red-legged tinamou		c
Crypturellus cinereus	cinereous tinamou	anamu	c
Family: PHALACROCORACIDAE	(cormorants)	(doiklari)	
Phalacrocorax olivaceus	neotropic cormorant	doiklari	n
Family: ANHINGIDAE	(anhingas)		
Anhinga anhinga	anhinga	doiklari of fisman	c

Family: ARDEIDAE	(herons, egrets)		
Ardea cocoi	white-necked heron	kumawari	n
Butorides virescens	green heron	-----	n
Butorides striatus	mangrove-reiger	tyontyon	n
Egretta alba	common egret	sabaku	n
Pilherodius pileatus	capped heron	-----	n
Agamia agama	chestnut-bellied heron	-----	n
Nycticorax nycticorax	black-crowned nightheron	kwak, dikkop	n
Tigrisoma lineatum	rufescent tigerheron	tigrifowru	n
Family: THRESKIORNITHIDAE	(ibises, spoonbills)		
Mesembrinibis cayennensis	green ibis	korokoro	n
Family: CATHARTIDAE	(American vultures)	(tingifowru)	
Sarcoramphus papa	king vulture	granman-tingifowru	n
Coragyps atratus	black vulture	blaka-ede tingifowru	r
Cathartes burrovianus	lesser yellow-headed vculture	ger'ede tingifowru	c
Cathartes melambrotus	greater yellow-headed vulture	ger'ede tingifowru	n
Family: ACCIPITRIDAE	(kites, eagles, hawks)		
Elanus leucurus	white-tailed kite	-----	n
Elanoides forficatus	swallow-tailed kite	sesei-aka, sipifowru	c
Leptodon cayanensis	grey-headed kite	-----	n
Chondrohierax uncinatus	hook-billed kite	-----	n
Harpagus bidentatus	double-toothed kite	-----	n
Harpagus diodon	rufous-thighed kite	-----	n
Ictinia plumbea	plumbeous kite	gresi-aka	n
Accipiter bicolor	bicolored kite	-----	n
Accipiter superciliosus	tiny hawk	-----	n
Buteo albicaudatus	white-tailed hawk	-----	n
Buteo brachyurus	short-tailed hawk	-----	n
Buteo nitidus	grey hawk	-----	n

Family: ACCIPITRIDAE	(cont'd.)		
Leucopternis albicollis	white hawk	weti-aka	n
Leucopternis melanops	black-faced hawk	-----	n
Buteogallus urubitinga	great black hawk	blaka-aka	n
Morphnus guianensis	crested eagle	-----	n
Harpia harpyja	harpy eagle	gonini	r
Spizastur melanoleucus	black-and-white hawk-eagle	-----	n
Spizaetus ornatus	ornate hawk-eagle	-----	r
Spizaetus tyrannus	black hawk-eagle	-----	r
Circus buffoni	long-winged harrier	-----	r
Family: PANDIONIDAE	(ospreys)	(aka's)	
Pandion haliaetus	osprey	fisi-aka	r
Family: FALCONIDAE	(falcons, cracaras)	(aka's)	
Herpetotheres cachinnans	laughing falcon	alen-aka	n
Micrastur semitorquatus	collared forest-falcon	-----	n
Micrastur gilvicollis	lined forest-falcon	wetbere-aka	h
Daptrius ater	black caracara	gelfutu-aka	n
Daptrius americanus	red-throated caracara	busikaka, gowtuman	c
Milvago chimachima	yellow-headed caracara	tingifowru-aka	n
Polyborus plancus	crested caracara	-----	n
Falco deiroleucus	orange-breasted falcon	-----	n
Falco rufigularis	bat falcon	fremusu-aka	c
Family: CRACIDAE	(curassows, guans, chachalacas)		
Crax alector	black curassow	powisi	n
Penelope marail	marail guan	marai	n
Ortalis motmot	little chachalaca	wakago	c
Pipile cumanensis	white-headed guan, piping guan	wet'ede-marai	n

Family: PHASIANIDAE	(quails, partridges)		
Odontophorus gujanensis	marbled woodquail	tokoro	c
Family: PSOPHIIDAE	(trumpeters)		
Psophia crepitans	grey-winged trumpeter	kamikami	c
Family: RALLIDAE	(rails, gallinules)		
Aramides cajanea	grey-necked wood-rail	kriko	h
Family: EURYPYGIDAE	(sunbitterns)		
Eurypyga helias	sunbittern	sonfowru	r
Family: CHARADRIIDAE	(plovers, lapwings)		
Hoploxypterus cayanus	pied lapwing	-----	r
Family: SCOLOPACIDAE	(curlews, snipes, sandpipers)		
Tringa flavipes	lesser yellowlegs	-----	n
Actitis macularia	spotted sandpiper	snepi	c
Family: RYNCHOPIDAE	(black skimmers)	(fisman)	
Rynchops nigra	black skimmer schaarbek	fisman	n
Family: COLUMBIDAE	(doves, pigeons)	(doifi)	
Columba speciosa	scaled pigeon	peni-ati-busidoifi	n
Columba cayennensis	pale-vented pigeon	mangrodoifi	h
Columba subvinacea	ruddy pigeon	busidoifi	h
Columba plumbea	plumbeous pigeon	busidoifi	h
Columbigallina talpacoti	ruddy ground-dove	stondoifi	n

Family: COLUMBIDAE	(cont'd.)		
Leptotila verreauxi	white-tipped dove	pasidoifi, paskadoifi	c
Leptotila rufaxilla	grey-fronted dove	pasidoifi, paskadoifi	c
Geotrygon montana	ruddy quail-dove	redipaska	c
Geotrygon violacea	violaceous quail-dovef	-----	?
Family: PSITTACIDAE	(macaws, parrots, parakeets)	(rafru)	
Ara ararauna	blue-and-yellow macaw	tjambaraaf	c
Ara macao	scarlet macaw	bokraaf	c
Ara chloroptera	red-and-green macaw	warawrafru	n
Ara severa	chestnut-fronted macaw	rafruprakiki	c
Ara manilata	red-bellied macaw	morisiprakiki	n
Aratinga leucophthalmus	white-eyed parakeet	kofimamaprakiki	r
Aratinga pertinax	brown-throated parakeet	karuprakiki	c
Phyrrhura picta	painted parakeet	penikaruprakiki	c
Forpus passerinus	green-rumped parakeet	okroprakiki	n
Brotogeris chrysopterus	golden-winged parakeet	kankantri-prakiki	c
Touit batavica	lilac-tailed parrotlet	peniprakiki	n
Pionitus melanocephala	black-headed parrot	wetbereprakiki	n
Pionopsitta caica	caica parrot	-----	n
Pionus menstruus	blue-headed parrot	margriki	c
Pionus fuscus	dusky parrot	basra-fransmadam	c
Amazona ochrocephala	yellow-headed parrot	-----	n
Amazona amazonica	orange-winged parrot	kulekule	c
Amazona dufresniana	blue-cheeked parrot	----	?
Amazona farinosa	mealy parrot	mason	c
Deroptyus accipitrinus	red fan parrot	fransmadam	c

Family: CUCULIDAE	(cuckoos)		
Coccyzus melacoryphus	dark-billed cuckoo	-----	n
Coccyzus americanus	yellow-billed cuckoo	-----	n
Piaya cayana	sqirrel cuckoo	pikan	n
Piaya minuta	little cuckoo	pikin-pikan	n
Piaya melanogaster	black-bellied cuckoo	-----	r
Crotophaga ani	smooth-billed ani	kawfutuboy	c
Crotophaga major	greater ani	bigikawfutuboi	n
Family: TYTONIDAE	(barnowls)		
Tyto alba	barnowl	puspusi-owrukuku	?
Family: STRIGIDAE	(owls)	(owrukuku)	
Otus choliba	tropical screech-owl	-----	n
Otus watsonii	tawny-bellied screech-owl	-----	n
Glaucidium brasilianum	ferruginous pygmy-owl	-----	n
Lophostrix cristata	crested owl	-----	n
Pulsatrix perspicillata	spectacled owl	krabu-owrukuku	n
Ciccaba virgata	mottled owl	-----	?
Ciccaba huhula	black-banded owl	peniblaka-owrukuku	?
Asio clamator	striped owl	-----	n
Family: NYCTIBIIDAE	(potoos)	(butabuta, yorkafowru)	
Nyctibius grandis	great poto	poto	n
Nyctibius griseus	common poto	poto	n

Family: CAPRIMULGIDAE	(nightjars, nighthawks)	(butabuta, yorkafowru)	
Nyctidromus albicollus	pauraque,	-----	c
Lurocalis semitorquatus	semi-collared nighthawk	-----	n
Caprimulgus nigrescens	blackish nightjar	butabuta	c
Hydropsalis climacocerca	ladder-tailed nightjar	-----	n
Family: APODIDAE	(swifts)		
Streptoprocne zonaris	white-collared swift	-----	c
Chaetura chapmani	Chapman swift	-----	?
Chaetura spinicauda	band-rumped swift	-----	c
Chaetura brachyura	short-tailed swift	-----	c
Chaetura andrei	ashy-tailed swift	-----	?
Panyptila cayennensis	lesser swallow-tailed swift	-----	n
Tachornis squamata	fork-tailed palmswift	-----	c
Family: TROCHILIDAE	(hummingbirds)	(kownubri)	
Glaucis hirsuta	rufous-breasted hermit	-----	n
Phaethornis superciliosus	long-tailed hermit	-----	c
Phaethornis bourcieri	straight-billed hermit	-----	n
Phaethornis ruber	reddish hermit	korke	n
Phaethornis longuemareus	little hermit	-----	n
Campylopterus largipennis	grey-breasted sabrewing	-----	n
Florisuga mellivora	white-necked jacobin	-----	c
Anthracothorax nigricollis	black-throated mango	-----	n
Avocettula recurvirostris	fiery-tailed awlbill	-----	n
Chrysolampis mosquitus	ruby-topaz hummingbird	-----	n
Lophornis ornata	tufted coquette	-----	r
Discosura longicauda	racket-tailed coquette	-----	n

Family: TROCHILIDAE	(cont'd.)		
Chlorestes notatus	blue-chinned sapphire	-----	n
Chlorostilbon mellisugus	blue-tailed emerald	-----	n
Thalurania furcata	fork-tailed woodnymph	-----	c
Eupetomena macroura	swallow-tailed hummingbird	-----	n
Hylocharis sapphirina	rufous-throated sapphire	-----	n
Hylocharis cyanus	white-chinned sapphire	-----	n
Polytmus theresiae	green-tailed goldenthroat	-----	r
Amazilia fimbriata	glittering-throated emerald	-----	r
Topaza pella	crimson topaz	-----	c
Heliothrix aurita	black-eared fairy	-----	n

Family: TROGONIDAE	(trogons)	(donfowru)	
Trogon melanurus	black-tailed trogon	pingofowru	n
Trogon viridis	white-tailed trogon	otogi	c
Trogon collaris	collared trogon	-----	n
Trogon rufus	black-throated trogon	-----	c
Trogon violaceus	violacious trogon	udulosofowru	c

Family: ALCEDINIDAE	(kingfishers)	(fisman)	
Ceryle torquata	ringed kingfisher	-----	c
Chloroceryle amazona	Amazon kingfisher	-----	c
Chloroceryle americana	green kingfisher	-----	c
Chloroceryle aenea	pygmy kingfisher	-----	n
Chloroceryle inda	green-and-rufous kingfisher	-----	n

Family: MOMOTIDAE	(motmots)		
Momotus momota	blue-crowned motmot	-----	n
Family: GALBULIDAE	(jacamars)	(granmankorki)	
Galbula leucogastra	bronzy jacamar	-----	n
Galbula dea	paradise jacamar	-----	n
Galbula albirostris	yellow-billed jacamar	-----	n
Galbula galbula	green-tailed jacamar	-----	n
Brachygalba lugubris	brown jacamar	-----	n
Jacamerops aurea	great jacamar	-----	n
Family: BUCCONIDAE	(puffbirds)		
Notharchus macrorhynchos	white-necked puffbird	-----	?
Notharchus tectus	pied puffbird	-----	n
Bucco tamatia	spotted puffbird	-----	r
Bucco capensis	collared puffbird	-----	r
Malacoptila fusca	white-chested puffbird	-----	r
Nonnula rubecula	rusty-breasted nunlet	-----	n
Monasa atra	black nunbird	redimofo	c
Chelidoptera tenebrosa	swallow-wing	gronman	c
Family: CAPITONIDAE	(barbets)		
Capito niger	black-spotted barbet	papajafowru	c
Family:RAMPHASTIDAE	(toucans)	(kuyake)	
Ramphastos tucanus	white-throated toucan	bigikuyake	c
Ramphastos vitellinus	channel-billed toucan	blakanoso	c
Pteroglossus aracari	black-necked araçari	redi-bantji kuyake	c
Pteroglossus viridis	green araçari	stonkuyake	c
Selenidera culik	guianan toucanet	-----	c

Family: PICIDAE	(woodpeckers, piculets)	(temremans)	
Picumnus exilis	golden-spangled piculet	-----	n
Piculus rubiginosus	golden-olive woodpecker	-----	c
Piculus flavigula	yellow-throated woodpecker	-----	n
Piculus chrysochloros	golden-green woodpecker	-----	n
Celeus elegans	chestnut woodpecker	-----	n
Celeus undatus	waved woodpecker	-----	c
Celeus flavus	cream-colored woodpecker	-----	n
Celeus torquatus	ringed woodpecker	-----	n
Dryocopus lineatus	lineated woodpecker	-----	c
Melanerpes cruentatus	yellow-tufted woodpecker	-----	n
Veniliornis cassini	golden-collared woodpecker	-----	c
Campephilus melanoleucos	crimson-crested woodpecker	-----	c
Campephilus rubricollis	red-necked woodpecker	bigirediborsu	c

Family: DENDROCOLAPTIDAE	(woodcreepers)		
Dendrocincla merula	white-chinned woodcreeper	-----	n
Dendrocincla fuliginosa	plain-brown woodcreeper	-----	c
Glyphorynchus spirurus	wedge-billed woodcreeperr	-----	c
Dendrocolaptes certhia	barred woodcreeper	-----	c
Dendrocolaptes picumnus	black-banded woodcreeper	-----	c
Hylexetastes perrotti	red-billed woodcreeper	-----	n
Xiphorhynchus guttatus	buff-throated woodcreeper	-----	n
Xiphorhynchus pardolatus	chestnut-rumped woodcreeper	-----	c
Lepidocolaptes albolineatus	lineated woodpecker	-----	n
Campylorhamphus procurvoides	curve-billed cythebill	-----	r

Family: FURNARIIDAE	(spinetails)	(fityo)	
Synallaxis gujanensis	plain-crowned spinetail	-----	n
Synallaxis rutilans	ruddy spinetail	-----	c
Synallaxis cabanisi	Cabani's spinetail	-----	c
Philydor erythrocercus	rufous-rumped spinetail	-----	n
Philydor ruficaudatus	rufous-tailed spinetail	-----	?
Philydor pyrrhodes	cinnamon-rumped spinetail	-----	r
Automolus infuscatus	olive-backed foliage-gleaner	-----	n
Automolus ochrolaemus	buff-throated foliage-gleaner	-----	n
Xenops minutus	plain xenops	-----	n
Xenops tenuirostris	slender-billed xenops	-----	r
Xenops milleri	rufous-tailed xenops	-----	r
Sclerurus rufigularis	short-billed leafscraper	-----	r

Family: FORMICARIIDAE	(antbirds)	(mirafowru)	
Cymbilaimus lineatus	fasciated antshrike	-----	c
Frederickena viridis	black-throated antshrike	-----	r
Taraba major	great antshrike	-----	n
Sakesphorus melanothorax	band-tailed antshrike	-----	n
Thamnophilus doliatus	barred antshrike	-----	n
Thamnophilus murinus	mouse-colored antshrike	-----	c
Thamnophilus punctatus	slaty antshrike	-----	n
Thamnophilus amazonicus	amazonian antshrike	-----	n
Pygiptila stellaris	spot-winged antshrike	-----	n
Thamnomanes ardesiacus	dusky-throated antshrike	-----	n
Thamnomanes caesius	cinereous antshrike	-----	c

Family: FORMICARIIDAE (cont'd.)

Myrmotherula brachyura	pygmy antwren	-----	n
Myrmotherula surinamensis	streaked antwren	-----	n
Myrmotherula guttata	rufous-bellied antwren	-----	n
Myrmotherula gutturalis	brown-bellied antwren	-----	n
Myrmotherula axillaris	white-flanked antwren	-----	c
Myrmotherula longipennis	long-winged antwren	-----	n
Myrmotherula menetriesii	grey antwren	-----	n
Herpsilochmus sticturus	spot-taile antwren	-----	?
Herpsilochmus stictocephalus	Todd's antwren	-----	?
Teranura spodioptila	ash-winged antwren	-----	?
Microrhopias quixensis	dot-wingen antwren	----	n
Cercomacra cinerascens	grey antbird	-----	c
Cercomacra tyrannina	dusky antbird	-----	n
Myrmoborus leucophrys	white-brown antbird	-----	c
Hypocnemis cantador	warbling antbird	-----	c
Hypocnemoides melanopogon	black-chinned antbird	-----	n
Percnostola rufifrons	black-headed antbird	-----	c
Percnostola leucostigma	spot-winged antbird	-----	r
Myrmeciza ferruginea	ferruginous-backed antbird	-----	c
Myrmeciza atrothorax	black-throated antbird	-----	n
Formicarius colma	rufous-capped antthrush	-----	n
Formicarius analis	black-faced antthrush	-----	c

Family: FORMICARIIDAE	(cont'd.)		
Pithys albifrons	white-plumed antbird	-----	c
Gymnopithys rufigula	rufous-throated antbird	-----	c
Hylophylax naevia	spot-backed antbird	-----	c
Hylophylax poecilonota	scale-backed antbird	-----	n
Myrmornis torquata	wing-banded antpippa	-----	n
Myrmothera campanisona	thrush-like antpippa	-----	c
Grallaria macularia	spotted antpitta	-----	n
Grallaria varia	variegated antpitta	-----	?
Family: CONOPOPHAGIDAE	(gnateaters)		
Conopophaga aurita	chestnut-belted gnateater	-----	r
Corythopis torquata	ringed antpipit	-----	n
Family: COTINGIDAE	(cotingas, becards, fruitcrows)		
Phoenicircus carnifex	Guianan red cotinga	-----	?
Cotinga cotinga	purple-breasted cotinga	-----	?
Cotinga cayana	spangled cotinga	-----	c
Xipholena punicea	pompadour cotinga	-----	c
Iodopleura fusca	dusky purpletuft	-----	r
Atilla spadiceus	bright-rumped attila	------	?
Laniocera hypopyrrha	cinereous mourner	-----	n
Rhytipterna simplex	greyish mourner	-----	n
Lipaugus vociferans	screaming piha	kwetkwetyaba	c
Pachyramphus marginatus	black-capped becard	-----	n
Platypsaris minor	pink-throated becard	-----	r
Tityra cayana	black-tailed tityra	-----	c
Tityra inquisitor	black-crowned tityra	-----	r

Family: COTINGIDAE	(cont'd.)		
Haematoderus militaris	crimson fruitcrow	-----	?
Querula purpurata	purple-throated fruitcrow	-----	c
Gymnoderus foetidus	bare-necked fruitcrow	-----	n
Perissocephalus tricolor	capuchinbird	busikaw	c
Procnias alba	white bellbird	gongé	c
Family: RUPICOLIDAE	(cock-of-the-rocks)		
Rupicola rupicola	Guianan cock-of-the-rock	-----	c
Family: PIPRIDAE	(manakins)		
Piprites chloris	wing-barred manakin	-----	n
Pipra serena	white-fronted manakin	-----	?
Pipra erythrocephala	golden-headed manakin	-----	c
Pipra pipra	white-crowned manakin	-----	n
Corapipo gutturalis	white-throated manakin	-----	n
Chiroxiphia pareola	blue-backed manakin	-----	c
Xenopipo atronitens	black manakin	-----	r
Manacus manacus	white-bearded manakin	-----	n
Tyranneutes virescens	tiny tyrant manakin	-----	?
Schiffornis turdinus	thrush-like manakin	-----	n
Family: TYRANNIDAE	(tyrant flycatchers)		
Colonia colonus	long-tailed tyrant	-----	n
Muscivora tyrannus	fork-tailed tyrant	-----	c
Tyrannus melancholicus	tropical kingbird	grikibi	c
Legatus leucophaius	piratic flycatcher	tigrigrikibi	n

Family: TYRANNIDAE (cont'd.)

Megarhynchus pitangua	boat-billed flycatcher	-----	n
Myiozetetes cayanensis	rusty-margined flycatcher	-----	c
Sirystes sibilator	sirystes	-----	n
Conopias parva	white-ringed flycatcher	-----	c
Tyrannopsis luteiventris	dusky-chested flycatcher	-----	r
Pitangus sulphuratus	great kiskadee	grikibi	c
Myiarchus ferox	short-crested flycatcher	-----	c
Myiarchus tuberculifer	dusky-capped flycatcher	-----	n
Contopus cinereus	tropical pewee	-----	n
Terenotriccus erythrurus	ruddy-taile flycatcher	-----	?
Myiobius barbatus	sulphur-rumped flycatcher	-----	n
Hirundinea ferruginea	cliff flycatcher	-----	n
Onychorhynchus coronatus	Amazonian royal flycatcher	-----	n
Platyrinchus platyrinchos	white-crested flycatcher	-----	n
Tolmomyias sulphurescens	yellow-olive - flycatcher	-----	n
Rhynchocyclus olivaceus	olivaceus flatbill	-----	r
Ramphotrigon ruficauda	rufous-tailed flatbill	-----	?
Todirostrum chrysocrotaphum	painted tody-flycatcher	-----	r
Todirostrum cinereum	common tody-flycatcher	-----	n
Todirostrum fumifrons	smoky-fronted tody-flycatcher	-----	n
Idioptilon zosterops	white-eyed tody-tyrant	-----	?
Lophotriccus vitiosus	double-banded pygmy-tyrant	-----	?
Colopteryx galeatus	helmeted pymy-tyrant	-----	c
Myiornis ecaudatus	short-tailed pygmy-tyrant	-----	r

Family: TYRANNIDAE	(cont'd.)		
Myiopagis gaimardii	forest alaenia	-----	?
Camptostoma obseletum	southern beardless tyrranulet	-----	?
Tyranniscus gracilipes	slender-footed tyrannulet	-----	c
Pipromorpha oleaginea	ochre-bellied flycatcher	-----	c
Pipromorpha macconnelli	McConnell's flycatcher	-----	n
Leptopogon amaurocephalus	sepia-capped flycatcher	-----	r
Family: HIRUNDINIDAE	(swallows)		
Tachycineta albiventer	white-winged swallow	-----	c
Paeoprogne tapera	brown-chested martin	-----	c
Progne chalybea	grey-breasted martin	-----	c
Notiochelidon cyanoleuca	blue-and-white swallow	-----	c
Riparia riparia	bank swallow	-----	c
Hirundo rustica	barn swallow	-----	c
Atticora fasciata	white-banded swallow	-----	c
Atticora melanoleuca	black-collared swallow	-----	c
Stelgidopteryx ruficollis	rough-winged swallow	-----	n
Family: CORVIDAE	(jays)		
Cyanocorax cayanus	Cayenne jay	-----	c
Family: TROGLODYTIDAE	(wrens)	(gadofowru)	
Thryothorus coraya	coraya wren	-----	c
Thryothorus leucotis	buff-breasted wren	-----	n
Henicorhina leucosticta	white-breasted wood wren	-----	c
Cyphorhinus aradus	musical wren	baskopu	c

Family: TURDIDAE	(thrushes)		
Turdus olivater	black-hooded thrush	-----	r
Turdus fumigatus	pale-vented thrush	-----	c
Turdus albicollis	white-necked thrush	-----	c
Turdus ignobilis	black-billed thrush	-----	n
Family: SYLVIIDAE	(gnatcatchers, gnatwrens)		
Polioptila guianensis	Guianan gnatcatcher	-----	n
Polioptila plumbea	tropical gnatcatcher	-----	n
Ramphocaenus melanurus	long-billed gnatwren	-----	c
Microbates collaris	collared gnatwren	-----	c
Family: CYCLARHIDAE	(peppershrikes)		
Cyclarhis gujanensis	rufous-browed peppershrike	-----	c
Family: VIREOLANIIDAE	(shrike-vireos)		
Smaragdolianus leucotus	slaty-capped shrike-vireo	-----	?
Family: VIREONIDAE	(vireos, greenlets)		
Vireo olivaceus	red-eyed vireo	-----	?
Hylophilus muscicapinus	buff-cheeked greenlet	-----	h
Hylophilus ochraceiceps	tawny-crowned greenlet	-----	?

Family: COEREBIDAE	(honeycreepers)		
Coereba flaveola	bananaquit	bakbatitri	c
Cyanerpes caeruleus	purple honeycreeper	geelpoot	c
Cyanerpes cyaneus	red-legged honeycreeper	-----	c
Dacnis lineata	black-faced dacnis	pusi-ai	n
Dacnis cayana	blue dacnis	blawpetpet	c
Chlorophanes spiza	green honeycreeper	blaka-ede	c
Familie: PARULIDAE	(wood-warblers)		
Dendroica petechia	yellow warbler	koprofowru	r
Setophaga ruticilla	American redstart	-----	n
Basileuterus rivularis	river warbler	-----	n
Granatellus pelzelni	rose-bresatsed chat	-----	n
Family: ICTERIDAE	(American orioles, blackbirds)	(ponpon)	
Psarocolius decumanus	crested oropendola	ponpon	c
Psarocolius viridis	green oropendola	busiponpon	c
Cacicus cela	yellow-rumped cacique	banabeki	c
Cacicus haemorrhous	red-rumped caciquepreeuw	redibanabeki	c
Scaphidura oryzivora	giant cowbird	bigikarufowru	c
Quiscalus lugubris	Carib crackle	-----	n
Leistes militaris	red-breasted blackbird	-----	n
Family: TERSINIDAE	(swallow-tanagers)		
Tersina viridis	swallow tanager	-----	n

Family: THRAUPIDAE	(tanagers)	(kanari)	
Euphonia musica	blue-hooded euphonia	blaw-ede kanari	?
Euphonia minuta	white-vented euphonia	wetitere	n
Euphonia finschi	Finsch's euphonia	blawdas	c
Euphonia violacea	violaceous euphonia	gerdas	c
Euphonia cayennensis	golden-sided euphonia	grangrandir	c
Tangara velia	opal-rumped tanager	-----	?
Tangara chilensis	paradise tanager	-----	?
Tangara punctata	spotted tanager	-----	r
Tangara mexicana	turquoise tanager	blawvink	c
Tangara gyrola	bay-headed tanager	-----	c
Thraupis episcopus	blue-grey tanager	blawforki	c
Thraupis palmarum	palm tanager	krontoblawforki	n
Ramphocelus carbo	silver-beaked tanager	kin of redikin	c
Cyanicterus cyanicterus	blue-backed tanager	-----	?
Lanio fulvus	fulvous shrike-tanager	-----	n
Tachyphonus rufus	white-lined tanager	blakakin	n
Tachyphonus cristatus	flame-crested tanager	fayatyarikin	c
Tachyphonus surinamus	fulvous-crested tanager	gowtukrown kin	n
Tachyphonus phoenicius	red-shouldered tanager	-----	n
Tachyphonus luctuosis	white-shouldered tanager	-----	r
Hemithraupis guira	guira tanager	mangrokanari	r
Hemithraupis flavicollus	yellow-backed tanager	geelstuit	?
Lamprospiza melanoleuca	red-billed tanager	-----	c
Eucometis penicillata	grey-headed tanager	-----	n
Cissopis leveriana	magpie tanager	-----	c

Family: FRINGILLIDAE	(seedeaters, finches, grosbeaks)	(alesifowru)	
Saltator maximus	buff-throated saltator	-----	c
Caryothraustes canadensis	green grosbeak	sabanatwatwa	c
Pitylus grossus	slate-colored grosbeak	redi-mofo	c
Cyanocompsa cyanoides	blue-black grosbeak	bergitwatwa	c
Sporophila americana	variable seedeater	dyak	c
Sporophila lineola	lined seedeater	krownmustasy	r
Sporophila bouvronides	lesson's seedeater	pleinmustasy	r
Sporophila castaneiventris	chestnut-bellied seedeater	-----	n
Sporophila nigricollis	yellow-bellied seedeater	blawbaka-roti	n
Oryzoborus crassirostrus	large-billed seed-finch	twatwa	n
Oryzoborus angolensis	lesser seed-finch	pikolet	n
Volatinia jacarina	blue-black grassquit	-----	c
Arremon taciturnus	pectoral sparrow	-----	c

APPENDIX J
(see section 1.4.2)

MAMMAL CHECKLIST

OF THE

RALEIGHVALLEN/VOLTZBERG NATUURRESERVAAT

This checklist has been compiled from observations of visiting zoologists and from personal observations. Some data have also been taken from publications of the Carnegie Museum of Natural History, which has done several small mammal surveys in Suriname during the period 1974-1980. Most English and Sranan Tongo names for animals were obtained from Husson (1973) and Staffeleu (1975); some of the English names were taken from Walker (1975).

The bats mentioned in this checklist have been identified in other, similar habitats in Suriname, but they have not yet been definitely recorded for the Raleighvallen/Voltzberg Nature Reserve. Their inclusion in this list is therefore speculative, but it may be of value as background information for researchers.

At this time it can not be stated with certainty whether the mammals mentioned in the list are common or rare in the reserve.

c = presence claimed, but not yet verified confirmed
? = presence to be expected, but not yet officially recorded

TAXON	ENGLISH	SRANAN TONGO	REMARKS
Order: MARSUPIALIA	(marsupials)	(awari)	
Family: DIDELPHIDAE	(opossums)		
Caluromys philander	woolly opossum	awari	c
Monodelphis brevicaudata	short bare-tailed opossum	moismoisi-awari	?
Marmosa cinerea	murine opossum	moisoisi-awari	
Marmosa murina	-----	busmoismoisi	?
Metachirus nudicaudatus	four-eyed opossum	froktu-awari	?
Didelphis marsupialis	large American opossum	dagu-awari	?

Order: CHIROPTERA	(bats)	(fremusu)	
Family: EMBALLONURIDAE	(sac-winged bats)		
Rhynchonycteris naso	proboscis bat	fremusu	?
Saccopteryx bilineata	sac-winged bat	-----	?
Family: NOCTILIONIDAE	(bulldog bats)		
Noctilio labialis	fisherman bat	-----	?
Family: MORMOOPIDAE	(moustached bats)		
Pteronotus parnelli	moustache bat	-----	?
Family: PHYLLOSTOMIDAE	(American leaf-nosed bats)		
Micronycteris minuta	---------	-----	?
Micronycteris sylvestris	---------	-----	?
Micronycteris megalotis	little big-eared bat	-----	?
Glossophaga soricina	---------	-----	?
Anoura caudifer	tailless long-nosed bat	-----	?
Phylloderma stenops	---------	-----	?
Phyllostomus discolor	---------	-----	?
Phyllostomus elongatus	---------	-----	?
Phyllostomus hastatus	---------	-----	?
Phyllostomus latifolius	---------	-----	?
Trachops cirrhosus	lizard-eating bat	-----	?
Tonatia bidens	---------	-----	?
Tonatia silvicola	round-eared bat	-----	?
Lonchophylla thomasi	---------	-----	?
Rhinophylla pumilio	---------	-----	?
Artibeus cinereus	pygmy fruit bat	-----	?
Artibeus jamaicensis	Mexican fruit bat	-----	?
Artibeus lituratus	---------	-----	?
Uroderma bilobatum	---------	-----	?
Vampyrops helleri	Heller's broad-nosed bat, white-lined bat	-----	?
Carollia perspicillata	---------	-----	?
Sturnira lilium	Paraguayan yellow-shouldered bat	-----	?
Sturnira tildae	Trinidadian yellow-shouldered bat	-----	?

Family: VESPERTILIONIDAE	(smooth-faced or common bats)		
Eptesicus brasiliensis	---------	-----	?
Order: PRIMATES	(monkeys)	(yapiyapi)	
Family: CEBIDAE	(cebid monkeys)		
Chiropotes satanas	black saki	kwataswageri	
Pithecia pithecia	pale-headed saki	wanaku	
Alouatta seniculus	red howler monkey	babun	
Cebus apella	brown capuchin	keskesi	
Cebus nigrivittatus	weeper capuchin	bergi-keskesi	
Saimiri sciureus	common squirrel monkey	monkimonki	
Ateles paniscus	black spider monkey	kwata	
Family: CALLITRICHIDAE	(marmosets, tamarins)		
Saguinas midas	red-handed tamarin	saguwenke	
Order: EDENTATA	(edentates)		
Family: MYRMECOPHAGIDAE	(anteaters)		
Myrmecophaga tridactyla	giant anteater	tamanwa	c
Tamandua longicaudata	lesser anteater	mirafroiti	c
Cyclopes didactylus	silky anteater	likanu	c
Family: BRADYPODIDAE	(sloths)	(loiri)	
Bradypus tridactylus	three-toed sloth	sonloiri	
Chloepus didactylus	two-toed sloth	skapuloiri	
Family: DASYPODIDAE	(armadillos)	(kapasi)	
Euphractus sexcinctus	six-banded armadillo	-----	c
Priodontes giganteus	giant armadillo	granman-kapasi	c
Dasypus novemcinctus	nine-banded armadillo	lontutere	

Order: **CARNIVORA**	(carnivores)		
Family: **CANIDAE**	(canids)		
Speothos venaticus	bush dog	busdagu	?
Family: **PROCYONIDAE**	(raccons, coatimundis)		
Nasua nasua	coatimundi	kwaskwasi	
Potos flavus	kinkajou	netikeskesi	
Family: **MUSTELIDAE**	(mustelids)		
Galictis vittata	grison, hurone	weti-aira	?
Eira barbara	grey-headed tayra	aira	
Pteronura brasiliensis	giant otter	(bigi) watradagu	
Family: **FELIDAE**	(cats)		
Leopardus pardalis	ocelot	tigrikati	
Leopardus tigrinus	little spotted cat	tigrikati	
Leopardus weidii	margay	tigrikati	
Felis concolor	puma	reditigri	
Herpailurus yagouaroundi	jaguarundi	blaka-tigrikati	
Panthera onca	jaguar	pakiratigri	
Order: **PERISSODACTYLA**	(odd-toed ungulates)		
Family: **TAPIRIDAE**	(tapirs)		
Tapirus terrestris	tapir	bofru	
Order: **ARTIODACTYLA**	(even-toed ungulates)		
Family: **DICOTYLIDAE**	(peccaries)		
Tayassu pecari	white-lipped peccary	pingo	
Tayassu tajacu	collared peccary	pakira	

Family: CERVIDAE	(deer)		
Mazama americana	large red brocket	redidia, pranasidia	
Mazama gouazoubira	brown brocket, grey brocket	kuriaku, buskrabita	
Order: RODENTIA	(rodents)		
Family: SCIURIDAE	(tree squirrels)		
Sciurillus pusillus	South American pygmy squirrel	----------	
Sciurus aestuans	Guiana tree squirrel	bonboni, letyan	
Family: CRICETIDAE	(New World rats and mice)		
Oryzomys capito	rice rat	-----	?
Oryzomys macconnelli	rijstrat	-----	?
Oryzomys concolor	rijstrat	-----	?
Neacomys guianae	spiny rice rat	-----	?
Family: ECHIMYIDAE	(spiny rats)	(alata)	
Proechimys guyannensis	spiny rat	maka-alata	?
Family: HYDROCHOERIDAE	(capybaras)		
Hydrochoeris hydrochaeris	capybara	kapuwa	
Family: DASYPROCTIDAE	(agoutis)		
Dasyprocta leporina	red-rumped agouti	konkoni	
Myoprocta exilis	reddish acushi	mambula	
Family: AGOUTIDAE	(pacas)		
Agouti paca	paca, spotted cavy	hei	
Family: ERETHIZONTIDAE	(New World porcupines)		
Coendou prehensilis	prehensile-tailed porcupine	gindyamaka, agidya	

APPENDIX K
(see section 1.4.2)

FISH CHECKLIST

OF THE

THE RALEIGHVALLEN/VOLTZBERG NATURE RESERVE

This list of fish species of the Raleighvallen/Voltzberg Nature Reserve has been prepared from an anonymous, handwritten list discovered in the STINASU files. That list was neither dated nor could its author be identified. It should therefore only be considered as a very tenuous record of fish species to be found in the Coppename River and its tributaries in and around the reserve. Furthermore, there is no guarantee that the scientific names of the taxa mentioned are accurate. The list may nevertheless have some value as a starting reference in building up an inventory of fish species living in the reserve. Finding English names for the fish listed here proved difficult because of the lack of pertinent literature on the subject in Suriname. Some names were found in Axelrod et al (1989). For the spelling of fish names in Sranan Tongo several publications have been consulted, with preference given to an existing list of words in a Dutch-English-Sranan Tongo dictionary (Anon., 1980a). Where the Sranan Tongo name was not given, but the Saramaccaner word was, the latter was used.

SCIENTIFIC NAME	ENGLISH NAME	SRANAN TONGO
FAMILY: POTAMOTRYGONIDAE	(rays)	(spari)
Potamotrygon reticulatus	reticulated fresh-water stingray	libispari, tyubula
FAMILY: CLUPEIDAE	(herrings, sardines)	
Chalcinus rotundatus	sardine	sardin
FAMILY: CHARACIDAE		
Brycon falcatus	---------	moroko
Chalceus macrolepidotus	pink-tailed chalceus	alampiya
Pristella riddlei	---------	reditere-sriba
Moenckhausia oligolepis	glassy tetra	sriba
Acestrorhynchus falcatus	spotted cachorro	dagufisi
Acestrorhynchus microleps	---------	dagufisi
Hemiodopsis semitaeniatus	black-and-white-tailed hemiodus	djogu
Cretochanes melanurus	---------	nyanganyanga
Cretochanes caudomaculatus	---------	krikri nyanga-nyanga

FAMILY: SERRASALMIDAE	(piranhas)	(piren)
Serrasalmus rhombeus	white piranha	piren, pirenja
Serrasalmus spilopleura	fire-mouth piranha	redipiren
Serrasalmus Schomburgkii	---------	pikinpiren
Serrasalmus niger	---------	blakapiren
Myleus pacu	brown pacu	paku
Myleus rubripinnis	redhook pacu	pakusi
Myleus ternetzi	Ternetz' silver dollar	pakusi
Myleus rhomboidalis	--------	kumaru
Myleus asterias	--------	--------
Acnodon oligacanthus	--------	stonfisi
FAMILY: GASTEROPELECIDAE	(hatchetfish)	
Carnegiella strigata	marbled hatchetfish	banketman
Gasteropelecus levis	---------	timbi-bè
FAMILY: ERYTHRINIDAE	(trahiras)	
Hoplias macrophthalmus	--------	anyumara
Hoplias malabaricus	common trahira	pataka
Hoplerythrinus unitaeniatus	golden trahira	stonwalapa
FAMILY: ANOSTOMIDAE	(headstanders)	
Anostomus anostomus	striped headstander	----------
Leporinus fasciatus	banded leporinus	kwana
Leporinus maculatus	spotted leporinus	babunuwaaku
Leporinus alternus	---------	kwasima
Leporinus friderici	Frideric's leporinus	waraku
Schizodon fasciatus	four-barred leporinus	nyamsifisi
FAMILY: ELECTROPHORIDAE	(electric eels)	
Electrophorus electricus	electric eel	prake
FAMILY: GYMNOTIDAE	(knife fish)	
Gymnotus carapo	banded knife fish	logologo
Gymnotus anguillaris	slant-bar knife fish	logologo
Sternopygus macrurus	variable ghost knife fish	saprapi

FAMILY: DORADIDAE	(spiny catfish)	
Hemidoras carinatus	--------	dyumufolu
FAMILY: BUNOCEPHALIDAE	(banjo catfish)	
Bunocephalus chamaizelus	---------	apa dosi pai
FAMILY: PIMELODIDAE	(naked catfish)	(gratfisi)
Rhamdia quelen	---------	dyaki
Pimelodella cristata	--------	--------
Pimelodella blochii	--------	kaweri
Pseudoplatystoma fasciatum	tiger shovelnose catfish	spigrikati
Brachyplatystoma vaillanti	-------	pasisi, lalaw
FAMILY: CALLICHTHYIDAE	(armored catfish)	
Harttia surinamensis	--------	--------
Callichthys callichthys	slender armored catfish	plata-ede-kwikwi
Hoplosternum littorale	--------	sokekwikwi
Hoplosternum thoracatum	port hoplo	katarinakwikwi
Corydoras soorten	cory spp.	seseiguse
FAMILY: LORICARIIDAE	(armored catfish)	
Corymbophanes andersoni	---------	sawke
Hemiancistrus branneri	---------	tombo
Hypostomus soorten	hypostomus spp.	kakaaku, warawara
Loricaria cataphracta	---------	basyafisi
Loricariichthys stewarti	---------	sandu kakaaku
Pseudaneistrus barbatus	---------	gadyaga kakaku
fAMILY: AUCHENIPTERIDAE	(catfish)	
Trachycorystes galeatus	--------	poku poku
Pseudauchenipterus nodosus	black tailband catfish	pinamaw

FAMILY: BELONIDAE	(needlefish)	
Potamorrhaphis guianensis	freshwater needlefish	nanaifisi
Pseudotylosurus microps	---------	nanaifisi
fAMILY: NANDIDAE	(leaf fish)	
Polycentrus schomburgkii	Schomburgk's leaf fish	kala
FAMILY: CICHLIDAE	(cichlids)	(krobia's)
Aquidens portalegrensis	--------	owruwefi
Cichla ocellaris	peacock cichlid	tukunari
Cichlosoma bimaculatum	twin-spot cichlid	owruwefi
Crenicichla saxatilis	white-spotted pike cichlid	datrafisi
Geophagus surinamensis	Surinam geophagus	songe
FAMILY: HYPOPHTHALMIDAE		
Hypophthalmus edentatus	--------	kwasimama

APPENDIX J
(see section 3.8.4)

PERSONNEL TRAINING PROGRAM

In order to attain an adequate level of proficiency, and to develop a code of behavioral standards, a suitable training program should be organized for field personnel. The course must be focused on obtaining practical experience. This can best be accomplished by confronting the students with real-world situations that have been resolved in a more or less satisfactory manner.

The course must last at least 6 weeks, and is to be restricted to about 12 students at a time. Upon satisfactory completion of the course, the worker will be given a certificate of completion.

The curriculum has to include the following subjects and procedures (but it does not have to be limited to this):

1. Legislation - intensive for guards, less so for others.

   a) National conservation laws;
      pertinent international laws;
      pertinent treaties and conventions.

   b) Arrest and confiscation procedures;
      evidence gathering (e.g. weapons, nets, witnesses);
      legal rights of arrested person.

2. Ecology

   a) Basic plant and animal taxonomy;

   b) use of dichotomous keys to identify commonly seen plants, amphibians, reptiles, birds, and mammals;

   c) basic wildlife management field techniques;

   d) field identification of plants; especially herbs, shrubs, and trees commonly used by local people;

   e) recognition of animal tracks;

   f) collecting and preserving biological specimens.

3. Other field skills

a) Map reading, use of compass, use of binoculars;

b) simple shelter construction, cutting and marking of trails;

c) maintenance of field equipment;

d) First Aid course, emphasizing emergency treatment of deep cuts, snake bites, fractures, drowning, and sunstroke.

4. Communications

a) Proper use of field notebooks;

b) proper procedures for report writing;

c) dealing with tourists, researchers, and local people.

5. Miscellaneous

a) Physical fitness training;

b) personal hygiene.

The above is a mere outline of some of the subjects to be taught. The actual program will have to be worked out in greater detail by the staff of STINASU and the Surinam Forest Service. Assistance in teaching the course should be solicited from other government agencies, such as the Police Department (use of fire arms, arrest techniques), the Fisheries Department (Law of the Sea, fisheries regulations), and the University of Suriname. The subject "Natural Resources Legislation" is an existing course at the University, and some personnel could enroll in it. Several of the above-mentioned subjects are dealt with in this course.

APPENDIX M

Hydraulic Rams

Volunteers in Technical Assistance (VITA)

How They Work

A hydraulic ram is a simple device, invented in the early 19th century. It uses the power from falling water to force a small portion of the water to a height greater than the source. Water can be forced about as far horizontally as you desire, but because of friction, greater distances require larger pipe. There is no external power needed, and the ram has only two working parts. The only maintenance needed is to keep leaves and trash cleaned away from the strainer on the intake and to replace the clack and non-return or delivery valve rubbers if they get worn. There is almost no expense except for the original cost. And a home-built ram costs about one-tenth the cost of a manufactured one.

Two things are needed to make the ram work: (a) enough water to run the ram and (b) enough height for water to fall through the drive pipe to work the ram. A small amount of water with plenty of fall will pump as much water as a greater amount of water with only a little fall. The greater the height to which the water must be raised, the less water will be pumped, under a given set of circumstances.

Water may come from a spring on a hillside or from a river. It must be led into a position from which it can pass through a relatively short supply pipe to the ram, at a fairly steep angle (about 30 degrees below the horizontal is good). Often a catch basin or cistern is used as the source for the drive pipe, but an open ditch could be used. (See Figure 36.) Be sure to put a strainer on the top of the drive pipe to keep trash out of the pipe and ram.

The ram works on simple principles. The water starts to run down through the drive pipe, going faster and faster until it forces the automatic valve or clack to close suddenly. The weight of the moving water suddenly stopped, creates very high pressure, and

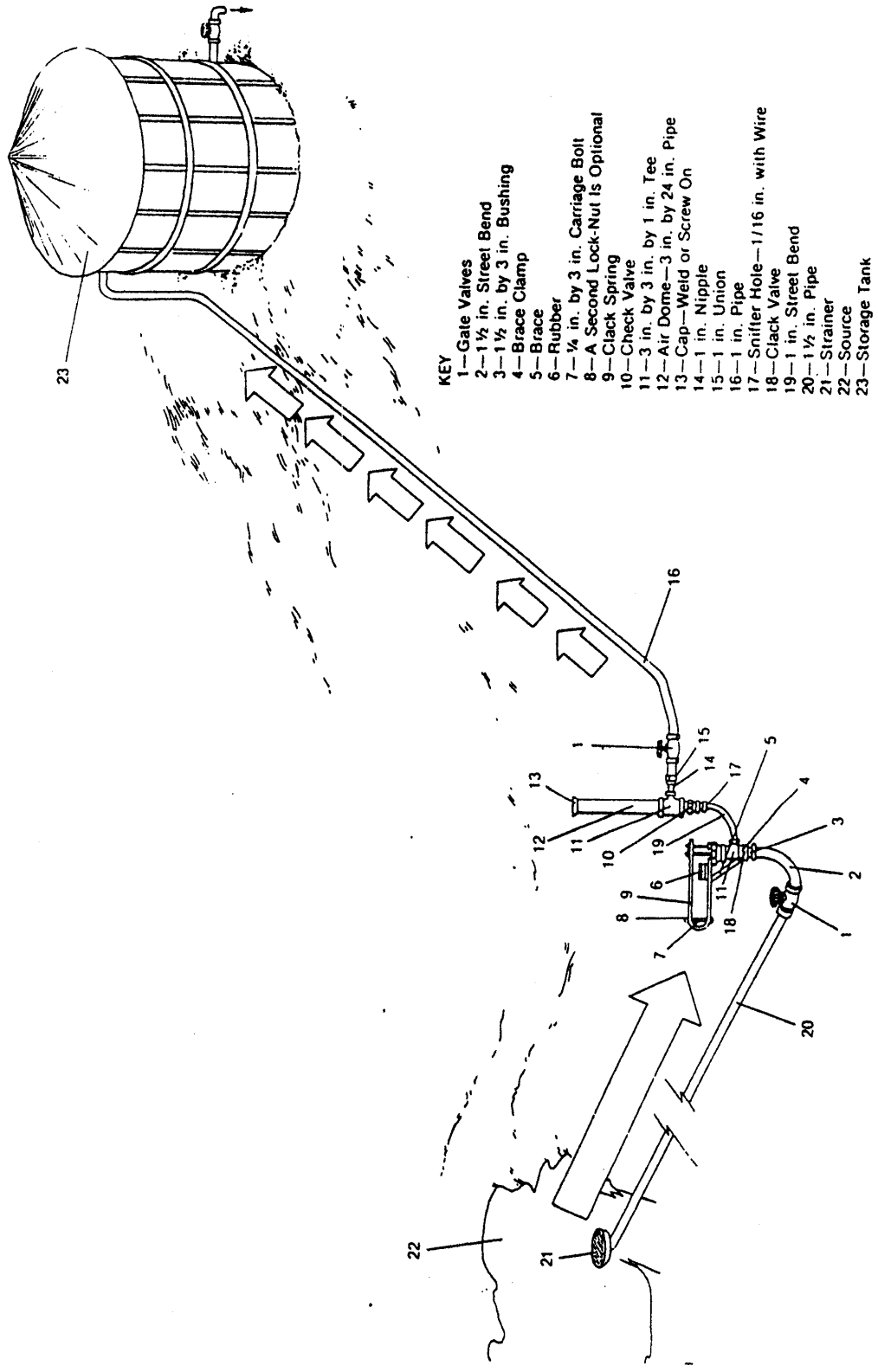


FIGURE 36. Hydraulic ram in operation.

forces some of the water past the non-return or delivery valve and into the air chamber, compressing the air more and more until the energy of the moving water is spent. This compressed air acts as a spring and forces the water up the delivery pipe to the storage tank in a steady stream.

It takes a lot of falling water to pump a little water up a hill. Often about one part in ten is delivered to the storage tank at the top of the delivery pipe. The snifter hole wastes a bit of water but takes in a bubble of air with each stroke. This is necessary to keep air in the air dome, which must not get plugged or it will get filled with water and the ram will stop.

The small ram works best at about 75 to 90 strokes per minute, depending on the amount of drive water available. The slower it goes, the more water it uses and the more it pumps.

Any working fall from 18 inches to 100 feet can be used to work a ram, but in general, the more working fall you obtain, the less the ram will cost and the less drive water it will require to raise a given amount of water. If there is plenty of water, a fall of 4 feet could be made to raise water 800 feet, but this would be an expensive installation. The following is a rough formula that will give you an idea of the amount of water which can be raised:

$$\frac{\text{Driving water per minute in gallons or liters} \times \text{twice the working fall in feet or meters}}{3 \times \text{vertical lift above ram in feet or meters}} = \text{Amount of water raised by the ram}$$

EXAMPLE: Working fall = 18 feet, lift above ram = 200 feet, driving water = 160 gallon/minute

$$\text{Water raised} = \frac{160 \times 2 \times 18}{3 \times 200} = \frac{9.6 \text{ gallons per minute}}{\text{or } 13{,}824 \text{ gallons per 24 hours}}$$

This would require a No. 7 Blake ram.
100 gallons falling 10 feet would elevate 10 gallons to 80 feet.
100 gallons falling 5 feet would elevate 1 gallon to 300 feet.
Double the working fall and you just about double the water delivered.

Unless you have practically unlimited water available, measure it exactly by making a temporary dam and putting a large pipe or two through it. Then catch and measure the water for, say, 15

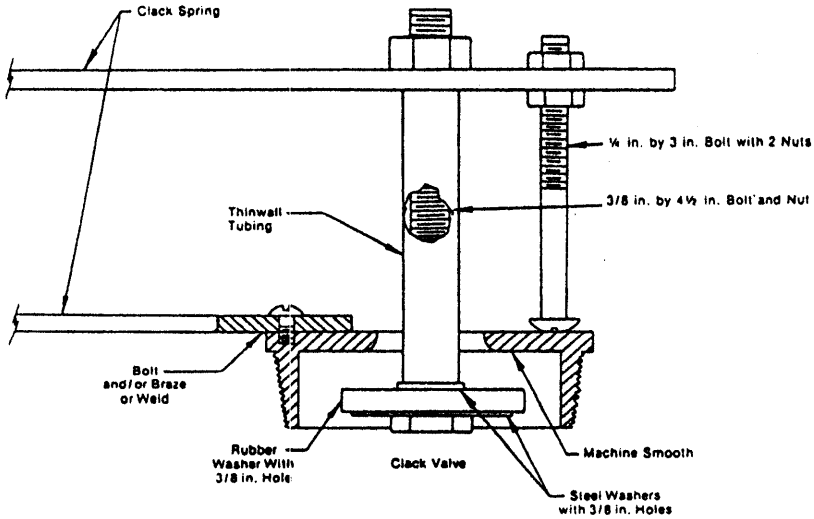


FIGURE 37. Clack valve for hydraulic ram.

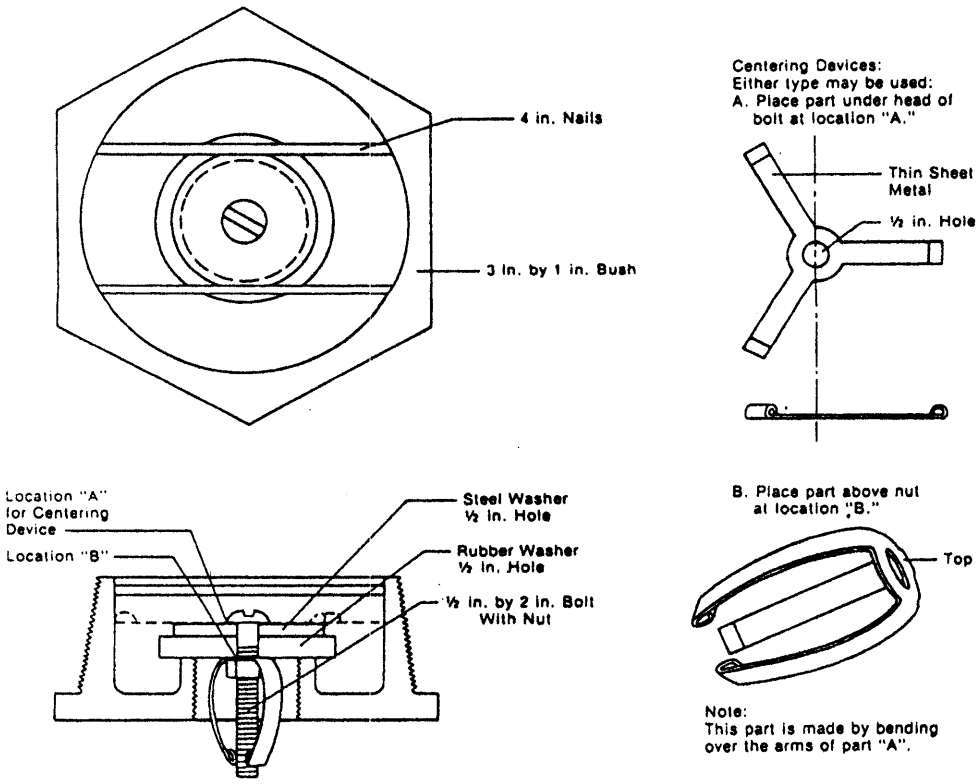


FIGURE 38. Check valve for hydraulic ram. (The purpose of the centering device—see detail on the right—is to prevent the moving assembly from slipping off-center or to the side.)

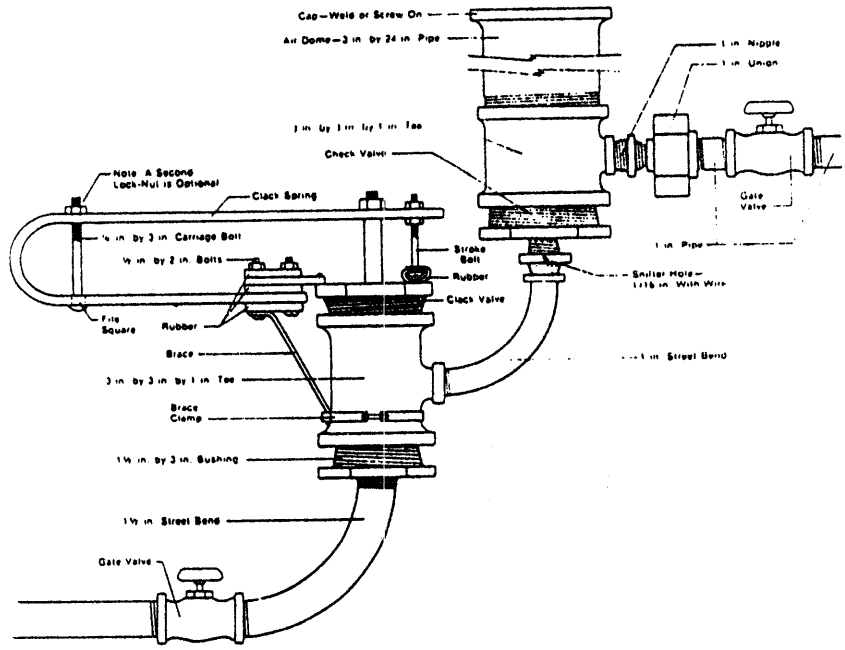


FIGURE 39. Complete assembly of hydraulic ram.

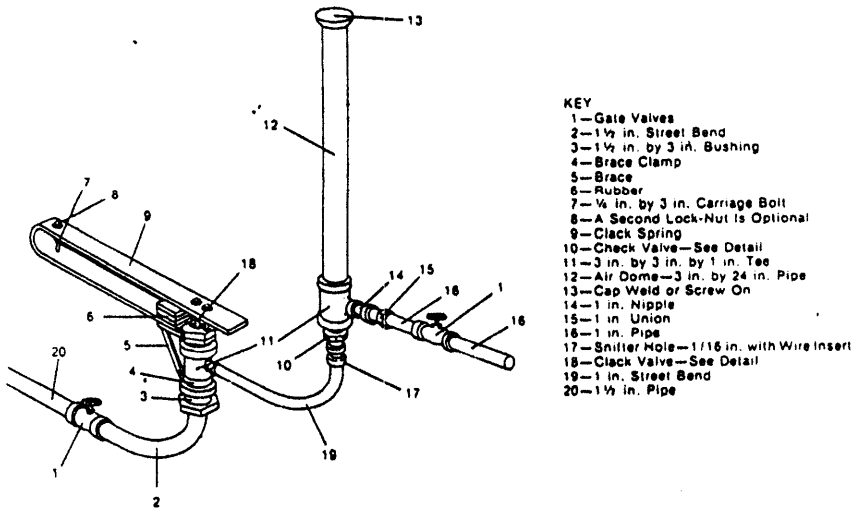


FIGURE 40. Assembly drawing of hydraulic ram.

minutes. Next, sight along a carpenter's level to the top of a 10-foot pole set on the ground down the hill at a lower level. Then move the level to the pole's position and sight again to the top of the pole, finding how many levels or fractions you have; this will give you, when added together, the amount of fall for the drive pipe. Do the

same for the height to which the water must be raised. This height is measured from the ram level.

Building the Ram

Start by building the clack valve. (See Figure 37.) If you do not have a metal lathe, a machine shop will do the work for a small price. Chuck a 3-by-1-inch pipe bushing in the lathe and turn the inside smooth, where the clack strikes. Turn out the threads and eliminate any sharp edges. Drill two ¼-inch holes near the end of a piece of strap iron ¼-by-1½-by-3-inch, and using it as a template, drill and tap holes in the top of the pipe bushing. Grind off the galvanizing, then bolt the clack spring support solidly to the bushing and braze it.

Bend a 36-inch iron strap, 1½-by-⅛ inches, around a 2-inch pipe to make the clack spring. Drill two ½-inch holes through the end and also through both the support and the two short pieces to make up the pad as shown in Figure 37.

Cut pieces of rubber inner tube and assemble the sandwich. This sandwich will keep vibrations from breaking the support off the pipe bushing. A brace can be added for additional support, but it is not absolutely necessary.

The clack valve itself is made up of a rubber disc and metal washer ⅜ inch smaller than the inside of your bushing and assembled on a ⅜-by-4½-inch bolt. One of the best sources of rubber for the disc is an old tractor tire—it shows no wear at all after eight months' use. Cut it on a band saw and sand it flat and even on a disc sander with coarse paper. A similar piece of rubber is used for the check valve.

Slip a washer over the bolt and a short length of thin wall steel tube (¾ inch o.d. conduit) with the ends filed exactly square. Then slip it through a hole in the clack spring. Adjust it by bending, so that the rubber clack strikes true and doesn't rub on the sides of the bushing.

Drill a hole for a carriage bolt to adjust the stroke of the spring, then drill a pair of holes about 3 inches from the round end of the spring for a tension bolt. If the bottom hole is filed square to fit the underside of the bolt, it will not turn when adjustments are made.

The check valve (Figure 38) is similar in construction, but a

½-by-2-inch galvanized bolt is used. Machine the lip true where the valve rests, but do not cut it down farther than necessary. This gives a bit of clearance for the water to pass. Drill two holes on each side of the middle for a 4-inch common nail to pass just above the valve metal washer, to keep it in place. Leave enough clearance so the valve can open just about 1/16 inch. Spread the bolt with a center punch just below the nut, so that the nut can't work loose. Cut the nails off and file threads across their ends so the bushing will screw into the tee above it.

Just one other small job is necessary before assembly: Drill a 1/16-inch hole in the center of the 1-inch nipple just below the check valve. Then bend a piece of copper wire to the shape of a cotter pin and insert it from the inside of the nipple with long nosed pliers. Spread the outside ends. This copper wire restricts the jet of water coming out, yet moves enough to keep the hole clean.

The air dome can be a 2-foot length of 3-inch pipe, threaded on both ends with a cap or a welded plate on the top end. The dome must be airtight at great pressure. Coat the inside of the pipe with asphalt paint to protect it from rust and to seal any small leaks in the weld. Let it dry in the sun while assembling the rest of the ram.

Assembly

Use plenty of good grade pipe joint compound, both on inside and outside threads. Screw components together firmly, but not excessively tight, and leave them in the correct position for your installation. (See Figures 39 and 40.) Set the ram reasonably level. The snifter hole must be immediately below the air dome so that the bubbles will go up into the dome. Clack and check valves must be free from binding and touch evenly all around. The old tractor tire rubber with some fabric on the back seems to be just the right toughness and resiliency to last a long time—much longer than either gasket rubber or live rubber.

There is no reason at all to mount the ram in concrete as has been suggested by some. In fact, it is very convenient to have a "portable" ram and to be able to shut off the two valves, loosen the unions, and take the ram to the shop for cleaning and painting. Painting, of course, doesn't improve operation, but it does improve your ram's appearance.

A bit of rubber stretched over the head of the stroke bolt will help to quiet the ram. Adjust the spring tension bolt and stroke bolt together to get the best period for your particular ram. Support the drive and delivery pipes so they don't bounce and vibrate.

The ram described here is a small one, but larger rams can be built. VITA has built two with 3-inch drive pipes and correspondingly larger ram parts. One of our larger hydraulic rams lifts water about 150 feet and drives it through 3600 feet of pipe.

Installation and Adjustments

The drive pipe should have a strainer on the top made of ½-inch coffee tray wire, hardware cloth, or anything similar. This wire will keep out trash, frogs, and leaves, all capable of clogging up the ram. The drive pipe should be 1½ inch or larger (we use 2-inch pipe) and, if possible, it should be new, solidly put together, straight, and well supported throughout its length. A gate valve on the drive pipe about 4 feet from the ram is a great convenience, but is not necessary. Another gate valve on the delivery pipe is almost a necessity since it will prevent the entire delivery pipe from draining whenever the ram is cleaned. The ram should be connected to the delivery and drive pipes by unions so it can be removed for cleaning. (See Figure 36.)

If it is desirable to use two rams, they must have separate drive pipes, but the delivery pipes can be joined, provided the pipe is large enough to carry the increased quantity of water.

The delivery pipe should lead off from the ram with about two lengths of 1-inch galvanized iron pipe. From there ¾-inch plastic pipe can make up the remainder of the delivery pipe. The iron pipe will give the ram better support, but plastic pipe is smoother inside and can be a size smaller than the iron pipe. Also, plastic pipe is cheaper, but it must be protected from mechanical injury and sunlight.

The length of the supply line must be at least three times the length of working fall. If it is shorter the ram will stop when the tap is turned on. (A float valve, however, might prevent this from happening.)

The small bolt at the end of the clack spring controls the length

of the stroke of the ram. The bolt at the back (rounded) end of the spring controls the tension of the clack spring. (See Figure 38.) Experiment for the best length of stroke and tension for your set of conditions. Adjust the length of stroke first, then the spring tension. The greater the tension and length of stroke, the slower the ram will work and the more water it will pump, but it will take more water to keep it working.

For a reliable, constant supply of water, lead all the water from the ram directly into a storage tank and use it from there. The overflow can be used to irrigate your garden or field.

IF ACTION IS FAULTY:

•See that the clack valve closes squarely, evenly, and completely. If it does not, the clack spring may have been bent somehow, and it will have to be straightened.

•See that the clack valve does not rub on the front, side, or back of the valve body.

•Check for trash in the ram, delivery valve, or in snifter hole.

•Check to see that the air dome is not filled with water. If it is filled with water, the ram will knock loudly and one or more parts may break. The snifter should allow a small amount of air to enter between each of the strokes to keep the dome full of compressed air.

•Check the rubber clack and delivery valve for wear or looseness.

•If drive water is in supply, speed up the stroke by loosening spring tension and shorten the stroke by lowering the stroke-adjusting bolt. More water is delivered by a faster stroke and continuous running than a slower stroke that stops every day.

•Check for leaks in the drive pipe. If air bubbles come out of the drive pipe after it has been stopped for a while, air is leaking into the drive pipe and is interfering with the ram action.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR LATIN AMERICA AND THE CARIBBEAN

REGIONAL PROGRAMME OF PLANNING AND MANAGEMENT
OF PROTECTED AREAS IN THE AMAZON REGION, EU-ACT

Av. Dag Hammarskjöld 3241, Vitacura
Casilla 10095
Teléfono: (56 2) 337-2100
Fax: (56 2) 337-2101/2/3
E-mail:FAO-RLC@field.fao.org
Santiago - Chile

Protected Areas in Suriname and Guyana

Proceedings of the Binational Seminar/Workshop Suriname-Guyana on Protected Areas of the Amazon Region. Paramaribo, Suriname
10 - 14 of September, 1997

Prepared by
Juan V. Oltremari

THE NATURE CONSERVATION DIVISION OF THE SURINAME FOREST SERVICE
ENVIRONMENTAL PROTECTION AGENCY OF GUYANA

February, 1998

CONTENTS

1. INTRODUCTION

The joint programmes on protected areas between bordering countries are becoming increasingly important in the Region, particularly in view of the possibility of protecting complete ecosystems which can maintain the continuity and make possible the interaction of biologic diversity. It is recognized that the degree of conservation of resources in frontier areas is normally high, as they generally are on land far from population centres, in sectors of difficult access. Thus, frontier areas are of great ecological importance and, because of their location, have a high potential for coordinated work between two or more countries.

The project "Regional Programme on Planning and Management of Protected Areas in the Amazon Region", European Union - Amazonian Cooperation Treaty, EU-ACT, contains several activities aimed at strengthening binational programmes in protected areas. One of these specific activities is considered in the Agreement signed between FAO and the Co-Director's Office of the Project, for the purpose of contributing to a diagnosis of the Amazonian frontier between the countries, and establish joint operational development plans through binational workshops.

During the Project's programming stage, therefore, it was agreed to support the proposal for the Binational Seminar/Workshop Suriname-Guyana, with the participation of representatives from the respective protected area administrations. In this context, the institutions involved agreed to carry out the present meeting in Brownsberg Nature Park, Suriname, from 10 to 14 September, 1997.

The objectives of the Seminar/Workshop were the following:

a. To make a diagnosis of the present situation of policies, legislation and establishment of protected areas systems.

b. To organize a joint plan of work on the establishment and management of protected areas.

c. To establish an integral coordination and cooperation strategy.

d. To analyse the results and applicability of the recommendations made at other international events of the EU - ACT Project in the Amazonian countries.

Institutions involved in the administration of protected areas in Suriname and Guyana, as well as other agencies and institutions linked with the subject, participated in the Binational Seminar/Workshop as central actors. A completed list of participants is in the Annex 1.

2. GENERAL CONCLUSIONS AND RECOMMENDATIONS

The representatives from Suriname and Guyana met in Paramaribo, Suriname for a Binational Seminar/Workshop to exchange experiences and discuss possible cooperation and coordination with regard to protected areas. The following are the agreed conclusions and recommendations of this Seminar/Workshop.

2.1 Organizational structure

1. The responsibility for protected area planning and management should reside at a level within the governmental structure which will permit it to have an effective role in policy formulation and decision making.

2. The institution responsible for protected areas management should be governmental and semi-autonomous.

3. Certain functions in protected areas should remain centralised, but more decentralisation of operations may need to be considered at some later stage as the national systems become more complex.

2.2 Legislation

4. Each country should develop its legislation on protected areas based on its peculiar circumstances. It is, however, recommended that this legislation be as comprehensive as possible and consistent with national environmental policy and legislation.

5. Enforcement of legislation and regulations should have political and civil support at all levels.

6. Institutional and human capacity should be strengthened in order to bring about effective enforcement of legislation.

7. Both countries should exchange information on their various existing legislation on protected areas and biodiversity conservation.

2.3 Financial mechanisms

8. The governments of both countries should explore various ways of financing the planning and management of protected areas, such as:

2.7 Methodologies for "Biogeographical Classifications"

14. In order to improve/develop an ecological classification system in the two countries, steps should be taken to cooperate in the generation of data and in the ecological classification of their territories, which have similar features. This will require a greatly improved data bank for each country, and should involve the utilization and exchange of local expertise as far as possible.

2.8 Methodologies for Geographical Information Systems and data base

15. The methodology for Geographical Information Systems used in both countries should be compatible, as well as the format of data bases to be used for protected areas.

2.9 Threats and management problems in protected areas

16. There is a need for trained personnel, material resources, and facilities in protected areas in order to safeguard their integrity. Furthermore, many threats are likely to originate from outside of protected areas and should be addressed within the larger context of environmental protection in the countries. The two countries should cooperate in the sharing of experiences given the commonality of the threats to their protected areas.

17. All options for reducing threats to protected areas should be pursued, including the participation of stakeholders, the use of environmental awareness and education programmes, incentives, and the implementation of buffer zones around protected areas, where appropriate.

18. The demarcation of the boundaries of protected areas should be performed as a basic requirement for effective management.

19. Clearly defined government policy on protected areas and related natural resources use are essential for the effective management of a national system of protected areas.

2.10 Experiences with management programmes, such as tourism, research, environmental education and protection

20. Given the scarcity of human and financial resources, and the applicability of their experiences to each other, both countries should consider collaboration in areas such as the development of guidelines for nature tourism, protected area regulations, collaboration in environmental education and interpretation,

3. REPORTS FROM SURINAME

3.1 Policies, legislation and organizational structure for protected areas in Suriname[1]

Introduction

The Republic of Suriname has a small population of approximately 400.000 people, which is concentrated in and around the capital city of Paramaribo and in small communities in the coastal plain.

Some 90% of the land surface (of about 164.600 km^2) is still covered with forest. Protected areas (13 nature reserves, 1 nature park and 1 Multiple-use Management Area) cover 4.9% of the land surface.

Until recently, nature conservation in Suriname was among the best in South America and the Caribbean. Riots in the interior, an unstable political and a severe economic crisis, however, have had a negative impact on nature conservation, and have caused a strong fall in the conservation activities. Fortunately, this situation is now changing due to the return of democracy, the so-called Peace Treaty of 1992 with the rebelling group, and some small conservation projects with international and foreign funds. However, there is further need for institutional strengthening (men and means) to restore the former system and to cope with the accelerated development and the associated pressure on nature (e.g. agriculture, gold mining, forest exploitation) of the interior.

In this regard it is expected that the Environment Fund of the Netherlands will finance the strengthening of the Nature Conservation Division and the inventory of the ecosystems of the interior (Guiana Shield).

Policy on protected areas

In 1948, the Nature Protection Commission ("Natuurbeschermingscommissie") was established by Government Resolution in order to study conservation problems, and to propose legislation concerning nature conservation. The resulting Game Law (Government Bulletin 1954 N° 25) and Nature Preservation Law (Government Bulletin 1954 N° 26) were published in 1954.

---

[1] Prepared by Mr. Ferdinand L.J. Baal, Head Nature Conservation Division of the Surinam Forest Service.

- The protected areas should as much as possible be distributed among the present and future cultural landscapes.
- The selection procedure of protected areas should consider the feasibility of "obtaining" (political, juridical, financial and social aspects) and "maintaining" (management aspects) of selected areas (Teunissen, 1979).

In the Planning Law of 1973 the Government underlined the importance of protected areas. Article 3 paragraph 3 indicates the necessity "to create spatial conditions for the maintenance of a sound living environment, for instance by securing nature reserves and recreational spaces in conformity with the future extent of the population, and also by safeguarding cleanness of soil, water and air".

A Conservation Action Plan for Suriname (CAPS) was published in 1990 with assistance of several national and international agencies. The Plan contains projected activities in nature conservation for a period of five years, during which international co-operation is needed. These activities include the management of existing protected areas and the establishment of new protected areas in the interior, based on an ecosystem inventory of the Guyana Shield region.

A National Environment Action Plan for Suriname is currently being developed with the support of the Organization of American States (OAS). One chapter of this plan is devoted to biodiversity.

Development of a National Biodiversity Strategy is also underway with the support of a regional GEF/UNDP project for the Amazonian Cooperation Treaty (ACT) countries.

At present a Pre-Investment Facility (PRIF) project is being executed to draft a large GEF/UNDP project, which will include for example the management of five protected areas which are of global or regional importance.

Suriname is prepared to contribute to several international and regional agreements with regard to conservation and management of protected areas.

Legislative framework and protected area system

Legislative framework and protected area system at national level

Up to 1953 there were no protected areas, and hunting and capturing wildlife occurred mostly without restrictions. There are now several laws and institutions dealing with the management and protection of the urban, rural and natural environment.

permits for timber exploitation (so-calles "houtkapvergunningen") to these tribal groups, under conditions set by Government Resolution. In the new Law on Forest Management the cutting permit areas are called Community Forests.

Community Forest ("Gemeenschapsbos") comprises of forest areas around community lands which are earmarked as a Community Forest for indigenous people who live in villages or settlements in tribal communities. These forests provide a variety of products for local use. They could possibly also be used for the collection of secondary forest products, commercial logging operations, or be cleared for agricultural purposes.

The Laws on the Issuance of State-owned Lands ("Agrarische Wet" of 1937 and "Decreet Uitgifte Domeingrond" of 15 June 1982) are also used to protect certain natural areas. For instance the Brownsberg Nature Park, has been issued on a long-term lease base to the Foundation for Nature Preservation in Suriname. The Foundation manages it as a national park.

Further more the Bigi Pan estuarine area has been put at the disposal of the Ministry of Natural Resources, and is managed by the Forest Service as a Multiple-Use Management Area. The Planning Law ("Planwet" of 1973) it contains the mechanism to establish Special Management Areas, to be developed as Multiple-Use Management Areas. Most of these laws contain requirements to respect the "traditional rights" and interests of indigenous people living in tribal communities.

Legislative framework and protected area system at regional or international level

Suriname also has international obligations regarding protected areas. In this regard, the Republic of Suriname has signed Agenda 21 and is a party to the following conventions:

- The Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (Western Hemisphere Convention);
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Wetlands Convention);
- The Convention on Biological Diversity;
- The Amazon Cooperative Treaty; and
- Bilateral agreements with Brazil, Guyana, and Venezuela.

Suriname is also in the process to accede to:

- The Convention on Climate Change;

full-time person in Suriname serving as technical advisor to the Surinam Forest Service. WNF has been active in conservation activities in Suriname since the 1960s and is planning to extend its activies to the Guianas.

The Nature Conservation Division is comprised of four sections: a Nature Conservation Research Section, a Management Section, a Nature Conservation Education Section and a Permit Section (for wildlife exports).

There are several vacancies at all levels, although 15 persons are now being trained for the functions of parkmanager and gamewarden.

Financial Resources

The costs of the management of nature reserves are carried by the Government budget and by external funds, e.g. :

- UNEP: Feasibility study and drafting of a management plan for the north Commewijne and Marowijne districts.
- Regional Environment Bureau of French Guyana: Feasibility study and drafting of a management plan for the north Saramacca district.
- Canadian Wildlife Service: Implementation of a part of the Management Plan of the Bigi Pan Multiple Use Management Area.
- World Wildlife Fund, the Netherlands: Institutional support to the Nature Conservation Division.
- ACT-SURAPA/European Union: Drafting of a Management Plan for Copi Nature Reserve, and Training of Parkmanagers.
- ACT-SURAPA/FAO: Binational Workshop Guyana-Suriname on protected areas.
- PRIF-GEF: e.g.Drafting of a full GEF project for 5 protected areas.

Funds are requested from:

- Environmental Fund of the Netherlands for strengthening of the Nature Conservation Division, and Inventory of the Ecosystems of the Interior (Guiana Shield).

- World Wildlife Fund the Netherlands for e.g.: Conservation Area Network, and Wetland Conservation.

The meetings resulted in an agreement that indigenous people living in tribal communities would be able to maintain their "Traditional Rights" and interests inside the nature reserves that were about to be established, provided that:

- No harm is done to the national objectives of the proposed nature reserves;
- The motives for these "Traditional Rights" and interests still exist; and
- The "Traditional Rights" and interests are limited to the time of consolidation of all people into a unified citizenship of Suriname.

The 1986 Note of Explanation refers to the Reconnaissance map of Suriname Lowland Ecosystems (Teunissen, 1978) and to the publication of Teunissen et al. (1979) with recommendations for the expansion of the system of nature reserves and forest reserves in the Suriname lowland. According to this publication, the "Traditional Rights" and interests can be described as follows:

- Free choice for the settlement of a village (this means permission to build camps);
- Free choice of parcel(s) for the establishment of shifting cultivation grounds;
- Permission to hunt;
- Permission to fish; and
- Possibility to maintain a cutting permit.

These activities may only take place on public lands which have not yet been formally issued to third parties. Furthermore, this freedom of action is limited by their own traditional and cultural norms and the general laws and the specific legal instruments on hunting, fishing, and forest utilization.

The Head of the Forest Service will consult with representatives of the inhabitants (or their Association), the relevant village chief and committee, and the Nature Protection Commission in matters concerning the general management of the reserves. In case of a dispute between the Head of the Forest Service and the local representatives, the local District Commissioner (the Government representative in the district) may be consulted. The reserve manager will consult with the local village chief concerning daily management activities.

In the Management Plan of the Copie Nature Reserve a consultation structure with the local people and the development of projects are mentioned.

Reichart H. and M.M. Held. 1991. People-Park Relationship in Suriname.

Reichart H. 1991. The Galibi Nature Reserve Management Plan.

Reichart H. 1991. The Brownsberg Nature Park Management Plan.

Reichart H. 1993. The Raleighvallen Nature Reserve Management Plan.

Rive Box J. de la, R. Power, J. Hendrison en P. Teunissen (red).1994. Milieu en Duurzame Ontwikkeling Suriname, deel I: Agenda van Actie.

Rive Box J. de la, R. Power, J. Hendrison en P. Teunissen (red). 1994. Milieu en Duurzame Ontwikkeling Suriname, deel III: Projectvoorstellen.

Schulz, J.P. 1976. Instelling bijzonder beheersgebied estuariene kuststrook. Nota over de bestemming van de zoute en brakke kuststrook in Suriname op oecologische grondslag. Rapport. Ministerie van Opbouw, Dienst 's Lands Bosbeheer, Paramaribo. 46.

Spaans, A.L. 1989. Bescherming Surinaamse kustgebieden. Milieu Ontwikkeling 7 (6): 13-14.

Spaans A.L. & F.L.J. Baal. 1990. The estuarine zone of Suriname: Towards a symbiosis between conservation and development of a coastal wetland area.. In: J.L. Fiselier. 1990. Living off the tides. Environmental Database on Wetland Interventions. Leiden. pp. 75-84.

Stichting Planbureau Suriname 1988. Suriname Planatlas. Organization of American States. Washington D.C.

Teunissen, P.A. 1978. Overzichtskaart Surinaamse Laagland Ecosystemen. Reconnaissance map Suriname Lowland Ecosystems, scale 1:200.000. WOTRO,'s Gravenhage, Ministerie van Opbouw, STINASU and ILACO, Paramaribo. 8 sheets.

Teunissen P.A. R. Artist, F.L.J. Baal, A.C. Cirino en J.P. Schulz. 1979. Aanbevelingen tot uitbreiding van het systeem van Natuurreservaten en Bosreserves in het Surinaamse Laagland (Tweede, opnieuw bewerkte en aangevulde uitgave). LBB en STINASU. 65 pp.

UNDP.1995. PRIF/GEF project proposal Enhancing The Capacity of Suriname to Conserve Biodiversity. 24 pp.

3.2 Protected areas in Suriname[2]

Nature conservation in Suriname

The ecosystem diversity in Suriname is rather high. Some of these ecosystems cover large areas, others are limited to small spots on the cart of Suriname. Each ecosystem is characterized by a unique complex of species, found in combination with species which have a larger distribution. Many of the Surinamese ecosystems are species rich. Table 1 gives an overview of the estimated and known plant and animal species in Suriname.

Table 1: Preliminary inventory of species of wild flora and fauna (Adhin *et.al.*, 1997).

TAXA	Estimated number of species	Known number of species
Bacteria, Algae, Fungi	> 60.000	????
Lichenes	800	350
Mosses	650	380
Ferns	450	330
Seed Plants	6.002	5.072
Invertebrates	600.000 - 1.000.000	1.589
Vertebrates	2.100	1.890
TOTAL	670.002 - 1.070.002	9.611

To protect the biodiversity, several laws and acts have been implemented since 1954, starting with the Nature Preservation Act (1954), the Game Act (1954) and the Fish Protection Act (1961). This resulted, among other things, in the possibility to establish different categories of protected areas:

- Nature Reserves. In 1954 the Nature Conservation Law provided for the establishment of nature reserves by government resolution.

- Special protection forest or forest reserves. Forest exploitation is prohibited in these areas. In 1992 new laws concerning forestry were implemented by means of the New Forest Management Law.

[2] Prepared by Mr. H. Hiwat, National Zoological Collection

Coastal-Estuarine Zone

The areas in this zone consists mainly of beaches, hypersaline to brackish swamps, and mangroves of the Young Coastal Plain. The Hertenrits is a very small area which is part of the larger Bigi Pan area. The Estuarien Zone area is, just as the Bigi Pan area (and surroundings), a so-called Multiple Use Management Area; it actually encompasses the entire coastal-estuarine zone, including all areas in this zone already protected by law.

In general, the biodiversity in the Coastal-Estuarine Zone is not very high. Its importance can be found mainly in its high biological productivity; it functions as a nursery for fish and marine invertebrates, in the occurring of sea turtle nesting beaches and in the presence of enormous numbers of migratory birds.

Protected Area: Hertenrits

Hertenrits, is a small mound of 100 ha only, which can be found east of the mouth of the Corantijn River, within the Bigi Pan Multiple Use-Management Area. Amerindians built this mound in the eight and ninth centuries A.D., using marine clays from the surrounding areas.

Archaeological investigations on the mound Hertenrits started in 1957, and continued until 1980. In addition to potsherds, stone axes, polishing-stones, and zoomorphic amulets, burial sites with human remains have been found.

There are no laws in this country that provide a legal basis for the establishment of a culture reserve. To protect this important archeological site, the area was declared a nature reserve in 1972, based on the Nature Conservation Law.

Protected Area: Coppename Monding

The Coppename Monding Reserve is located along the Atlantic coast. It was established as a game sanctuary in 1953, especially for herons and ibises, enlarged and designated as a nature reserve in 1961; it was enlarged again in 1969.

Coppename Monding was listed as wetland of international importance as water-fowl habitat on the RAMSAR list, under the RAMSAR Convention (1985). It is also listed as a Western Hemisphere Shorebird Reserve(1989), and it is linked to the Twin Sister Reserve of Minas Basin in Nova Scotia and Shepody Bay in New Brunswick, Canada (1989).

Galibi is the most important nesting beach of Olive Ridley (*Lepidochelys olivacea*) in the western Atlantic region, and it is the only beach where mass nesting aggregations (arribadas) of this species are known to have occurred in the Atlantic. Other sea turtles nesting on Galibi beaches are the Green Turtle (*Chelonia mydas*), the Leatherback (*Dermochelys coriacea*) and occasionally the Hawksbill (*Eretmochelys imbricata*). Galibi is visited by thousands of North American waders and possibly the Peregrine Falcon.

Two amerindian villages are located just south of the Reserve. The villagers are allowed to use the Reserve for fishing, hunting, plant collecting, and small scale agricultural activities. Nature tourism is predominantly under auspices of STINASU (Foundation for Nature Preservation in Suriname). The Reserve has a high potential for ecotourism; a public awareness campaign among the local inhabitants has just started.

Gold mining activities along the Marowijne River may have a negative impact on this Reserve, because of its location along the west bank of the mouth of this River. Uncontrolled harvesting of sea turtle eggs by locals, is a threat to the sea turtle population. Sea turtles also get entangled in fishing nets.

Protected Area: Bigi Pan and surrounding area

Bigi Pan is situated along the Atlantic coast, between Burnside and the mouth of the Corantijn River. In 1987, this area with its high biological productivity, was placed under the management of the Suriname Forest Service.

Bigi Pan is listed as a Western Hemisphere Shorebird Reserve (1989); and it is linked to the Twin Sister Reserve of Minas Basin in Nova Scotia and Shepody Bay in New Brunswick, Canada (1989).

The existence of various coastal ecosystems, and the abundance of fish and invertebrates, such as shrimps, maintain a high numbers of birds in the area. Breeding populations of herons and egrets may number up to 4.000 breeding pairs (for *Egretta tricolor*). The Scarlet Ibis (*Eudocimus ruber*) breeding colony is one of the largest in the world with up to 10.500 breeding pairs.

Except for the Peregrine Falcon (*Falco peregrinus*) there are 32 other migrating bird species. It is likely that the Manatee (*Trichechus manatus*) will also occur in this area.

The estuarine ecosystems are highly productive, and they serve as a nursery for marine invertebrates.

It is likely that several species of cats and the Manatee (*Trichechus manatus*), which are listed in Appendix I of CITES, will also occur in the area.

Protected Area: Boven Cusewijne

Boven Cusewijne is situated between the lower courses of the Coppename River and the Saramacca River. This area has the largest and most representative brown-sand savanna of the Cusewijne-type. It was declared a nature reserve in 1986. The Reserve also holds the typical mesophytic and hydrophytic forests (e.g. palm swamps with *Mauritia flexuosa*) of the Central Lowlands of Suriname. The River itself is a good representative of a black water river.

The Cusewijne River in this Reserve is an excellent habitat for Manatees (*Trichechus manatus*), Giant River Otters (*Pteronura brasiliensis*), and Caimans, which are quite abundant in this River.

Much research on Caiman ecology was carried out here. Also for the future, continued research on Caimans is planned here.

The swamps and other wet areas in the Reserve are important for several species of waterfowl, including migratory species. The palm swamps provide excellent breeding and feeding area for thousands of Macaws such as *Ara ararauna*.

It is planned to construct a small field station in this Reserve, especially suited for excursions and practical work of students of the University of Suriname and the Teachers College.

Villages of Amerindians are located not far from the Reserve, and they are allowed to continue their fishing and hunting activities.

Threats to the protected area are illegal hunting, illegal timber extraction and the uncontrolled burning of the savanna and open swamp.

Protected Area: Copi

Copi is situated between the Suriname River and Commewijne River, north of the Brokopondo Reservoir. The easternmost mesophytic dryland- and marsh forests on Old Flats are situated in this area. It was established as a nature reserve in 1986. The dry clay savanna of Welgelegen-type in this Reserve is the only state-owned one; the two other dry clay savannas in the country are private property.

Diversity can be considered rather high in general, because of the presence of a variety of ecosystems of the Old Coastal Plain and Savanna Belt. A complex of *Bertholletia excelsa* (Brazil Nut) trees occurs on the older river banks along the Kaburi Creek.

The composition of the western representatives of mesophytic dryland and marsh forests on Old Flats, Old River Banks, and Plateaus and Slopes, is extremely different from the same forest types in other parts of Suriname.

Threats to the protected area are hunting, a high fishing pressure and illegal fishing by the use of Neku, a natural fish poison (*Lonchocarpus latifolius*).

Since 1978, Kaburi kreek has been proposed as nature reserve.

Proposed Protected Area: Nani

Another proposed nature reserve is Nani, which lies south of Nieuw Nickerie. Floating vegetation, West Surinamese representatives of mesophytic dryland, and marsh forest on Young Ridges and Younger River Banks occur in this area.

Of the species listed in Appendix I of CITES, *Giant River Otters (Pteronura brasiliensis) occur in the area and Manatees (Trichechus manatus)* and several species of cats are likely to occur there as well.

The plant diversity is not very high due to the kind of ecosystems in the proposed nature reserve, which form part of the landscapes of the Young Coastal Plain.

Proposed Protected Area: Mac Clemen

On the right shore of the Corantijn River, north of Kaburi Creek, is located the 12.000 ha Mac Clemen area, which has been proposed as Forest Reserve.

Since this forest reserve has only landscapes of the Young- and Old Coastal Plain, the plant diversity is not particularly high.

The area is important for ecological-silvicultural research on *Mora excelsa* and *Carapa procera*, for the sustainable use of these forests elsewhere in Suriname.

Remnants of the oldest mission station of the Moravian Church, can be found near the mouth of the Kwikwi kreek.

Large-scale as well as small-scale miners in and around the nearby Gros-Rosebel Area, may affect the Reserve.

Protected Area: Brownsberg

West of the Brokopondo Reservoir lies Brownsberg, which is owned by the Foundation for Nature Preservation in Suriname (STINASU), on long-term lease. In 1969, STINASU obtained part of the Brownsberg Plateau to be managed as a Nature Park.

Due to the ecosystems (montane forest, ecosystems of waterfalls) and to the accessibility and the infrastructure, this nature park has served as a center for nature education and public awareness, as well as for ecotourism, since the establishment in 1969 until 1986, and since 1993 until present.

Gold-mining and balata bleeding (rubber) took place during the early years of 1900. Signs of bauxite prospecting (by the SURALCO) can be found here and there in the park.

More than 1.450 plant specimens (Pteridophyta and Spermatophyta) have been collected in this park. One hundred and thirty eight plant species of Brownsberg showed to be rare; twelve species have been recorded as endemics for the Park.

Of the fishfauna, *Corydoras punctatus* is only known from the Suriname River Basin, and therefore endemic to Suriname. Many zoologists have worked in the Reserve on, for instance monkeys. Small-scale gold mining occurs around and inside the Park, and signs of pollution have already been observed in the Witi Creek, which runs through the park. Illegal logging and hunting has also been noticed in this Nature Park. The Nature Park is too small when considering the protection of some of the larger mammals.

Protected Area: Raleighvallen

Ralleighvallen lies along the Coppename River, in the center of the country. It was established as a nature reserve in 1961 and enlarged in 1986.

The vegetation on granite outcroppings (inselbergs) in this reserve, notably the impressive 240 m high, dome- shaped Voltzberg and the 360 m high Van Stockumberg, is unique. These inselbergs have a rare ecosystem the so-called "muri-muri ("rock-savanna"). Five endemic plant species occur on the granite dome Voltzberg, and two in the forest of the reserve.

The flora and the fauna of this Reserve are largely unexplored and await the attention of scientists. The animal diversity is thought to be high. Eilerts de Haan was established as a nature reserve in 1966.

It may be assumed that the diversity in this Reserve is similar to the Wilhelminagebergte, a mountain range, bordering the Reserve. In the Wilhelminagebergte, about 3.000 Pteridophyta and Spermatophyta have been collected; 143 species appeared to be rare, and 11 endemic.

Protected Area: Sipaliwini

Sipaliwini is situated at the border with Brazil. The area was established as a nature reserve in 1972.

For Suriname, the savanna ecosystems occurring in this Reserve are unique. It is an important savanna refuge north of the Amazon River, and the largest one and most important one in the south of Suriname. The forest-islands in the savanna are a refuge for the Blue Poison-Arrow Frog (*Dendrobates azureus*), and maybe also for other fauna yet unknown. The Blue Poison-Arrow Frog is endemic to the forest-islands of the Sipaliwini Savanna. This is why this Reserve is important for research on "island biogeography" and the Blue Poison-Arrow Frog as such.

More than 2.660 plant specimens of Pteridophyta and Spermatophyta have been collected. One hundred and thirty eight turned out to be rare; sixteen species have been recorded as endemics.

Amerindians, living in the village of Kwamalasamutu, some 80 km west of the Reserve, and at Sipaliwini Airstrip, near the border of the Reserve, use the area in the vicinity of their village, including the savanna, as their hunting grounds. Stone age artifacts, such as spearpoints, choppers, and other stone tools are found here, and are of great archaeological value. Potsherds and petroglyps have been found as well.

The Reserve is threatened by poaching, illegal collecting of songbirds, parrots and toucans, reptiles and amphibians, including the fully protected Blue Poison-Arrow Frog. The frequent burning of the savanna could change its composition and threaten the forest-islands.

resulted in giving a high rank for the areas which face many threats. The weights of all the selection criteria, established during the workshop, can be found in Appendix 1. The different types of threats in the protected area, were also identified during the workshop. They can be found in Appendix 2a.

The following five areas were selected at the workshop:

- Sipaliwini
- Estuariene Zone (incl. Hertenrits, Coppename Monding, Wia Wia, Galibi, en Bigi Pan)
- Raleigvallen (incl. Voltzberg)
- Boven Cusewijne
- Wane Kreek

The rank of these and all other areas under consideration can be found in Appendix 3.

The threats each of these five areas face have been listed by the ERC and can be found in Appendix 2b. The most relevant and efficient actions that can be considered to protect these areas, are: establishing buffer zones around the areas, set up guard stations, develop a management plan, and ensure actual law enforcement.

With this selection procedure a rather effective method has been used to identify the status of the different protected areas in Suriname. Also, this workshop has shown which areas in Suriname are thought to be in need for extra support in order to conserve the biodiversity. Additionally, the workshop documents, prepared by the ERC, give an overview of the characteristics of each of the protected areas. Thus, all relevant information on the protected areas of Suriname has been compiled and made widely available.

Areas of regional importance

Of course, cooperative management of protected areas is mostly needed in those areas which are of mutual importance. The most obvious areas that can be categorized as mutual important to the Guianas are the Estuarine Zone, which includes the Coastal Zone from French Guyana, Suriname and Guyana, and the mountainous region which can be found at the south border of the Guianas with Brazil.

The Estuarine Zone is an important complex of interdependent ecosystems. It serves as a nesting area for sea turtles and as a nursery for marine invertebrates. The area harbors many birds; more than 34.000 breeding pairs of scarlet ibis were

Mittermeier,R.A. *et al.* 1990. Conservation Plan for Suriname, Division of Nature Conservation, Paramaribo.

Mittermeier,R.A. *et al.* 1988. Primates and Protected Areas in Suriname, Oryx Vol. 22, N° 1.

Staatsblad. 1992. Wet Bosbeheer, Staatsblad van de Republiek Suriname N° 80.

Ouboter, P.E. and M.C.M. Werkhoven. 1997. Area Profiles Dossier, Environmental Research Center, University of Suriname, Paramaribo.

Ouboter,P.E. and M.C.M Werkhoven. 1997. Voorproject inventarisatie binnenland ten behoeve van het natuurreserveringsbeleid, University of Suriname, Paramaribo.

Werkhoven, M.C.M. 1996. Het prospecteren van de biodiversiteit, paper voor het RLA/92/G32 subproject: National Strategy on Biodiversity, Nationaal Herbarium, Universiteit van Suriname, Paramaribo.

Appendix 2a. Different types of threats considered during the workshop on "Protected Areas"

- Non-sustainable forestry + non-timber forest product collection
- Non-sustainable and illegal hunting
- Non-sustainable and illegal fishing
- Disturbance of drainage
- Agriculture, aquaculture + related pollution
- Mining, oil drilling + related pollution
- Permanent human inhabitation
- Recreation-pressure
- Road construction

Wane Kreek

- Bauxite mining by the Suriname Aluminum Company
- Logging and hunting by the people from the nearby situated villages of Marijkedorp and Alfonsdorp
- Logging in areas surrounding the reserve
- Illegal hunting

3.3 Guidelines for the formulation of protected areas management plans[3]

To designate a region as a protected area is one thing -- knowing what to do with it is another. The latter is essentially the purpose of a management plan, but all too often, protected areas are managed on an ad-hoc basis, or not managed at all; like the socalled "paper nature reserves." This is not always necessarily the fault of the managing department, but usually a combination of two things: lack of personnel and not having a management plan.

The title of this paper: "Guidelines for the formulation of protected areas management plans" should not be misconstrued as being able to present a "Bible" for developing management plans. I am merely giving you my experiences in developing management plans for some protected areas in Suriname, and what I think is needed in general. Some of you here may not agree with certain statements, or you may have issues that I fail to mention. So I hope to stimulate some lively discussions during this workshop, so that we may perhaps arrive at a consensus for criteria needed to develop management plans for protected areas in the our region.

When undertaking the task of developing management plans for several of Suriname's protected areas, I surveyed the literature to get ideas on how to go about it -- no need to invent the wheel again -- but much of what I found was not all that suitable.

Many of us in the field of conservation are aware of the plethora of publications on managing protected areas, but I'm not happy with some of them. Of course, a book on developing management plans for the international conservation community has to be general. An author is trying to cover the entire world, and that's where the problem with most of these publications lies. Much of that type of literature has no bearing on the situation in Suriname -- for that matter the Guianas. Information on conditions here is needed -- not examples of case studies from Outer Mongolia, New Zealand, or some other unrealistic place for comparison with the Guianas.

There is one exception, though: the book by John and Kathy MacKinnon, *et al.*: "Managing Protected areas in the Tropics." If there is anything like a "Bible" for developing management plans, this is it. However, the book is definitely not a manual for cranking out management plans according to some multiple question answering system. But it does touch on all the salient features that could be covered in a management plan. It is up to us to look over their recommendations and see if they are applicable for conditions in the Guianas.

---

[3] Prepared by Henri Reichart, Senior Technical Advisor, Surinam Forest Service.

much as possible, that reprints of material referred to in the management plan are readily available to the manager.

Three important subjects are mandatory for inclusion in a management plan:

- A statement of objectives
- An implementation schedule
- A budget

Early in the management plan document a clear statement of **objectives** should be made, including a recommended strategy to attain these. Without it, the implementation of the plan is bound to flounder.

The objectives and strategy to obtain them, as they appear in the management plan for the Raleighvallen Nature Reserve in Suriname, have been added as Appendix B (numbers refer to sections in the management plan document).

Furthermore, it would be ludicrous to assume that, once you have a management plan, the money will be right there and implementation will run its natural course. Closely tied in with the goals and objectives is a **time schedule** for implementation and a **budget**. These, by the way, are also essential when applying for external funding.

The usual time period for a management plan is five years. This does not necessarily mean that everything in the management plan should or could be accomplished within five years. It's just an arbitrary, but nevertheless realistic time limit for implementation. The budget should accordingly also be estimated for a five-year period. An implementation time schedule for the Raleighvallen Nature Reserve management plan is attached for reference (Appendix C).

Protected areas cannot be run from some desk in the city. An often neglected, but critical part of implementing a management plan and running a protected area is a good field manager, including a well-trained staff. Often, at least in Suriname, someone is appointed manager because he is the only one among the workers who can read and write, but it is imperative that a qualified field manager is in charge for the plan's successful implementation. Fieldworkers are often also not properly trained for their tasks. For reference, the training program for fieldworkers in the Raleighvallen Nature Reserve is attached as Appendix D.

I believe that in many instances there is enough in-house talent in developing nations to write their own management plans. What is needed is a set of regional guidelines, including what peripheral aspects should be considered in the plan.

Appendix A. Table of contents for the Raleighvallen Management Plan

5. APPENDICES

A) G.B. 1954, N° 26 (Nature Protection Law)
B) G.B. 1966, N° 59 (Raleighvallen/Voltzberg Nature Reserve Decree
C) G.B. 1986, N° 52 (Raleighvallen/ Voltzberg Nature Reserve enlargement)
D) S.B. 1977, N° 45 (changes in terminology in Government Publications)
E) Technical data for the Foengoe Island airstrip
F) Soils map of Northern Suriname (in envelope)
G) Amphibian and Reptile checklist for the Raleighvallen/Voltzberg Nature Reserve
H) Bird checklist for the Raleighvallen/Voltzberg Nature Reserve
J) Mammal checklist for the Raleighvallen/Voltzberg Nature Reserve
K) Fish checklist for the Raleighvallen/Voltzberg Nature Reserve
L) Personnel training program
M) Instructions for the construction of a "Hydraulic Ram" water pump

LIST OF FIGURES

LIST OF TABLES

Strategy

In order to achieve these objectives, the management plan proposes the following strategy:

1. Establishment of firm boundaries for the reserve;
2. Establishment of usage zones inside and around the reserve;
3. Establishment of a strong guard force;
4. Improvement of relations with nearby Kwinti settlements;
5. Maintenance and expansion of the nature trails network;
6. Expansion of tourist facilities to other areas in the reserve;
7. Establishment of a team of trained field personnel;
8. Construction of mini hydro-power installations in the reserve;
9. Development of an education and information center;
10. Construction of a biological field research station.

Appendix D. Training program for fieldworkers in the Raleighvallen Nature Reserve

In order to attain an adequate level of proficiency, and to develop a code of behavioral standards, a suitable training program should be organized for field personnel. The course must be focused on obtaining practical experience. This can best be accomplished by confronting the students with real-world situations that have been resolved in a more or less satisfactory manner.

The course must last at least 6 weeks, and is to be restricted to about 12 students at a time. Upon satisfactory completion of the course, the worker will be given a certificate of completion.

The curriculum has to include the following subjects and procedures (but it does not have to be limited to this):

- **Legislation** - intensive for guards, less so for others.

  National conservation laws; pertinent international laws; pertinent treaties and conventions.
  Arrest and confiscation procedures; evidence gathering (e.g. weapons, nets, witnesses); legal rights of arrested person.

- **Ecology**

  Basic plant and animal taxonomy;
  Use of dichotomous keys to identify commonly seen plants, amphibians, reptiles, birds, and mammals;
  Basic wildlife management field techniques;
  Field identification of plants; especially herbs, shrubs, and trees commonly used by local people;
  Recognition of animal tracks;
  Collecting and preserving biological specimens.

- **Other field skills**

  Map reading, use of compass, use of binoculars;
  Simple shelter construction, cutting and marking of trails;
  Maintenance of field equipment;
  First Aid course, emphasizing emergency treatment of deep cuts, snake bites, fractures, drowning, and sunstroke.

4. REPORTS FROM GUYANA

4.1 Policies, legislation and organizational structure for protected areas in Guyana[4]

Introduction

Guyana is endowed with vast natural and biological resources. Of its 215.000 square kilometres about 80% is covered with forests. The forests contain a rich biodiversity, comprising about 8.000 plant species, including 1.000 tree species. There are about 1.200 species of vertebrates which are comprised of 728 reptile species and 105 amphibian species. Wildlife species of 144 are listed as endangered.[5]

The Government of Guyana recognises that to achieve meaningful development, there should be rational utilisation of its natural resources. It also recognises that the development process should proceed with due regard for the environment. In its National Environmental Action Plan (NEAP) which was ratified in Parliament in 1994 , the Government of Guyana has stated that it "is committed to adopting and implementing a national policy of environmental management and sustainable development".[6] The NEAP also outlines an Environmental Policy which includes a commitment by the Government of Guyana to establish a protected areas system.

To give effect to its Environmental Policy, the Government of Guyana, in June 1996, enacted legislation for the protection of the environment. The Environmental Protection Act of 1996 provides for the establishment of an Environmental Protection Agency which, inter alia, would be responsible for the "effective management of the environment so as to ensure conservation, protection and sustainable use of its natural resources" and co-ordination of the establishment and maintenance of a national parks and protected areas system and a wildlife protection management programme".[7]

There is currently no protected areas system in Guyana. However, with assistance from The World Bank, the Government of Guyana is preparing a project for the establishment of a National Protected Areas System (NPAS). This project is

---

[4] Prepared by Doorga Persaud, Head of the Guyana Natural Resources Agency

[5] National Forestry Action Plan, 1990-2000, p.4

[6] National Environmental Action Plan, p.2

[7] Government of Guyana Environmental Protection Act, pp10-11

future generations."[8] The National Parks Commission Act also provides for the creation of designated parks by the Minister assigned responsibility for national parks. This could include an area identified for its natural beauty and recreational use.

There are other legislation which bear relevance to protected areas. These include the Guyana Forestry Commission Act; the Forests Act; the National Trust Act; the State Lands Act; the Wild Birds Protection Act; the Fisheries Act; the Plant Protection Act; the Public Gardens and Agricultural Shows Act; and the Amerindian Act.

Another important legislation which is related to protected areas is the Iwokrama Act of 1996. This Act provides the legal framework for "the sustainable management and utilisation of approximately 360.000 ha of Guyana's Tropical Rain Forest dedicated by the Government of Guyana as the Programme Site for the purposes of research by the Iwokrama International Centre to develop, demonstrate and make available to Guyana and the international community systems, methods and techniques for the sustainable management and utilisation of the multiple resources of the Tropical Forest and the conservation of biological diversity; and for matters incidental thereto."[9]

Under the National Protected Areas System project, a legislative reform programme is intended. This would entail a two-stage process. In stage one of the reform, legal status will be given for the establishment of two pilot protected areas. This would be done through amendments to the Kaieteur National Parks and the National Parks Commission Acts. Stage two of the reform process would focus on the creation of the legislative framework for the establishment and maintenance of a comprehensive national protected areas system. This implies that the new legislation would replace the Kaieteur National Park and the National Parks Commission legislation.

Organizational Structure

As stated above, the National Parks Commission is the entity with the responsibility for maintaining and regulating the Kaieteur National Park. As a body corporate, the Commission shall consist of not less than four nor more than eleven members who are appointed by the Minister. A Chairman and Deputy Chairman are appointed from among the members.

---

[8] The Laws of Guyana .National Parks Commission Act, No. 23 of 1997, p.4

[9] The Laws of Guyana. Iwokrama Centre for Rain Forest Conservation and Development, 1996, p.3.

4.2 Situation of present and proposed national system of protected areas in Guyana [10]

Preamble

Guyana does not have a system of protected areas as yet although there are three legally designated protected areas in the country. Due to the non-threatened and inaccessible nature of much of the country's *in situ* biological diversity and other natural resources assets, and perhaps also the non-existence of a nature tourism industry requiring a formal wildland system, there was little need to give priority to the establishment of a national system of protected areas.

A system of protected areas was first officially proposed by government in the National Forestry Action Plan of 1989. At the moment the government is considering the initiation of activities towards the establishment of such a system through the development of a project for a National Protected Areas System (NPAS). A proposal to fund much of the initial work towards this end has been prepared and is receiving donor consideration for possible support. This report draws largely from the elements of policy contained in the proposal document. While many of the statements therein can be considered to reflect policy, only some, which are not likely to change as a matter of policy will be mentioned here. The details of this should be considered as indicative rather than definitive.

Ecological coverage

The system will be based on the principle of comprehensive representation of the major ecosystems of the country. There is no ecological classification system for the country at present but a system is expected as an outcome of existing initiatives.

Management categories

The system will include an array of protected area categories, possibly all seven, with the objective of meeting Guyana's national development objectives for conservation of biological diversity and sustainable utilization of natural resources. The classification system to be used will be that of IUCN 1994, including the nomenclature. Thus the classification of the various categories of protected areas will be standardised with the international. The IUCN system of 1994 will be used to categorise protected areas and every effort will be made to avoid the use of category names outside of this system, as is the case with the large majority of countries.

---

[10] Prepared by Mr. Macsood Hoosein, Guyana.

- ***Environmental Values***. Areas may have a particular value in the provision of environmental services for local communities or industries, or watershed protection;

Use of Geographical Information System

The use of this relatively new tool has been recognised and the Government of Guyana has made some initial investments in the purchase of hardware, software, and in human resources training in this area. The investment afforded so far has emphasised the Centre for the Study of Biological Diversity, which will be involved in much of the analysis of data in the planning stages. The plans are likely to require the purchase of remotely sensed images and the collecting of biophysical and socio-economic data for analysis by GIS in order to arrive at decisions with respect to choice of area, management category, and zoning.

One of the needs of the country will be for training in GIS and the acquisition of equipment and remotely sensed images. The planning for protected areas will fall within the context of the national land use planning programme, using digital and other available data, and sharing the same GIS system, formats and scales.

Stakeholder Participation

One of the elements emphasised in the planning design is that the process for the reaching of decisions with respect to individual areas and the national system as a whole is to ensure participation of all stakeholder groups, including local communities, entrepreneurs involved in the extractive industries and tourism, and the public at large. Public consultations are planned at the national and local levels, together with training for the citizenry, and their hiring to work in protected areas. Legislation will provide for co-management or local management involving local communities, public institutions, and NGOs, where appropriate. The participation of various stake holder groups in decision making bodies is to be institutionalised through legislation. Where applicable, emphasis will be placed on the training and hiring of citizens of local communities in the planning and management of protected areas.

A National Steering Committee comprising representatives of stakeholders is to be institutionalised, together with a National Amerindian Advisory Council for the protected areas system. In addition, community boards have been set up involving communities adjacent to protected areas, as is the case with Iwokrama.

management of the Iwokrama International Centre is about 1 million acres (360.000 ha), with natural boundaries formed by rivers and creeks. The area is covered in lush, pristine rain forest. The terrain is generally undulating to hilly, except for the Pakatau Hills (max. elevation: 410 m/1.345 ft) in the north-western corner and the Iwokrama Mountains (max. elevation: 835 m/2.740 ft) in the middle-eastern region of the site.

The Iwokrama International Centre for Rain Forest Conservation and Development was established on May 7th 1996, when His Excellency, the late President Cheddi B. Jagan, assented to the Iwokrama International Centre for Rain Forest Conservation & Development Act 1996. The Act had been previously passed in Parliament with the *unanimous* support of all parties. The idea of Iwokrama was proposed at the 1989 meeting of the Commonwealth Heads of Government meeting in Kuala Lumpur. In 1990 a Commonwealth Expert Group headed by Dr. M. S. Swaminathan, then President of IUCN, began working jointly with a Guyanese Inter-Agency Committee to establish Iwokrama. This was followed up with reconnaissance surveys of the area by the Natural Resources Institute (NRI) of the United Kingdom in 1992, and in 1993 the Global Environment Facility (GEF) agreed to fund the start up phase of Iwokrama as a project.

The rain forest site is now developed in terms of possessing a functional Field Station with about sixteen permanent staff, and is already in use by scientists, undergraduate and graduate students, tourists and other visitors from the United Kingdom, United States of America and Canada. In addition to the Government of Guyana, the Commonwealth Secretariat and the GEF, support for the establishment of Iwokrama has also come from the International Development Research Centre (IDRC) of Canada, most notably with the setting up of an Information & Communication Unit.

The activities of the Iwokrama International Centre are autonomously governed by policy, strategy, budgets, contracts and plans approved by an International Board of Trustees (BOT). The 15-member Board includes members from the Commonwealth Secretariat, Brazil, Ghana, Japan, the University of the West Indies, the University of Guyana and the Government of Guyana, under the chairmanship of Dr. M. S. Swaminathan (of India). The members of the BOT are appointed by the President of Guyana, the Commonwealth Secretary-General, the Government of Guyana and the Commonwealth Secretariat.

The BOT appoints a Director-General to manage the operations of the Centre, who is in turn supported by professional and other staff. The Board of Trustees will also be advised by several bodies where appropriate. These are a Scientific and Technical Advisory Network (STAN), which will provide international peer review and advice on technical matters; a Sustainable Human Development Advisory Panel; and a Guyana Stakeholders Group to foster and reinforce the natural cooperation that

Following the expected improvement of a reliable road from the capital city on the Atlantic coast of Guyana to Lethem on the south-western border with Brazil, directly *through* the Iwokrama Forest, there will be scope for unsanctioned logging and other activities. This is already reported to be occurring in nearby regions of the country. This road is already in existence and in use, but activities along it are limited because sections of it are not always easily passable. When it does become more accessible, (Government initiated construction and maintenance are currently underway), the Iwokrama Forest will face the threat of illegal logging, hunting, the threat of colonists, the spread of diseases, narcotrafficing, other socio-economic impacts, among others.

As a background, unsanctioned activities *already* occurring in Guyana's forests can be briefly described. There are recurring incidents of unlicensed and unsustainable logging; some of it probably encouraged by the ongoing construction boom in Guyana. There are also many incidents of unlicensed gold and diamond mining operations. Reportedly, much of this is perpetuated by persons intruding from outside of Guyana. The military have been used to try and curb this type of activity; however it still continues. The local newspapers recently reported an estimated 400 unsanctioned Brazilian miners operating in an area to the north of the Iwokrama Forest. Front page stories in the Stabroek News newspaper of March 30th, April 7th, April 12th, April 15th and May 28th, 1997, illustrate the growing problem of unsanctioned intrusions, especially for gold mining, in interior locations. Easier access to mining areas which the road will provide, may allow this to become prevalent in and around the Iwokrama Forest.

The Iwokrama Centre is anticipating this potential problem by improving its on-site presence in the form of full time Forest Rangers, is considering the placement of monitoring posts, and is also exploring options based on remote sensing technology to guide such efforts in a more effective manner.

Even though the road corridor will be the responsibility of the Government of Guyana, and efforts are apparently being made to establish a national policing presence in the area as well as an enhanced operation at the road's major crossing at the Essequibo river, these and other development related problems are expected to pose a threat to the Iwokrama protected area.

Status of management plans for Iwokrama Forest (Zoning of the forest)

As noted in section 2.0 above, the Iwokrama Act 1996 requires two broad zoning types of the Iwokrama Forest in an almost 50% and 50% division of the area: the Wilderness Preserve and the Sustainable Utilization area. As defined in the Iwokrama Act 1996, "[the] Wilderness Preserve [refers to] the area ... for conserving

and weighing of factors, expression of constraints, assumptions, uncertainty, end-result maps and tables, accuracy/error assessment, and other relevant matters with regard to each scenario. As much as possible these will be summarised with decided rankings and projections from each scenario to indicate a final design.

Criteria, methodology and participatory approach in planning process

The zone planning criteria will be chosen to reflect the intentions of the Iwokrama Act 1996 which stipulates a "principle [objective to] conserve biological diversity", and other management guidelines such as the Iwokrama Operational Plan 1998-2002. The GIS will be the major tool in applying these criteria to produce alternative designs and to perform sensitivity analysis of the parameters used and the models produced.

The full results will be submitted to the STAN for a technical review of the analysis carried out and the final design proposed. This is to ensure that the design takes advantage of the best international expertise, opinions and knowledge. This may then produce revisions to the analysis which may be done and resubmitted for the consideration of the STAN. In addition, the design proposal will be submitted to the local stakeholders for advice based on the indispensable local knowledge of the Iwokrama Forest and the Guyanese (ecological, administrative and legal) environment that resides in local Guyanese agencies. It should be pointed out also that the Iwokrama Centre has encouraged the formation of the North Rupununi Amerindian Board; a group representing Amerindian villages near the Iwokrama Forest for discussion of issues that are common in the area, and the zoning designs will probably be communicated to the stakeholder Amerindian community via this route.

The Iwokrama Centre will then do its own final revision of the proposals outlining explicit responses to both the technical review by the STAN and the stakeholder comments and inputs. This final design will then be sent for approval and legitimisation by the Board of Trustees and will then become the final operational zoning design.

It needs to be emphasized that Iwokrama committed itself to the having a participatory technical (STAN) and stakeholder review of the protected area planning and design process very early. This is in recognition of the international responsibility that Iwokrama holds, and will ensure that the process benefits from the human resources available to Iwokrama; human resources that are essential for the dealing with the complexities and uncertainties and achieving successful implementation of the Iwokrama protected area.

Program I: Sustainable Management of the Tropical Rain Forest.
To demonstrate how tropical rain forests can be both conserved and equitably utilized, yielding ecological, economic and social benefits to the people of Guyana and the international community.

Program II: Conservation and Utilization of Biodiversity.
To manage part of the forest as a Wilderness Preserve and systematically prospect the rich biodiversity for new products from the forest, thereby increasing local scientific and technical capacity.
This programme is expected to produce an inventory of Iwokrama's biological diversity, a protected Wilderness Preserve, and a programme of biological prospecting under prescribed regulations.

Program III: Sustainable Human Development.
To help people develop their ability to benefit from the tropical rain forest and to address the complex issues related to its sustainable management.
This programme is expected to assist neighbouring Amerindian communities to develop in harmony with Iwokrama, develop the institutional capacity for training in the management of natural tropical forest, and provide useful environmental information about tropical rain forest to the Guyanese public, scientists, technicians and students from around the world as appropriate.

Program IV: Forest Research.
To compile, adapt, refine, generate and disseminate knowledge and technologies to improve the management and utilization of the resources of tropical rain forests in order to provide a sustainable basis for human development.

Program V: Information and Communication.
To establish an international information and communication resource unit which will serve as a channel for dissemination of knowledge gained from the Iwokrama Programme, will facilitate dialogue between Iwokrama staff, local communities and diverse regional and international stakeholders and will support the research activities of the Programme.

Program's IV and V, Forest Research and Information and Communication, are considered to be cross-cutting ones; for example it is obvious that forest research will directly influence both the Sustainable Management and Biodiversity programs, and the

As part of its training and education thrust, Iwokrama, along with the Office of the President, successfully completed a training course for Park Rangers at the Iwokrama Forest. Eighteen participants, the majority of whom were Amerindian from Amerindian Districts, and including four women, were trained in various aspects of wildland management and protection. Eight of these participants now have full-time jobs with Iwokrama, and amongst other duties as skilled guides, etc. are part of the Forest Inventory being conducted by Iwokrama. With their newly acquired skills, the other graduates are now available for service to other protected areas. Iwokrama will continue to place strong emphasis on human resource development and training.

With its data-based methods, and with the facilities that are available to it, it is believed that Iwokrama is suitably poised to act as a regional training resource for protected area managers and planners.

Research and protection

Research at the Iwokrama Forest is administered and controlled by the Iwokrama Centre. Some of the scientific work has been formally contracted by the Centre to scientists from various institutions; much of this has been survey and inventory; e.g floral survey, faunal survey, archaeological survey by the Walter Roth Museum, and Amerindian use of the Forest by the Amerindian Research Unit, University of Guyana. In addition, other researchers have been given permission to conduct studies at the Iwokrama Forest. Some of these have been formal educational experiences, such as visits by entire classes from universities abroad . In other cases, the studies have been individual field work as parts of degree courses, or simply studies in an area of interest by a scientist or group of researchers.

Research approved to be conducted at the Iwokrama Forest is done under Memoranda of Understanding with the researchers. One important element is the sharing of any data, reports or knowledge gained with the Iwokrama Centre and the deposit of duplicate specimens collected, with a local repository. This is to try and ensure that the resources are studied in a manner approved by the Centre and by Guyana. This element of Iwokrama's management and development of the Iwokrama protected area is now being strongly considered with a view towards developing a formal system and mechanism for ensuring protection for intellectual property rights, benefit-sharing and the sovereign rights of the country.

Visitors are being catered for by the development of prepared trails and guided tours into suitable areas.

4.4 Priority areas and strategies for a cooperative programme in protected areas management [12]

Introduction

The planning and management of protected areas in Guyana has recently been receiving much attention by the Government, and it is being realised that there is much to be done. In terms of protected areas in the country and their state of management, there is only one national park (Kaieteur National Park) for which a management plan is still to be developed. The Iwokrama project has advanced greatly in developing its own management plan and the Moraballi Reserve is still to receive attention in this respect.

Nationally, there is now an attempt to develop a system of protected areas, and a strategy document has been prepared which identifies elements of a national policy, but this has to be enlarged upon. In the area of laws and regulations on protected areas and conservation for the country, these would have to be re-examined from time to time and updated when necessary, and new ones would have to be established.

In terms of research, much effort is being placed on obtaining an inventory of the flora of the country, with less effort being given to the fauna. Also, there are some applied studies in the area of forestry which looks at ecological inter-relationships, but there is still much more to be done. Further, there has not been much attention in the country at obtaining a description of the flora and fauna of particular areas, like the Kaieteur National Park, although the Iwokrama project has commissioned work of this type for its management plan.

In the area of environmental education and public awareness, most of the information is spread through the public media and some fora for restricted participants, so there is a need to have a more integrated approach and to develop educational programmes for schools. At the University of Guyana, there are some courses in undergraduate programmes on environmental education, recreation and eco-tourism but they are insufficient for the full training of personnel for the management of protected areas. Also, some individual institutions occasionally offer in-house training, but this is also insufficient and costly. There is a need, therefore, to expand and intensify these programmes to cater for more training of personnel. Recently, some tour operators in the country have introduced eco-touring in their packages, but national guidelines need to be developed and trained personnel be employed for such tours, less the environment be unfavourably affected.

---

[12] Prepared by Mr. Indarjit Ramdass, Senior Lecturer, University of Guyana.

The implementation of the management plan is also of importance. For example, infrastructural works would be necessary - administrative centers, tourists facilities, guard posts, training and research facilities, etc.. Questions can be asked like how to determine the ideal sizes of these, the design of them, the landscaping to be done, and where best to locate them? These issues are functions of the size of the protected area, the reasons for establishing it, and the tourist population, if any. Also, what are the typical bottlenecks in implementation? Funding, of course, is usually the fundamental one, but what others are there, and how are they best resolved? Again, the experiences of the countries in the region would be beneficial to each other.

Research

Research is essential to elucidate the composition of protected areas and inter-relationships within them with a view to properly protect them. It also would give information on ways of protecting endangered and rare species and encouraging the survival of such species. Research results also feed back to policy and management decisions resulting in changes to them. Countries in the region as a whole have done various amounts of research on their biodiversity, so information could be shared especially with respect to protected areas and indicator species. There is also the opportunity to conduct joint expeditions to gather inventory and other data, and to conduct some amount of field training. Further, common research methodologies could be developed which would better permit the comparison of data and formulation of guidelines for management.

Environmental education and public awareness

Environmental education and public awareness is important for the overall protection of the natural resources of any country. Countries within the region can benefit from the experiences of each other. Joint public awareness campaigns, especially on protected areas and indicator species, could be mounted. This would reduce the unit cost of production. There are also many types of promotional materials which can be jointly produced: documentaries, educational posters, postcards, stickers, t-shirts, brochures, curios, etc.. Apart from joint productions, there can also be sharing of materials -with appropriate compensations- which have been produced independently in the past.

Training

Trained personnel is a pre-requisite for formulating and implementing any management plan. Trained personnel are usually in short supply for the region as a whole, so this is one area which can involve sharing of resources. Joint training programmes, involving both theoretical and field aspects, could be mounted. There can

ANNEX 1. PARTICIPANTS

GUYANA

Mr. Lloyd Andrews
Principal Administrative Assistant to the Minister of Amerindian Affairs
c/o Office of the President
New Garden Street
Georgetown, Guyana
Tel. (592) 2-75067

Mr. Andrew Bishop
AICP, Coordinator of Land Use Planner
Office of the President
Georgetown, Guyana
Tel: 02- 549883
Fax: 02-73849

Ms. Ravita Diaram
Environmental Officer
Environmental Protection Agency
Office of the President
New Garden and South Road
Georgetown, Guyana
Tel: (592) 2-73849
Fax: (592) 2-66453

Ms. Tessa Fraser
Director of Tourism
Tourism Division, Ministry of Trade, Tourism and Industry
229 South Road Lacytowwn
Georgetown, Guyana
Tel: (592) 2-65384
Fax: (592) 2-54310

Mr. Macsood Hoosein
Office of the President
New Garden Street
Georgetown, Guyana
Tel: (592) 2-25783/4/5
Fax: (592) 2-25785

Mr. Khalawan
Senior Assistant Commissioner of Forest (Environment)
1 Water St Kingston
Georgetown, Guyana
Tel: 67271-5, 67176
Fax: (592) 2-68956

Mr. Doorga Persaud
Head of Guyana Natural Resources Agency
Guyana Natural Resources Agency
41 Brickdam and Boyle Place
Georgetown, Guyana
Tel: (592) 2-66549, 2-64424
Fax: (592) 2-71211

Mr. Indarjit Ramdass
Senior Lecturer
Department of Biology
University of Guyana
Turkeyen Campus, Guyana
Tel: (592) 2-23586-9

Mr. Naseem Nasir
GIS Specialist and Data Manager
Biodiversity Centre, University of Guyana, Guyana
Tel: (592) 2- 24921
Fax: (592) 2- 24921
Email: nnasir@guyana.net.gy

Drs. Carlo Julen
Deputy Director of Forestry and Nature Conservation and Acting Head of the Surinam Forest Service
LBB, Corn.Jongbawstr.10
Suriname
Tel: 474346, 471316, 490166
Fax: 410256

Mr. Raymond Landveld
Program Coordinator
NGO Forum Suriname
Gravenstr.1260
Paramaribo, Suriname
Tel: (597) 422610, 475992
Fax: (597) 477696
Email: forumngo@sr.net

Mr. Paul Ouboter
Head National Zoological Collection Suriname, Environmental Research Center
University of Suriname
P.O.Box 9212
Paramaribo, Suriname
Tel: 494765/465558
Fax: 494756
Email: nzcs@cq-link.sr

Ms. Mia Quik - M.P.A.Quik-Stregels
Lecturer Zoology, Secretariat
Environmental Research Center
Department of Environmental Sciences,
Faculty of Technology,
University of Suriname
P.O.Box 9212
Paramaribo, Suriname
Tel: 465558, 494756
Fax: 494756
Email: nzcs@cq-link.sr

Mr. H. Reichart
Senior Technical Advisor
Surinam Forest Service
P.O. Box 8183
Paramaribo, Suriname
Tel: (597) 474607
Fax: (597) 474607

Ms. Stuger
Communication Officer
NGO Forum, Gravenstraat 126bv.
Suriname
Tel: (597) 422670, 475992
Fax: (597) 477696
Email: forumngo@sr.net

Mr. M.I. Taus
Head of the Soil Survey Department
Ministry of Natural Resources
Titanium straat no. 4
Suriname
Tel: 491440

Mr. K. Tjon
University of Suriname, Leysweg
CELOS / NARENA
Suriname
Tel: 490128

Ms. Dorothy Traag
Assistant Curator
National Herbarium
University of Suriname, Leysweg
Suriname
Tel: 464151
Fax: 464151

ANNEX 2. PROGRAM

Monday, September 8 : Arrrival to Paramaribo, Suriname.

Tuesday, September 9: Individual and group meetings with personnel of the Suriname Forest Service.

Wednesday, September 10

08:00 - 09:00 Registration of participants.
09:00 - 10:00 Open and introductions.
Welcome adresses by: Representative FAO, Representative Suriname Government.
10:00 - 10:30 Coffee break.
10:30 - 11:30 Policies, legislation and organizational structure for protected areas in the Amazon (K. Thelen).
11:30 - 12:00 Presentation of Suriname: Policies, legislation and organizational structure for protected areas in Suriname (F. Baal).
12:00 - 12:30 Presentation of Guyana: Policies, legislation and organizational structure for protected areas in Guyana (D. Persaud).
12:30 - 13:30 Lunch break.
13:30 - 14:30 Workgroups on topic.
14:30 - 15:00 Coffee break.
15:00 - 16:00 Workgroups on topic (continuation).
17:00 - 18:00 Guidelines for the formulation of management plans for protected areas in the Amazon: conceptual framework and methodological process (K. Thelen).

Thursday, September 11

09:00 - 10:30 National systems of protected areas in the Amazon (S. Olivieri).
10:30 - 11:00 Coffee break.
11:00 - 11:45 National systems of protected areas in Suriname (H. Hiwat and D. Traag).
11:45 - 12:30 National system of protected areas in Guyana (M. Hoosein).
12:30 - 13:30 Lunch break.
13:30 - 14:30 National systems of protected areas in the Amazon (continuation) (S. Olivieri).
14:30 - 15:00 Coffee break.
15:00 - 17:00 Workgroups on topic.

ANNEX 3. PROTECTED AREA SYSTEMS IN THE AMAZON[13]

1. Characterization of the amazonian environment and of the protected areas of the amazonian watershed

1.1 What is the Amazonian region?

Various criteria, many of them valid, have been used to find a precise definition for the Amazonian region, and in most cases there have been substantial differences. The variables mostly used have been: biogeography, plant cover and phytogeografic composition. For the purpose of this guide, the Amazonian region will be defined as a series of watersheds which make up the hydrographic system of the Amazon river, with well defined characteristics, running from the Andes to the Atlantic Ocean and shaping a mosaic of ecosystems, divided into several provinces based on differences in the arboreal flora and other biogeographic criteria.

There are several criteria for determining the extent of the Amazonian region. The most orthodox conception includes the snow covered heights of the Andes and a number of inter-Andean valleys whose vegetation is not of the same type as that which is considered typical of the Amazonian flora. There is discussion regarding its borders, especially the western border. Some authors are of the opinion that the Amazonian region begins between 3 000 or 4 000 m above sea level, along the highest tree line of the Andes, while others point out that it begins between 300 and 600 m above sea level. For the purpose of this guide, the area considered is that agreed upon by the TAC signatory countries, covering approximately 7 350 621 km^2 which include what some States consider to be legally their Amazonian region (territories of Brazil, Bolivia, Colombia, Ecuador, Guyana, Peru and Venezuela). Also considered are 142 000 km^2, of Suriname; and although this area is not considered to be within the Amazonian watershed proper, it is mostly covered by Hylea amazonica or a plant cover of the Amazonian type. All of this totals 7 492 621 km^2 Castaño, 1993.

Without doubt this immense area is the largest watershed on earth. It is estimated that its territory covers 1.4% of the planet's surface, 4.82% of the earth's continental area and 40% of South America. This watershed holds nearly 20% of the earth's overall supply of fresh water, excluding polar ice. The main system of the Amazon river, the Amazon-Solimoes-Ucayali axis, is 6762 km long, and also is the planet's longest river. The Amazon is also the widest river on the earth, flooding some sectors as far as 50 km on both sides, and forming a large number of islands and channels.

---

[13] This paper is a non official translation of Chapters III and IV of the document in Spanish: "Guía para el Montaje del Sistema de Areas Protegidas de la Amazonía".

The value of the biologic wealth contributed by the Amazonian region is the highest in the world. Studies and inventories in the countries of the region, which are still incomplete, show the great diversity of species present in the heterogeneous mosaic of the different plant formations. Some of the most outstanding data on Amazonian biodiversity and which make it incomparable, indicate that the Amazonian region has (IDB-UNEP-SPT-TCA, 1992 and Castaño, 1993):

has 70% of the planet's tropical forests
60 000 superior plant species
2.6 million arthropod species
2 000 fish species
Over 1 500 bird species
Over 300 mammal species
2 000 useful plant species
4 000 timber species
Over 100 species of domesticated plants and their byproducts.

1.3 Socioeconomic and cultural aspects

The degree of intervention in the Amazonian ecosystems in recent decades, has taken on different forms and proportions. In many cases intervention has not been adequately planned and has been carried out without sufficient technical and scientific knowledge to allow for a rational occupation process.

This situation is even more worrying because the occupation process and forms of exploitation have caused various impacts on the environment and on the peoples living in the region who depend on the forest for their survival. This has affected especially native people, who have contributed to mankind their knowledge on the functioning and management of the various Amazonian ecosystems, as well as on the utilization and application on the different species of its flora and fauna.

The main impacts caused by anthropic activities are high deforestation rates, decrease of the fisheries potential, contamination of water resources, loss of biodiversity and atmospheric contamination caused by fires. Added to these is the loss and decharacterization of the natural environments caused by the flooding of large areas and the formation of dams for hydroelectric plants.

Demographic growth in the countries sharing the Amazonian watershed has given raise to the search for new spaces for occupation. It is estimated that at present the tropical Amazonian area shelters over 22 million inhabitants. Three of the cities located in the watershed - Belem and Manaus in Brazil and Santa Cruz in Bolivia, total more than a million people, and other cities, such as Boa Vista, Porto Velho, Leticia, Iquitos and

Awareness regarding the important environmental problems and grave trends evident in the models adopted for the development of the Amazonian watershed, has led to the gradual generation of a current of change which promotes a new model for this region. World concern for the conservation and ecologic balance of the Amazonian region is one of the factors which has contributed to the initiation of this change of attitude in the different countries of the region.

The serious alterations caused to the Amazonian environment and the loss of biologic diversity in the region, are the main reasons for which a number of institutions are paying special attention to the establishment and proper management of protected areas in the entire watershed. Their importance is therefore understood in this region which concentrates the planet's greatest biologic diversity.

The reality of protected Amazonian areas does not differ in great measure from the region's reality. Available human and financial resources and the lack of complete and coherent policies for the protected areas, on the part of some authorities, do not permit the execution of the necessary measures to ensure their conservation. In addition, insufficiency of resources to administrate and manage the Amazonian protected areas, is the reason for which a high percentage of management plans, although they exist in some area, have not been implemented.

It must be pointed out that most Amazonian protected areas are not being adequately managed (only 26% of them have management plans) and have problems of different types. Thus, for example, deforestation in 60% of these areas is a serious problem, the main causes for this being the following: directed colonization 9%; spontaneous colonization 37%; mining 49%; engineering works (specially roads and highroads) 36%, and illegal crops 39.6%. All this confirms the need to rethink support options for protected areas which are part of a system of international scope.

Likewise, it may be easily concluded that there is a need to extend coverage to the different Amazonian ecosystems, improve management of existing areas, develop the units with adequate activities and sufficient financial resources, and provide them with an optimum number of trained personnel. For this purpose, consideration must be given to the different methods that may be applied to the staff's training process, the exchange of experiences, research, and development and dissemination of appropriate technologies.

A brief review, follows, of the present situation in the Amazonian region and the protected areas established in it by the countries of the watershed, grouped according to various factors.

Regarding the structure and components of the systems of national protected areas

In all cases, Amazonian protected areas are integrated in their respective national systems of natural protected areas. In general, there are no policies or strategies designed exclusively for protected areas in the Amazonian zone in the countries of the watershed.

Ecologic classification systems, for the purpose of protecting representative samples of the Amazonian environments, are widely varied and in some cases they are expressed in terms that will allow for comparisons. An evaluation of the system is necessary on the basis of standardized criteria or criteria shared by the countries.

In the eight signatory countries of the Treaty on Amazonian Cooperation, 22 denominations for management categories are accounted for. In general, the generic name or management category given to an area corresponds to some preestablished objectives or management guidelines (Ormazával, 1988). Awareness exists in the countries regarding the need to evaluate the state of conservation, degree of conflict, area and other criteria in order to determine agreement or disagreement of present reality with the objectives of the existing categories.

Most of the categories established by the Amazonian countries correspond to the category of national park or natural national park (in the case of Colombia) equivalent to category II of the UICN, representing approximately 32.4% of the total. It must be pointed out that all the countries of the region have this management category. However, as may be seen in the following table, there are great differences in the nomenclature of the remaining categories, which must be analyzed in seeking to conciliate them. (See Table 1).

Regarding protection of biologic diversity in national protected area systems

Amazonian protected areas are vulnerable to environmental pressures, mainly anthropogenic, such as poverty and lack of opportunities, problems of lack of legal support, confrontation of interests and absence of identification of the local population with their protected area, among others.

In view of this situation and considering that the solution of these problems can only be achieved in the long term, with continuous and patient work, the Amazonian countries are implementing actions aimed at achieving the conservation of Amazonian ecosystems. It is expected to achieve the latter through internalizing the environmental component in the formulation of policies, rules and regulations, as well as by strengthening control and vigilance, extension and training, the search for development alternatives and by providing better conditions to those responsible for the areas and involving the local population, to fulfill one of the major objectives of protected areas, that is, the conservation of biologic diversity.

Regarding public use of national protected area systems

At present, the countries of the Amazonian watershed recognize that the region's protected areas provide an excellent opportunity for the development of a number of activities generating income and productive employment opportunities, such as tourism, education and research, among others, which are compatible with their biologic diversity conservation objectives.

Tourism, is currently and potentially an important item in the economy of the Amazonian watershed countries. Among the best known forms of tourism, "nature tourism" presents many options for becoming, if not the major, one of the most profitable investments in this sector. This activity, of course, must be developed in an organized and orderly fashion, in harmony with the area's objectives and thus permitting the generation of direct economic benefits for the local population and for the areas themselves.

The points to be taken into account in connection with the protected areas include estimates on carrying capacity and measures to control the affluence of visitors, rigorous consideration of studies on environmental impact and mitigation and control measures. There is also a tendency to invite the participation of private institutions, profitable or non profitable (consortiums, touristic operators, NGOs), or to local indigenous or peasant communities, in touristic activities with the protected areas.

At present countries are making notable progress in the design of policies and formulation of plans aimed at providing better environmental conditions, as well as implementing services to promote tourism toward natural Amazonian areas.

As a means to achieve greater integration between protected areas and local populations, governments and private sector agencies involved, are assigning priority to environmental education and training of local populations, for the purpose of expediting the process of participation and commitment in management, so that they may play a direct and leading part in managing the areas.

No substantial information has been generated in the surrounding zones of the Amazonian protected areas, recording the intensity of uses in the buffer areas nor their effect on the area's natural diversity.

1.5 Need for a system of protected amazonian areas

As is known, the Amazonian region is one of the world's areas with the greatest biodiversity. The humid and pluvial jungles of the Amazonian watershed, together with other plant formations (thickets, savannas, dense forests), in addition to being one of the world's oldest plant formations, is the largest, most complex assemblage of biomas and ecosystems with unique species. For these reasons, this region is considered a biologic reserve of world importance which is strategic for maintaining the environmental balance.

Likewise, the fundamental role of natural protected areas in the conservation of the world's biologic diversity must be kept in mind. If we consider the biologic and ecologic wealth of the Amazonian protected areas, most of which were established to protect representative samples of the natural diversity of the countries, their importance to mankind can be easily understood.

The linkage of the natural protected areas of the Amazonian countries, in an adequately structured system, will make the action to preserve this wealth more effective. A system of protected areas in the Amazonian region may ensure that its rich biodiversity is appropriately represented and that a large enough area is protected to ensure the ecologic sustainability of the most important biomas.

Efforts displayed by the Amazonian countries to establish national parks, reserves and other protected areas, require to be continued and complemented with greater human, technical and financial support both from the countries of the watershed and from the international community.

The great importance of the Amazonian watershed and its ecosystems for the conservation of the world's biologic diversity, amply justifies special attention by the countries sharing this geographic zone because of the protected areas in it. The conception of a System of Amazonian protected areas, therefore, is essential and fully justified.

2. Technical elements for setting up the system of amazonian protected areas based on the amazonian subsystems

This chapter contains the technical elements required to consolidate the system on the basis of the national subsystems of natural protected areas. An analysis is made of the objectives, management categories, representativity criteria and of the criteria and methods for area evaluation, endeavoring that they be applied as a reference basis common to all the countries. All of these elements are essential to link all the Amazonian protected areas around a common pattern.

2.1 Definition of conservation objectives of the Amazonian protected areas

Introduction

Conservation objectives reflect the image and objectives that are sought to be achieved with respect to the Amazonian environment through natural protected areas. The objectives may serve as a guideline for all activities connected with the protection, preservation, and sustainable use of resources and, in general, the conservation of biologic diversity in the Amazonian watershed's protected natural areas.

It is important to make a distinction between conservation objectives in the Amazonian region, in the broadest sense, and conservation objectives for the Amazonian system of protected areas. Evidently, there will be a number of coincidences between them, but it is important for the purposes of this guideline, to make it clear that there are two different levels of definition. This only reflects the fact that the conservation of biologic diversity is a task which widely exceeds the field of action of protected areas. To protect and manage natural areas is only one of the most important strategies available to achieve the objectives of conserving biologic diversity.

The present guideline aims at identifying, formulating and declaring the conservation objectives for the Amazonian system of protected areas. The management of the entire system, as well as of the elements which make it up, will need to have as a reference framework, the fulfillment of these objectives. This implies that all decisions to be taken in connection with the Amazonian protected areas, even from their basic definitions, must be guided and oriented by their objectives and the will to achieve them.

Definition of the objectives of the Amazonian protected areas

A first element to be taken into account when defining the objectives of Amazonian natural protected areas, are the aspects of policy declaration and plans for the watershed's development. Beyond the particular policies of each of the countries involved, in the case of this guideline, it is necessary to take into account the agreements and declarations adopted

4. **Protect endemic species:** maintain flora and fauna populations whose distribution is restricted.

5. **Protect threatened flora and fauna:** maintain populations or individuals of flora and fauna considered, by international conventions or national provisions, to be in danger of extinction or under some degree of threat.

6. **Protect genetic resources:** maintain representative samples of genetic diversity, particularly of the wild relatives of domesticated species of flora and fauna for the benefit of mankind.

7. **Protect watersheds and water resources:** preserve watersheds and the resources and benefits they generate.

8. **Protect areas of migratory species:** maintain important sites to ensure the movement of migratory animal species.

9. **Provide flora and fauna resources:** ensure a sustainable supply of flora and fauna species of economic value.

10. **Produce wood and associated products:** ensure the supply of resources from the forest mass of the Amazonian watershed.

11. **Conserve landscape values:** maintain sites of aesthetic value for the enjoyment of the present and future population.

12. **Promote environmental education:** conserve environments and resources that are useful as elements for the population's environmental education.

13. **Promote recreation and tourism:** conserve important environments (landscapes, adventure tourism) for the recreation of the local population and of visitors.

14. **Protect cultural and historic values:** conserve samples of Amazonian cultures for posterity.

15. **Promote research and monitoring:** maintain the environment for the development of scientific and technical research on the components of the Amazonian region.

16. **Recover degraded areas:** promote the recovery of Amazonian environments affected by negative anthropic actions.

by traditional populations, it is extremely important to the System's objectives, to have coherent and complementary categories.

The categories within a system of amazonian protected areas

The ideal situation, although it is very difficult to achieve in practice, would be for the different countries of the watershed, to use the same denominations and the same definitions for all the protected area categories. From the viewpoint of the System, this would make it consistent, facilitating in great measure its viability and enforcement. To have a common standard in all the countries for all of the protected areas as far as categories are concerned would be optimum. However, in practice this will be very difficult to achieve for various reasons and because of the particular characteristics of each country, especially, due to the fact that each one of them reserves the legitimate right to define and establish its own series of protected area categories. It must be pointed out that in the Amazonian countries, as was seen in Chapter 3, a wide range of denominations for categories (22) exists for natural protected areas. Although this will probably continue to be so in the future, it is necessary to have a reference scheme, a common pattern and a more or less homogeneous nomenclature, among other aspects, which will permit evaluating and comparing the units making up the System on equal terms.

The countries of the watershed must adopt a common reference pattern, which will allow them to compare the different protected areas among themselves.

The achievement of an ideal standard situation, for instance, would require changes and modifications in the legislation of the countries, so that these definitions will be accepted in all of them on the same terms. In fact, this is practically not viable. The present guideline recognized the fact that in the different countries of the watershed, different names are used to express the same concept or management model of their protected areas.

Nevertheless, this does not mean that efforts aimed at a standardization of the categories and the achievement of a common language should be given up. The different actors of the System in the different countries, especially the administrations of the protected areas should promote actions aimed at achieving the ideal situation of standardization of categories and their definitions.

Taking measures aimed at establishing this coherence and an equal reference level, is a matter of priority in the different countries, and it is feasible to propose the possibility of introducing slight changes in the body of technical and administrative rules in the various countries involved.

It is recommendable that the categories of protected areas defined by the World Union for Nature (UICN), be the common reference pattern. Table 1 (see Table 1) shows a

MANAGEMENT CATEGORIES OF UICN PROTECTED AREAS

I. Strict natural reserve/scientific reserve. Protected area managed mainly for scientific purposes or for the protection of nature.

Ia. Strict natural reserve: a protected area managed mainly for scientific purposes. An area which posseses an ecosystem, geologic or physiologic feature and/or outstanding or representative species, mainly destined to scientific research activities and/or environmental monitoring.

Ib. Wild natural area: protected area managed mainly for the purpose of protecting nature. A large area of land and/or sea unchanged or slightly changed, which maintains its natural character or influence, is not inhabited permanently or significantly, and is protected and managed to preserve its natural condition.

II. National park. Protected areas managed mainly for the conservation of ecosystems and for recreational purposes. Their purpose is to protect outstanding natural and scenic areas of national or international importance for scientific, educational and recreational uses. They are relatively large areas, which have not been altered substantially by human activity, and in which the use of natural resources for extractive purposes is not allowed.

III. Natural monument. Protected areas managed mainly for the conservation of specific natural characteristics. Their purpose is to preserve and protect specific natural elements of national importance, because of to their unique characteristics or their special interest. These are relatively small areas and are focused on the protection of specific natural features.

IV. Habitat/species management area. Protected area managed mainly for conservation, with intervention in management. The purpose of these areas is to ensure the necessary natural conditions to protect species of national importance, groups of species, biotic communities or physical characteristics of the environment when they require artificial human manipulation for their perpetuation. The controlled use of some of their natural resources may be allowed.

V. Protected landscapes or seascapes. Protected areas managed mainly for the conservation of landscapes and seascapes and for recreational purposes. Their objective is to maintain landscapes of national importance which are characteristic of the harmonious interaction between man and earth and at the same time provide opportunities for public enjoyment through recreation and tourism, within the context of the local lifestyle and of the economic activities typical of the area. These areas contain a mosaic of natural and cultural landscapes of great scenic quality, in which traditional soil uses are maintained.

VI. Protected area with managed resources. Protected area managed mainly for the sustainable use of its natural ecosystems. The purpose of these areas is to ensure the protection and maintenance of biologic diversity in the long term, and at the same time provide a sustainable flow of natural products and services to meet the community's needs.

MATRIX: CONSERVATION OBJECTIVES/MANAGEMENT CATEGORIES FOR THE AMAZONIAN REGION

Objectives	IUCN Categories						
	1a	1b	2	3	4	5	6
1. Protection of ecosystems	2	1	2	3	3	3	2
2. Protection of associations (flora/fauna)	2	1	2	3	3	3	2
3. Protection of geomorphologic units	-	-	2	2	3	1	3
4. Protection of endemic species	1	2	1	1	1	2	1
5. Protection of threatened flora and fauna	1	2	1	1	1	2	1
6. Protection of genetic resources	1	2	1	1	1	2	1
7. Protection of watersheds, water resources	2	1	1	-	1	2	1
8. Protection of sites of migratory species	2	1	2	3	3	3	3
9. Sustainable use of flora and fauna	-	3	3	-	2	2	1
10.Production of wood and associated products	-	3	3	-	2	2	1
11.Landscape values	-	-	1	1	3	1	3
12.Education	-	-	2	2	2	2	3
13.Recreation and tourism	-	2	1	1	3	1	3
14.Protection of cultural and historic values	-	-	-	-	-	1	2
15.Research and monitoring	1	3	2	2	2	2	3
16.Recovery of degraded areas	2	1	2	3	3	3	2
17.Protection of fragile areas	2	1	2	3	3	3	2
18.Provision of environmental services	2	1	1	-	1	2	1
19.Contribute to sustainable management and development models	-	3	3	-	2	2	1

Legend

1a Strict natural reserve
1b Wild natural area
2 National park
3 Natural monument
4 Habitat/species management area
5 Protected landscapes and seascapes
6 Protected area with managed resources

Key

1 Principal objective
2 Secondary objective
3 Potentially applicable objective
- Does not apply

developed a classification of the ecoregions following a hierachical classification scheme ranging between extinct, critical, threatened, and vulnerable or relatively stable. Five indicators of the landscape's integrity were used for this classification, to which different weights were assigned: total loss of the original habitat (40%); number and size of habitat fragments (20%); conversion rate of the habitat (10%); degree of fragmentation or degradation (20%), and degree of protection (10%). The biologic singularity of the ecoregions was another criterion applied, using specific wealth, endemisms, beta diversity, biologic phenomena and relative rarity of the habitat type as indicators. Finally, the team of researchers integrated the state of conservation with biologic singularity, which was useful to identify the ecoregions having priority for the conservation of biologic diversity.

The ecoregions obtained in the study are an important instrument for the evaluation of representativity in the watershed; therefore, joint work with the team in charge of the World Bank - WWF document, should be attempted, in order to improve mapping, which as carried out on a scale of at least 1:2 500 000, and which should contain minimum planimetric information for its adequate utilization (hydrography, national and intranational borders, highways, cities, towns, human settlements, infrastructural works, among others).

In accordance with the mentioned study, the following are the 34 ecoregions which would correspond to the Amazonian watershed environment.

Humid tropical Amazonian forests

1. Humid forests of the Guyanese highlands - Venezuela, Brazil, Guyana.
2. Pantepui - Venezuela, Brazil, Guyana, Surinam, Colombia.
3. Humid forests of the Napo - Peru, Ecuador, Colombia.
4. Mountain forests of Macarena - Colombia
5. Humid forests of Japura/Negro - Colombia, Peru, Venezuela, Brazil.
6. Humid forests Uatama - Brazil, Venezuela, Guyana.
7. Humid forests Amapa - Brazil, French Guyana.
8. Humid forests of Guyana - Venezuela, Guyana, Suriname, Brazil, French Guyana.
9. Swampy forests of Paramaribo - Suriname.
10. Humid forests of Ucayali - Brazil, Peru.
11. Western Amazonian swampy forests - Peru, Colombia.
12. South eastern Amazonian humid forests - Brazil, Peru, Bolivia.
13. Humid forests Jarua - Brazil.
14. Varzea forests - Brazil, Peru, Colombia.
15. Humid forests Purus/Madeira - Brazil.
16. Humid forests Rondonia/Mato Grosso - Brazil, Bolivia.
17. Humid forests of the Beni gallery - Bolivia, Brazil.
18. Humid forests Tapajos/Xingu - Brazil.

represented, pleistocenic sanctuaries, degree of threat, pristine areas, endemisms, presence of threatened species and ecologic, scenic and historic cultural values.

Mostly on the basis of these criteria, the complete list of which is included below, an initial exercise has been carried out for the purpose of assigning qualification values to each one of them, so that the resulting ratios will be useful as elements for comparison. Even these criteria, except those covering "management", may be useful in qualifying protected areas which have already been established and compare them between themselves, and with those that will be established eventually.

It is important to point out that the scope of this guideline does not include a particular methodology of the system for evaluating sites for the establishment of new areas. The definition, and full adoption of a methodology is precisely one of the priorities as regards the System of Amazonian protected areas.

Tools for analysis: criteria for the evaluation of sites for the establishment of new protected areas in the Amazonian region

There is consensus regarding the fact that most Amazonian subsystems in the countries are not complete. In the coming years it will be necessary to establish new protected areas to improve the coverage of the systems. In this chapter a review will be made of the technical elements to evaluate the conservation objectives, management categories and biogeographic representativity in the national Amazonian subsystems of each country. Availability of this information will provide a starting point for the efforts to complete each national Amazonian subsystem, in other words, determine which conservation objectives are not covered, which management categories are not being applied and which biogeographic regions are not represented or are poorly represented.

In order to contribute to the evaluation of sites that potentially may be incorporated in the subsystems, evaluation criteria were defined in the mentioned Guatopo international workshop, to determine the most likely sites to be declared protected areas. The list of criteria mentioned in the workshop is used in this guideline, making an initial effort to qualify criteria. The use of these common criteria, after review by the countries, will contribute subsequently to the consistency of the System of Amazonian protected areas.

Table 2. (cont.....)

	Criteria	1	2	3	4
5.	**State of conservation**				
	Threats **				
	Degree of intervention **				
	Environmental contamination and deterioration *				
	Presence of threatened species.				
	Biologic sustainability.				
6.	**Legal and institutional elements**				
	Institutional context and capacity.				
	Legal framework.				
	Policy elements.				
	Budgetary allocations.				
	Covenants and agreements.				
	Amazonian national and regional policy elements.				
7.	**Local and sub-national contributions**				
	Links to regional development.				
	Environmental education.				
	Local/regional services.				
	Promotion of the conservationist culture.				
	Integration of inserted local or neighbouring populations.				

Key:

1. Nil 2. Low 3. Fair 4. High

* Values are inversely applied in the case of criteria marked with (*).

** The threat criterion may have different implications. The decision regarding values to be assigned is left to the users.

The higher the ratio obtained by the sum of all the criteria, the greater is the priority for the site to be established as a protected area.

Personnel training and formation.
Allocation, search and negotiation of budgetary funds (governments are committed to contributing at least minimum funds).
Representation of the country in international covenants and systems.

Role of local governments

Establishment of areas complementary to the national system.
Recognition and consideration of protected areas in national and local development plans.
Recognition, adoption and commitment of national policies on protected areas.
Participation, support and execution of compatible activities in buffer zones and zones of influence of the protected areas.
Promotion and dissemination of conservation in protected areas and zones of influence.
Participation in the coordination with local groups.

Role of non governmental organizations

Support and collaboration in:

Formulation of proposals and execution of management programmes.
Seek financing for protected areas.
Interlocution in the solution of conflicts.
Coordination with other NGO's and other sectors related with protected areas.
Warning about threats.
Activities to strengthen national policies, plans and strategies.
Generation of information.

Coparticipation in:

Preparation of management plans.
Formulation and execution of specific projects.
Local community projects in buffer and influence zones.

Role of the private sector

Establishment of complementary areas.
Participation in the provision of services (through concessions and agreements).
Transfer of managerial knowledge.
Contribution to financing.
Support and commitment with national policies, plans and strategies.

ANNEX 4. REVIEW OF AND PROPOSALS FOR POLICIES, STRATEGIES AND ACTIONS FOR THE PROTECTED AREA SYSTEMS IN THE AMAZON [14]

1. Synthesis and conclusions of the diagnosis of the System of Amazonian Protected Area

In the Amazonian countries, protected areas existing in the watershed, are integrated in the national systems. In general, there are no policies or strategies designed exclusively for the Amazonian area as regards the various factors that influence the planning, establishment and management of protected areas. The present state of said factors is synthesized below, on the basis of the diagnoses carried out by the countries.

Institutional factors

The Amazonian protected areas have been created through various legal instruments: in Bolivia by Law, Supreme Decrees, and Ministerial Resolutions; in Brazil and Venezuela through Decrees; in Colombia through Ministerial Resolutions; in Ecuador generally by Ministerial or Interministerial Agreements and in Peru by Law and Supreme Decrees. The legal act generally specifies the name, location of the area, its size, borders, management category and the agency in charge of its administration.

The administration of Amazonian protected areas is in charge of state offices and in a few exceptions, it has been assigned to non governmental organizations, through special delegation. Most government offices are not autonomous and depend directly or indirectly on the ministries of agriculture (Peru), environment (Bolivia, Colombia, Venezuela) or on institutions in charge of the country's renewable natural resources (Brazil). There is limited coordination between these offices and other productive sectors such as fisheries, agriculture, tourism and power, among others. In general the number of personnel in charge of administration is not enough, nor is their preparation in accord with the extent and objectives of the areas. The most recurrent professions of the staff in the areas are those of biologists, forestry engineers and technicians, educators, botanists, ecologists and anthropologists.

Amazonian protected areas in general, do not have adequate budgets, equipment nor personnel for their proper management, and although it is believed that some of them may be profitable, the idea that they may be self-financing, is still very far off. However, the countries believe that adequate planning and income allocation may help cover their administration costs. They also fully agree that one of the greatest challenges that would

[14] This paper is a non official translation from the document in Spanish: "Políticas, Estrategias y Acciones para la Conservación de la Diversidad Biológica en los Sistemas Amazónicos de Areas Protegidas" (FAO-RLC/UNEP).

economic benefits both for the local population and for the areas involved. Among other parameters, there is coincidence regarding the need to make a careful estimate of the carrying capacity and to promote other measures to control the affluence of visitors, as well as to give rigorous consideration to environmental impact studies and mitigation and control measures.

Importance is also assigned to the acceptance of private, profit or non profit institutions (consortiums, touristic operators, non governmental organizations), and to indigenous or local peasant communities in the administration of touristic activities within the protected areas.

At present the countries clearly understand the need to include touristic use of the protected areas in the primary objectives for their conservation, as well as the need for coordination with government authorities in charge of tourism, in order to harmonize and determine the policies for its development in the protected areas.

Research

The lack of information regarding different aspects of the Amazonian watershed is explained by its great size and by the enormous magnitude of the number of species it contains. This does not exclude the limited scientific research carried out in the protected areas of the Amazonian region and the lack of long term research programmes. With some exceptions, a great effort is still required to be made in the promotion of profitable uses of the protected areas, as well as in carrying out greater research of a technical - scientific nature.

Countries require information and follow up systems for the various activities being carried out in the protected areas, to support the actions of their authorities and of the institutions involved. This is essential to achieve effective management of the areas in relation with protection and sustainable use. The Data Centers for Conservation may be a good alternative for managing both geographic as well as biologic, social and economic information. To achieve greater efficiency it is necessary to favour and promote cooperation between researchers and the administration, ensuring that the results of research are incorporated in the management of the natural protected areas.

The countries assign priority to the promotion of long term multidisciplinary research on the links existing between biodiversity, sustainable economic development and conservation. In this respect, it is necessary for scientific research to have an integral orientation, and to promote the training of personnel of the protected areas, in order to provide an expeditious system for the generation, processing and utilization of information.

* Increase the flow of information regarding the importance of the protected areas and their programmes, toward decision makers of the highest level (Presidency and National Congress).

* Promote the creation, within the national administrations of protected areas, of regional (subnational) administrative offices or units for the Amazonian protected areas as a whole.

* Promote the organization of a central administration, in cases of institutional dispersion or the existence of different administrative offices for the management of given management categories, territorial administrative area, or others.

* Give priority to the consideration, in general terms, of the strengthening of administrations, financing, and legislation relating to Amazonian protected areas.

* Promote the interaction of the administration of Amazonian protected areas with the various political administrative instances of Regions, Departments and Communities, among others, extending the theory and practice of technical management of the Amazonian protected areas to other dimensions, such as the political and financial dimensions.

* Incorporate the different sectors of civil society to favour the development of Amazonian protected areas, involving the largest number of institutional and regional actors.

Actions

* Design a Regional Plan to promote establishment of a hierarchic order for the administrative units of protected areas in the Amazonian region, drawing a series of proposals from same, to permit units to attain higher ranks.

* Promote actions aimed at making the political level sensitive regarding the importance and adequate level of the administration of protected areas.

* Strengthen the capacity of public agencies to carry out lobbying activities, especially through seminars and visits to the protected areas of the persons responsible for policy decisions, publications and wide distribution of reports on the areas' progress.

Actions

* Preparation of a correspondence table of the systems used in each country for the definition of their ecologic units.

* Promote the exchange of information on active processes being developed in each of the countries with respect to the definition of ecologic classification criteria, especially through regional workshops.

* Seek mechanisms to harmonize ecologic classification criteria used in each of the countries, for the purpose of providing a representative system of protected areas in the Amazonian watershed.

* Revise and strengthen common methodologic aspects of national classification systems of the ecologic regions.

Strategies

* The Subnetwork must propitiate regional workshops for the exchange of experiences on ecologic classification methodologies.

* Prepare a directory of professionals and consultants specialized in biogeography and geographic information systems to support the countries requiring it.

Management categories

Policies

* Promote the evaluation of the representativity of the different protected areas of the Amazonian watershed in relation with their categories.

* Effective strengthening of the management categories which have functioned best as regards conservation of the Amazonian biologic diversity.

* Diversify the use of management categories which provide the possibility of incorporating sustainable forms of resource utilization and the biologic diversity of the protected areas of the Amazonian watershed.

* Promote the exchange of experiences of each country in relation with the development and implementation of their management categories.

Actions

* Carry out a comparative analysis of the criteria used for the establishment of new protected areas in the watershed's countries, in order to unify these aspects as far as possible.

* Incorporate unified criteria, in relation with the analysis of new experiences and knowledge in the protected areas of the watershed.

* Promote the creation of new protected areas in environments that have a low or no representation in the Amazonian protected area system.

* Consolidate the system of Amazonian protect areas, through the creation in each country of protected areas which will permit an adequate representativity of the ecosystems, favour the conservation of biologic diversity and reduce to a minimum social conflicts and conflicts regarding the use of resources.

* Collaborate in the establishment of protected areas under municipal administration, oriented toward the conservation of biologic diversity, in order to complement the national and subnational systems of protected areas.

* Identify and provide assistance to solve biogeographic representativity gaps, taking the priorities identified by the countries as a basis.

* Analyze the viability of establishing border protected areas of regional interest, and support their establishment when so determined by the involved countries.

Strategy

* Carry out a first regional workshop in the maximum term of one year, to define the next activities.

Human and financial resources

Quantitative and Qualitative elements of personnel

Policies

* Endeavor to strengthen training processes for the administration of Amazonian protected areas.

* Explore mechanisms for incentives in order to provide better qualified personnel for the administration of Amazonian protected areas, requesting the advice of financial agencies and ongoing programmes.

Strategies

* Actions related with training must be in charge, mainly, of national and subnational authorities; as far as possible national initiatives should be supported by the Subnetwork of Amazonian protected areas.

* The Subnetwork will carry out special action in the high level development center and in the demonstration centers.

Financing

Policies

* Find new financing mechanisms for the development of protected areas in the Amazonian region.

* Find and implement mechanisms to facilitate the application and investment of economic resources expeditiously, to solve priority aspects in the Amazonian protected areas.

* Use the combined strength of the countries of the subregion in the search for national and international financing for the Amazonian protected areas.

* Examine each country's legislation, in order to design actions which will facilitate access and utilization of economic and financial resources for the management of the protected areas.

* Get total or partial management expenditures of the protected areas to be considered in financing plans at the department or regional level (subnational).

* Promote private investment in protected areas as a way to increase the availability of economic resources to their benefit.

* Design a strategy to create awareness and practice among the users of renewable natural resources, which will permit reinvestment in the management of protected areas, of at least a part of the benefits obtained from the utilization of biodiversity.

* Strengthen relations with nongovernmental organizations and base organizations for the purpose of attracting funds and spending resources, strengthening the capacity for action in protected areas.

* Establish programmes for dissemination and awareness raising at political and government levels, regarding the importance of management in Amazonian protected areas.

* Promote and coordinate a common front for joint negotiation with potential donors.

* Promote the formulation of subregional or binational projects through the Subnetwork of Amazonian protected areas.

Strategies

* Advise governments on the formulation of efficient mechanisms to obtain internal funds for the operations of the protected areas.

* Work with the organizations of civil society and specialized agencies in the search for funds for Amazonian protected areas.

Protection of biologic diversity

Eradication of threats

Policies

* Search for mechanisms within the framework of the Covenant on Biologic Diversity, and other international treaties, which will permit sustaining and strengthening the management of protected areas in the Amazonian region.

* Promote the exchange of experiences in relation with legislation on the control of threats to protected areas.

* Promote cooperation among the subregion's countries, to exchange experiences and develop joint actions aimed at reducing or avoiding threats and negative impacts by human actions or other external agents.

* Identification, monitoring and maintenance of a permanent record of species present in the Amazonian protected areas.

* Find a standardized system to record information on biodiversity in order to facilitate the exchange of such information between the countries.

* Detection and identification of the critical species which may require ex-situ conservation mechanisms.

* Support ex-situ research and programmes, establishing effective mechanisms for the conservation of species.

* Give priority to the support of ex-situ programmes aimed at repopulation or reintroduction of species and genetic resources in Amazonian protected areas.

Evaluation of the environmental impact on the development of the protected areas

Policies

* Favor the development, refinement and application of common indicators and criteria for monitoring the environment of Amazonian protected areas.

* Encourage the exchange of experiences that have been developed and of strategies that have been formulated or applied.

* Share methodologies and systems for the management of information, monitoring and evaluation of environmental impact developed or being developed in the countries of the subregion in connection with the protected areas, especially low cost methodologies and systems.

Actions

* Recover information which has already been processed, through ample consultation in the countries.

* Analysis of the countries' capacities in relation to new technologies: geographic information system, videography, remote sensors, among others, to be applied in the Amazonian environment, possibly seeking regional technologic standardization.

* Establishment of mechanisms for permanent exchange of experiences regarding environmental impact studies between the administrations of Amazonian protected areas.

* Promote the exchange of planning, monitoring and evaluation methodologies in the subregion's protected areas.

* Exchange information on the different processes and strategies developed in the countries of the watershed as regards the systems and instruments used for planning, as well as on the participation of different parties in the preparation of plans and their follow up.

* Propitiate the establishment of a monitoring system in the Subnetwork, which will make it possible to follow up the process of the plans and the execution of management in the protected areas of the Amazonian subregion.

* Tend towards the standardization of the methodologies for the preparation, follow up and evaluation of management plans for protected areas, as well as of impact indicators in the societies of the watershed's countries.

Actions

* Compile information on the effect of management plans on the operation of protected areas in the watershed's countries.

* Innovate methodologies for the preparation of management plans, considering expeditious and participative processes.

* Strengthen the Subnetwork's actions in unifying criteria at the planning level in the watershed's areas.

* Preparation of planning manuals for the subregion's protected areas in coordination with the initiatives of the Treaty on Amazonian Cooperation and of the Subnetwork that are underway.

* Development of instruments that will make it possible to provide legal support to management plans of the Amazonian protected areas.

* Organization and orientation in every country, of multidisciplinary teams trained in techniques for the preparation of management plans for protected areas in the subregion, considering expeditious and participative processes.

* Preparation and implementation of management plans or other planning instruments, of a broadly participative nature, for the Amazonian protected areas.

* Prepare outlines, and develop and apply a special regulation for the Amazonian protected areas, in line with national policies on public use, the management plans and regulations on use, addressed, among others, to the following aspects:

  . Concessions of touristic operations
  . Studies on environmental impact
  . Safety
  . Fares
  . Carrying capacity requirements

* Coordinate public use activities with management and development programmes of local neighbouring communities, so that they may participate in the social economic benefits.

* Linkage of touristic activities in protected areas with touristic development plans being prepared by agencies and other public and private offices.

* Request the Secretariat Pro Tempore of the Treaty on Amazonian Cooperation to revive the project on tourism in protected Amazonian areas, promoting its consultation at the level of the protected area administrations in each of the countries.

Zoning and location of important facilities

Policies

* Ratify the need for zoning in every protected area, in order to identify the areas for public use activities and services, including such zoning in every Management Plan.

* Plan the development of infrastructure within the protected areas in zones specifically set aside for these purposes and in harmony with the surrounding landscape, also keeping in mind the fragility of the ecosystems and the cultural aspects pertaining to the Amazonian subregion.

* See to it that the development of important infrastructure (medium and large works) for public use in Amazonian protected areas, is located outside of their borders.

Actions

* Disseminate, through the Subnetwork, the concepts and experiences on zoning at the subregional and regional level.

* Promote the flow of information on research underway and the exchange of experiences in applied research regarding the management of biologic diversity in Amazonian protected areas.

* Promote the participation of the local population in scientific research activities carried out in Amazonian protected areas.

Actions

* Strengthening of the information bank and the Subnetwork's bulletin, as well as of the other national information banks, promoting exchange mechanisms.

* Exchange of experiences and documents related with the standardization of scientific research in Amazonian protected areas.

* Preparation of a register and analysis of scientific research carried out, and follow up of same.

* Support the development of infrastructure and other facilities for the promotion of scientific research in Amazonian protected areas.

* Promote scientific research related with the needs and generation of knowledge applied to the management of Amazonian protected areas.

* Promote the activities of research institutes, with emphasis on national institutes, to attract research works to the Amazonian protected areas in order to generate information to improve their management.

* Define, organize and apply methodological schemes which consider the use of information systems on Amazonian protected areas.

* Develop mechanisms for the exchange of information on the results of research carried out in the Amazonian protected areas.

* Support the production of publications disseminating the results of research carried out in the Amazonian protected areas.

* Call on Brazil to implement the programme of the Research Center within the framework of Project "Regional Programme on Planning and Management of Protected Areas of the Amazonian Region UE-TCA" and the Subnetwork.

Buffer zones and local communities

Establishment of buffer zones

Policies

* Promote standardization for effective management of the buffer zones in the Amazonian protected areas, recognizing the importance of this concept.

* Promote the establishment of criteria aimed at standardizing the management and promotion of special programmes in buffer zones in the protected Amazonian areas.

* Promote the establishment of buffer zones surrounding protected Amazonian areas.

* Promote cooperation and the active participation of all actors in the planning and development of buffer zones.

* Ensure the continuity of the plans and programmes designed for the development of the buffer zones.

* Promote the incorporation of local internal and neighbouring communities in different management instances of the Amazonian protected area, in accordance with the particular realities, situations and policies of each of the Subregion's countries.

* Promote the development of programmes which will be effective to improve the quality of life of the human population linked to the Amazonian protected areas, as a strategy aimed at ensuring their long term continuity.

* Assign priority to applied scientific research in the buffer zones, for the purpose of seeking alternatives to the local population's needs.

* Explore management experiences by biogeographic regions, beginning with the protected areas and their buffer zones, promoting their dissemination in the Amazonian watershed through adequate mechanisms.

Actions

* Compile legal regulations existing in some countries in connection with the establishment and management of buffer zones in the protected areas, for the purpose of taking them into account in the countries that are formulating their legislation regarding conservation units.

Actions

* Exchange experiences related with the special treatment being given the population settled inside the Amazonian protected areas, in the different countries of the subregion.

* Promote the creation of management committees in every Amazonian protected area which involves local populations in its management.

* Formulate and execute specific projects involving local communities.

* Use of interpretation centers as a means to disseminate the traditional cultural values of the local communities.

* Carry out a technical meeting to analyze and revise the subject, considering its importance, taking advantage of the proposed meeting on planning and zoning in Brazil.

Relationship with indigenous communities

Policies

* Develop strategies which will aid the participation of indigenous communities in the management of the Amazonian protected areas.

* Promote cultural revaluation and recover traditional technology and knowledge which may contribute to the development of the conservation objectives of Amazonian biodiversity.

Actions

* Exchange of experiences related with participation and the relationship between indigenous communities and the Amazonian protected areas.

* Compile the experiences of the subregion's countries related to the development of Amazonian protected areas which overlap indigenous territories, including the legal aspect.

ANNEX 5. PLANNING OF PROTECTED AREAS IN THE AMAZON [15]

1. What is a protected area?

"Protected Area" is the expression used by conservationists to identify the areas known by the public as National Parks, Natural Monuments, Protected Landscapes, Natural Wildlife Reserves, Scientific Reserves, and other similar denominations.

The World Commission on Protected Areas - WCPA, defines the protected area as a stretch of land and/or sea especially set aside to protect and maintain biologic diversity and associated natural and cultural resources, which is managed through juridical and other effective means. At present protected areas cover approximately 6% of the world's land area and a small proportion of the oceans.

Protected areas:

* Are essential for the conservation of nature, saving a large number of species from becoming extinct.

* They provide drinking water clean air and other vital necessities of life;
* They act as stores for the genetic material of Nature, for its use in medicines and the improvement of crops and domestic animals;
* They sustain human communities and show how people can live in harmony with nature;
* They generate funds to support the local and national economy, especially through tourism;
* They safeguard areas of cultural importance; and
* They are places where people may be in contact with nature and provide a source of spiritual wealth and well-being to communities throughout the world.

According to these premises the specific objectives pursued in protected areas, differ considerably; the following are among the most important:

* Scientific research
* Conservation of biodiversity
* Protection of wild zones
* Preservation of species and of genetic diversity
* Perpetuation of scenic values
* Maintenance of environmental services

---

[15] This paper is a non official translation from the document in Spanish: "Manual para la Formulación de Planes de Manejo en Areas Protegidas de la Amazonía" (FAO/Project European Union/Amazonian Cooperation Treaty, 1997).

The strategy for achieving the objectives of environmental planning must be focused on obtaining as much knowledge as possible regarding the environmental resources existing in each protected area, in order to ensure the sustained implementation of a continuous information feedback process, to strengthen and/or improve the guidelines and actions established in planning.

On the basis of this strategy it is necessary to apply an homogenous methodology in the System of Protected Areas, which will establish coherent guidelines and actions to ensure the rational management and conservation of the environment and ecosystems, maintaining as the main objective the achievement, in this case, of an Integrated System of Protected Areas in the Amazonian region. This process must be dynamic and continuous. Therefore, it must not end with the formulation of the first final version of the Management Plan.

To achieve this strategic objective, it is essential to gradually deepen and expand knowledge on the natural and socioeconomic dynamics of the protected areas of the entire region, either through continuous research programmes, environmental monitoring programmes or administrative and management experiences. This would ensure dynamic planning which will make it possible to enrich and improve the guidelines and actions established in the applied planning methodology, not only in each unit's plans, but also in the entire Amazonian system of protected areas.

Continuous feedback of basic information, and of management experiences, will bring about a direct improvement of decision making and, consequently, greater efficiency and effectiveness in the conservation and management of both natural as well as sociocultural resources.

It is of utmost importance to develop a participative strategy during the planning process, involving and ensuring the intervention of neighbouring communities or of those inserted in the area, as well as of the different governmental and non governmental and other institutions of society in general, involved in protected area programmes and sustainable resource management. The purpose of this is to get the representatives of society, at the different levels, national, regional and local, to assume the commitment to support the implementation of the provisions of the Management Plan, to ensure the solution of the main problems related with the protected area's management and conservation, and should it be the case in accordance with the area's objectives, with the sustainable use of its natural resources.

In other words, to plan strategically it is necessary to establish multidisciplinary methods which will make it possible to unify criteria on technical and nontechnical personnel through team work and not in groups, ensuring the participation of all parties involved in directing and managing the resource, those who make use of the resource and those who are affected by the Plan's results, as the central axis of the process.

5. The concept of management plan

The management plan based on an ecologic planning process, is a dynamic, viable, practical and realistic instrument which, set out in a technical and regulatory document, provides the general guidelines on conservation, management and use of the natural space, to become the governing instrument for territorial organization, management and development of protected areas. It must also establish priorities for action and terms of execution, as well as economic programming to determine the Plan's costs of operation and implementation.

The general planning guidelines for territorial management and sustained use of resources, resulting from the management plan, must necessarily be oriented towards ensuring the conservation and protection of nature and its ecologic processes through the establishment of general outlines and standards to define, among other aspects: the scope of action, management methods, administrative strategies, as well the plan's continued operation and revision periods.

6. Data base

To orient decision making scientifically and rationally, every planning process must be supported by thorough knowledge of the resources and factors pertaining to the area under consideration. For this reason, it is necessary and advisable to establish strategies aimed at an orderly and systematic compilation of all the information obtained through research, with a clear idea regarding what it is needed for and in what way it will be used in the planning process and how it will finally be reflected in the document.

The best way to achieve this, is to establish a Data Base, which must be set up as an archive of elements organized with a view to ranking information through written and spacial data, classifying their functions in accordance with a subordination sequence and their respective importance to facilitate the definition of environmental units.

For the operation and better utilization of the data base, the various methods that may be applied to research, must be defined before planning, to ensure effective basic information, referred to coordinate systems for easy location, and based on the search for the main ecologic and sociocultural relationships to determine its key points of balance.

technology allows for the manipulation and evaluation of the different environmental components by the superposition of the maps, approximation analysis, resource distribution analysis, maps, synthesis and tridimensional models, among others. These technological alternatives convert this system into an excellent tool to facilitate planning and management of the Amazonian protected areas.

This way, an important data and objective information base is created through the Geographic Information System, regarding the territory's permanent reality, which may be continually updated, and for this reason it will facilitate decision making, in space and time, for the administration and management of protected areas.

8. Purpose of the Management Plan

The management plan will be considered as the master planning instrument, the key for effective and rational management of any protected area, as it establishes the policies and criteria for the allocation of uses in accordance with zoning based on the assurance of continuity of the ecologic processes and the formulation of management programmes needed to achieve the objectives pursued in the area, thus ensuring the sustained conservation of the natural resources and the sociocultural values present in the protected area.

Consequently, the fundamental purpose of the management plan will be to rationally and methodologically implement the administrative decisions, policies and guidelines relating to the entire national system of protected areas.

9. General provisions

The basic objective of the Plan must be aimed at the harmonious achievement of the objectives pursued by the protected area, as well as at the establishment of the bases for proper conservationist management of the area's resources and their sustainable use, in accordance with its objectives and production potentials.

The preparation of the Management Plans must be in charge of an interdisciplinary team, including various professions and institutions, which must seek the participation of the communities, particularly that of the human team responsible for the area's administration, so that the latter, in addition to participating, may contribute with knowledge regarding the area's resources and their experience in the management and solution of the problems of the area.

This team shall determine the policy for managing the area's territory, in accordance with the potentials of each of the zones that are compatible with the proposed management, on the basis of the analysis and evaluation of the economic and socio cultural dynamics of the unit under study.

f. Considering the results of the Public Consultation, the final version of the Management Plan should be prepared, and shall be subject to a period of public audience before its official approval, in the protected area's facilities, for a period of 60 days, so that the interested parties, may see the final version and emit their final comments. After this period and acceptance of the comments that may be deemed pertinent, procedures will allow for its presentation to the principal governmental levels with authority for its official approval.

g. After the results of the planning process have been made known to authorities and agencies connected with the protected area, they must be submitted to the highest authorities for the purpose of legalizing the Management Plan, to ensure its strict implementation.

h. After the Management Plan has been officially approved, the agency responsible for the administration of the Protected Area must ensure, through a strategic information programme, the widest possible dissemination of this document.

10. General Structure of the Management Plan

Introduction

Section I

- Purposes and objectives of the management plan
- General provisions for the implementation of the management plan
- General information on the objectives of the protected area and its most important
- resources
- Values which determined its declaration
- Origin of its name
- Legal background

Section II

- National Conservation Strategy and/or (if not available) the strategy pursued through the Special Commission on Environment of the Amazon Cooperation Treaty (CEMAA of the TAC)
- General characteristics of the national context
- Biogeographic and sociocultural characteristics of the regional context
- The protected area in the National System of Protected Areas
- Public and private agencies involved in the area's management

Section VI

- Development od the time schedule for the implementation of the plan
- Administrative structure for the unit's management
- Standards for the implementation of administrative procedures to penalize infractions or default in the compliance with the plan's guidelines
- Administrative penalties

Section VII

- Regional, national and Amazonian importance and influence of the protected area
- Acts and/or participation areements made with the community, non governmental organizations or with other public agencies
- Guidelines for the promotion and dissemination of the plan's contents
- Transitory provisions
- Final provisions

Annexes
Bibliography

WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

CENTRAL SURINAME NATURE RESERVE (SURINAME)

1. DOCUMENTATION

i) **IUCN/WCMC Data Sheet:** (15 references)

ii) **Additional Literature Consulted:** BOS Foundation. 1996. The Guyana Shield – Recent Developments and Alternatives for Sustainable Development. **Newsletter** 15(2). September; UNDP. 2000. Conservation of Globally Significant Forest Ecosystems in Suriname's Guyana Shield. Programme Document; Sitzer, N. and R. Rice. 1995. Backs to the Wall in Suriname: Forest Policy in a Country in Crisis. WRI; Peres, C. and J. Terbourgh. 1995. Amazonian Nature Reserves: An Analysis of the Defensibility Status of Existing Conservation Units and Design Criteria for the Future. **Conservation Biology.** 9(1) February; FAO/UNEP. 1995. Protected Area Systems in the Amazon. (English translation of report); Davis, S. D. *et. al.* 1997. **Centres of Plant Diversity**. Vol. 3. WWF/IUCN; Bean-Douezy, J. P. *et al*. 1999. **Neblina** ed. De la Maritime; Harcourt, C. S. and J. Sayer. 1996. **Conservation Atlas of Tropical Forests – The Americas**. Simon and Schuster; Dinerstein, E. *et al*. 1995. **A Conservation Assessment of the Terrestrial Ecoregions of Latin America**. WWF/World Bank; CIFOR/UNESCO. 1999. **World Heritage Forests**. The World Heritage Convention as a Mechanism for Conserving Tropical Forest Biodiversity. Workshop Proceedings; Prance, G. and T. Lovejoy 1985. **Amazonia**. Pergamon; Colchester, M. 1995. Forest Politics in Suriname. International Books; Eden, M. J. 1992. **Ecology and Land Management in Amazonia**. Belhaven Press.

iii) **Consultations:** 9 external reviewers, officials from Suriname Ministry of Natural Reserves, STINASU, Conservation International and WWF-Suriname

iv) **Field Visit:** J. Thorsell, February, 2000

2. SUMMARY OF NATURAL VALUES

The Central Suriname Nature Reserve (CSNR) comprises 1.6 mil. ha. of primary tropical forest of west-central Suriname, within the phylogeographic limits of Amazonia. The Reserve protects the upper watershed of the Coppename River and covers a range of topography and ecosystems. The nominated site is one of the two largest reserves in the Guyana Shield highlands (the other being the 3 mil. ha Canaima World Heritage site in Venezuela). The CSNR is of notable conservation value due to its pristine state as an uninhabited and unhunted region. Its montane and lowland forests contain a high diversity of plant life with almost 6,000 vascular plant species collected to date. There are also other areas of swamp forest, savannah and xerophytic vegetation on the granite outcrops. The Reserve's avifauna numbers 400 species and there are viable populations of animals typical of the region including jaguar, giant armadillo, giant river otter, tapir, sloths and eight species of primates. Much of the CSNR has yet to be inventoried and the true extent of the area's diversity is not fully known.

Several distinctive geological and physical formations occur in the site including several granite inselbergs that rise up to 360m above the surrounding tropical forest. The eastern-most tepui of the Guyana Shield occurs in the Reserve and there is a range of hills in the south that reach 1,230m. The CSNR was established in 1998 to link up three pre-existing reserves that are now incorporated in the larger site.

3. COMPARISONS WITH OTHER AREAS

Comprising 1.6 mil. ha., the CSNR covers 11% of the land surface of Suriname and is by far the largest and most important protected area in the country. Compared to its neighbours, Guyana and French Guyana, the CSNR is much larger and more pristine than the protected areas in those countries. Within the Guyana Biogeographical Province it is smaller than the existing Canaima World Heritage site (3 mil. ha.) although, only 2 mil. ha. of

Canaima is forested and tepui-dominated. Canaima has much more varied scenery and topography that the CSNR and displays more dramatically the natural features of the Guyana Shield and "pantepui system". The CSNR is also much smaller than the 3.5 mil. ha. transfrontier Neblina National Park(s) between Brazil and Venezuela. Much of this site, however, has been adversely affected by illegal gold mining and human settlement.

Although the area of the CSNR is not within the Amazonian watershed, it is mostly covered with Amazon basin vegetation(e.g. *Hylea amazonica*) and is within the phytogeographic limits of Amazonia. Within this region, where the planet's most extensive and diverse tropical forests remain, three natural World Heritage sites have been inscribed: Sangay (Ecuador), Rio Abiseo (Peru), and Manu (Peru). Two others have been nominated for evaluation in 2000: Jaú (Brazil) and Noel Kempff (Bolivia). In 1996 there were 60 protected areas (IUCN Category I and II) in the Amazon basin, most of which are globally significant (see Map 1) but there is no easy formula for identifying the sites which would be the "most outstanding". Various attempts to assign priorities among these have been made (e.g. Dinerstein *et. al.* 1995). In this study, the Amazon was divided into 34 ecoregions, each having distinctive feature but specific reserves were not given ratings.

Granitic dome structures are found in several other World Heritage sites including Huangshan (China), Yakushima (Japan) and in the newly nominated Kinabalu Park (Malaysia). Although all of these are higher and more numerous than the domes found in CSNR, the geological origins are distinct.

To conclude, the CSNR has a number of attributes that distinguish it from other reserves in the region: (1) its size makes it one of the 10 largest tropical forest reserves in the Amazon/Guyana Shield region; (2) its floristic composition, due to its location on the eastern edge of the precambrian Guyana Shield, contains an assemblage of species with substantial differences with the rest of the region; (3) it is of particular importance for several rare faunal species such as Cock-of-the Rock and Giant Otter; (4) it contains the distinctive geological feature of granite domes and additional relief provided by a tepui and the Wilhelmina mountain range; and (5) it is one of the very few undisturbed forest areas in the Amazonian region with no inhabitants and no human use.

4. INTEGRITY

Although large parts of the Guyana Shield and Amazon regions are being rapidly transformed by logging, hunting, mining and settlement, the CSNR remains inaccessible, largely unaffected and unthreatened by human activity. However, as development pressures build around the reserve it is likely that, in future, threats may arise. For example, 60-100km to the north and west of the CSNR mining and logging concessions are being given mainly to multi-national companies. There is currently some small-scale mining in reserves to the east of the reserve and a major bauxite deposit is known to exist to the west in the Bakhuis hills.

While the aforementioned concessions lie outside of the CSNR's watershed, vigilance is needed to ensure that future development activity is not expanded into areas critical to maintaining ecological functions within it. This is necessary to foreclose the risk mercury contamination within the Reserve or alteration of vital hydrological functions through water abstraction and sedimentation. Increased human activity and traffic that will come with the development of concessions could also pose a threat. A buffer zone would help ensure that any development is strictly controlled. Satellite image monitoring will be used to identify any changes in regional forest cover.

As is the case with all of Suriname's protected areas system the CSNR suffers from a general lack of resources and capacity within government agencies to enforce its protected area status or provide the necessary park management infrastructure. The remoteness of the CSNR has thus far protected it, but this same factor has also slowed the government's conservation activities there. Of the three existing protected areas that were linked to form the CSNR, only the Raleighvallen Natural Reserve has infrastructure for park management and a management plan. Preparation of a plan for the whole reserve has commenced. This process will take some time as consultations with the local communities (residing 60-100km outside the CSNR) are being undertaken .

To ensure the necessary capacity and long-term financing to manage the CSNR (and Suriname's other protected areas), the Government of Suriname, Conservation International and UNDP/GEF have commenced a 6 year project. The project focuses on capacity building and provision of facilities on site. Over US$1 mil. has been invested to date with a total of US$18 mil. being provided in a trust fund which will be managed by the newly-formed Suriname Conservation Foundation.

5. ADDITIONAL COMMENTS

The creation of the CSNR has encouraged the French government's plans to create the Parc du Guyane in the southern section of French Guyana. The Government of Guyana has also recently expanded the extent of the Kaieteur National Park. There may be considerable opportunities for regional cooperation between the three countries in terms of a conservation corridor through the region (although all 3 of these sites are not contiguous).

6. APPLICATION OF WORLD HERITAGE CRITERIA

CSNR was nominated under all four natural criteria. CSNR is complementary to an existing World Heritage site in the same Biogeographical Province (Canaima). It is a strong candidate for inscription under natural criteria (ii) and (iv):

Criterion (ii): Ecological processes

The CSNR conserves a large portion of the easternmost portion of the Guyana Shield, an ancient, mineral-dense layer of the earth's crust, formerly connected to the continent of Africa. As a geologically stable speciation centre, this region has produced a well-defined assemblage of biota including many endemics. The area of the reserve falls within one of 26 Amazonia refugia as defined in Prance and Lovejoy (1985). The CSNR encompasses significant vertical relief, topography and soil conditions which have resulted in a variety of ecosystems. Such ecosystem variation across environmental gradients is necessary to allow organisms within these ecosystems to move in response to disturbance, adapt to change, and maintain gene flow between populations. The CSNR's size, undisturbed state (a rare condition in Amazonian forest parks) and protection of the entire Coppename watershed will allow long-term functioning of the ecosystem. IUCN considers that the nominated site meets this criterion.

Criterion (iv): Biodiversity and threatened species

Although much basic inventory work remains to be done in the unexplored portions of the CSNR, it is clear that the Reserve is a major reservoir for biota of the region. The CSNR is globally significant for its high diversity of plant life (6,000 vascular plant species, 8 primate species), a number of which are endemic to the Guyana Shield and are threatened. IUCN considers that the nominated site meets this criterion.

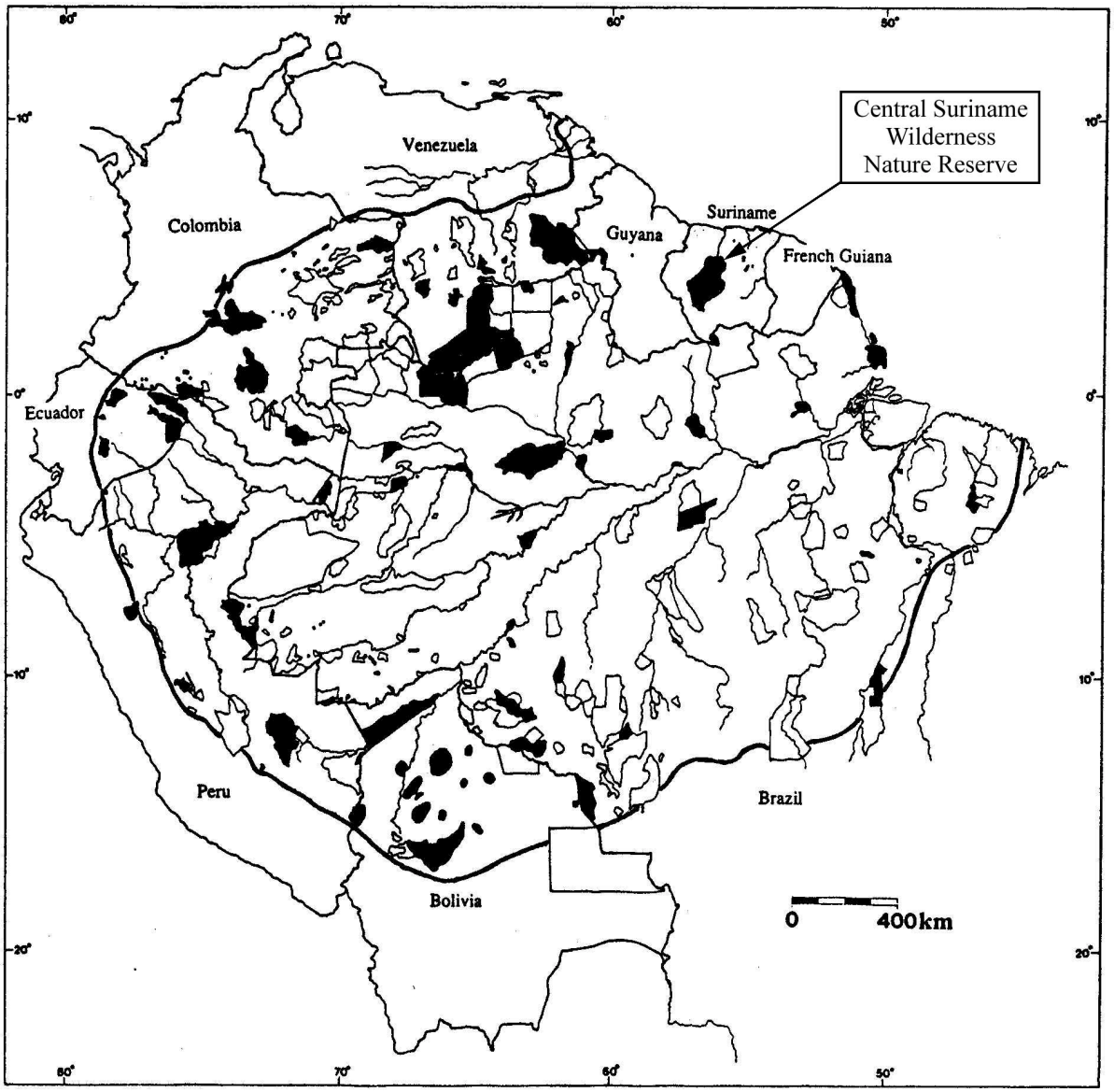
The case for natural criteria (i) and (iii) was not convincingly made in the nomination document and both these criteria are better demonstrated in the Canaima World Heritage site. Although there are high geological values and scenic values in the CSNR, there are considered secondary to its primary natural values under (ii) and (iv).

The site meets all related "conditions of integrity" as described in Operational Guidelines paragraph 44(vi) but early completion and implementation of the management plan should be encouraged.

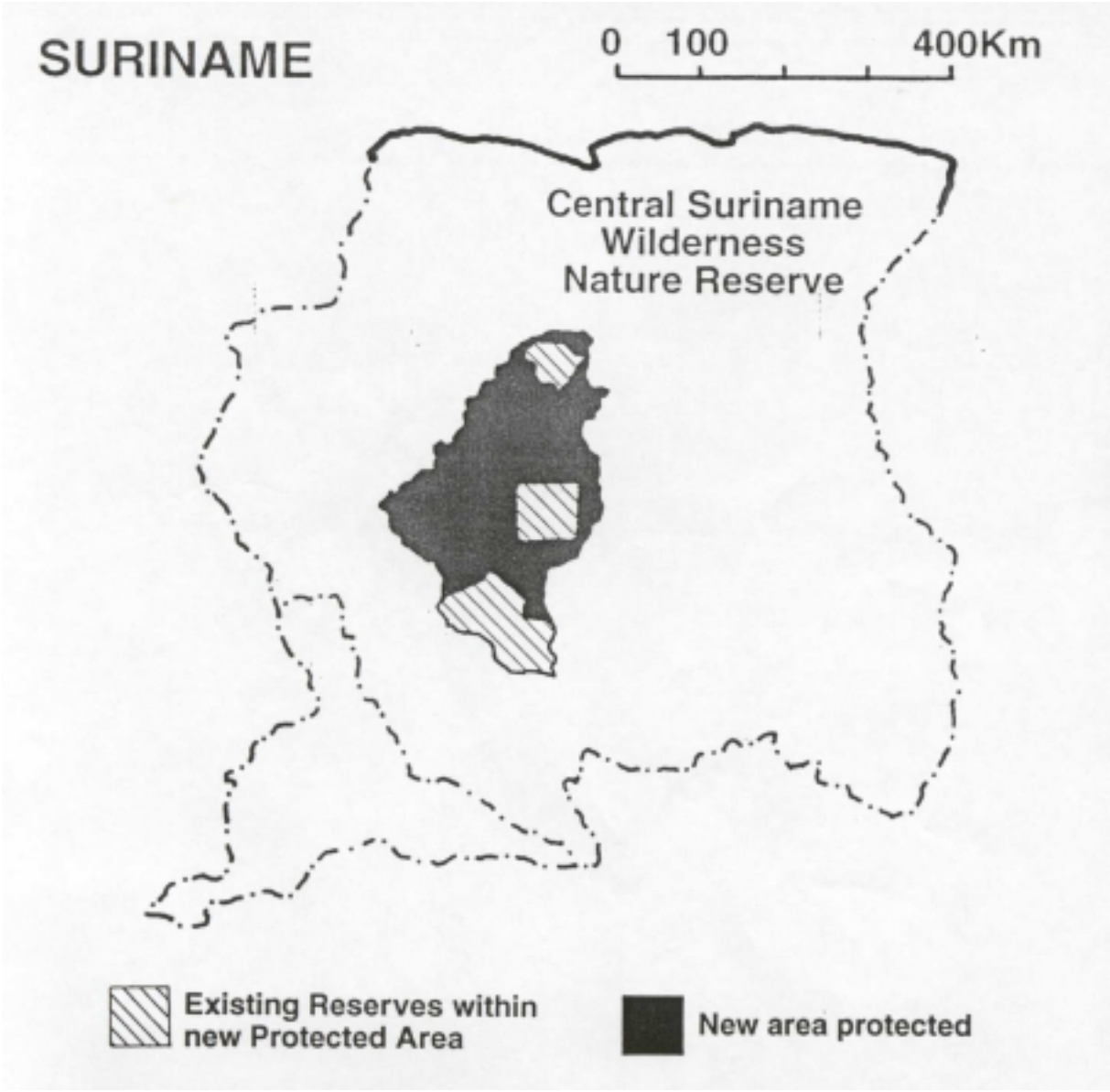
7. RECOMMENDATION

The Bureau recommended to the Committee that the Central Suriname Nature Reserve be **inscribed** on the World Heritage list under natural criteria (ii) and (iv). The Bureau noted that the site encompasses significant vertical relief, topography and soil conditions that have resulted in a variety of ecosystems. This ecosystem variation allows organisms within these ecosystems to move in response to disturbance, adapt to change, and maintain gene flow between populations. The site's size, undisturbed state (in general a rare condition in Amazonian forest parks) and protection of the entire Coppename watershed will allow long-term functioning of the ecosystem. The site contains a high diversity of plant and animal species, many of which are endemic to the Guyana Shield and are globally threatened.

The Bureau encouraged the completion of the management plan for the Reserve and commended the State Party and its partners for establishing the US$ 18 Million trust fund to support protection of the site, which could serve as a model for other sites



Map 1: Location Map – Central Suriname Nature Reserve



Map 2: Site Map – Central Suriname Nature Reserve

CANDIDATURE AU PATRIMOINE MONDIAL - ÉVALUATION TECHNIQUE UICN

RÉSERVE NATURELLE DU SURINAME CENTRAL (SURINAME)

1. DOCUMENTATION

i) **Fiches techniques UICN/WCMC** (15 références)

ii) **Littérature consultée:** BOS Foundation. 1996. The Guyana Shield – Recent Developments and Alternatives for Sustainable Development. **Newsletter** 15(2). September; UNDP. 2000. Conservation of Globally Significant Forest Ecosystems in Suriname's Guyana Shield. Programme Document; Sitzer, N. and R. Rice. 1995. Backs to the Wall in Suriname: Forest Policy in a Country in Crisis. WRI; Peres, C. and J. Terbourgh. 1995. Amazonian Nature Reserves: An Analysis of the Defensibility Status of Existing Conservation Units and Design Criteria for the Future. **Conservation Biology.** 9(1) February; FAO/UNEP. 1995. Protected Area Systems in the Amazon. (English translation of report); Davis, S. D. *et. al.* 1997. **Centres of Plant Diversity**. Vol. 3. WWF/IUCN; Bean-Douezy, J. P. *et al*. 1999. **Neblina** ed. De la Maritime; Harcourt, C. S. and J. Sayer. 1996. **Conservation Atlas of Tropical Forests – The Americas**. Simon and Schuster; Dinerstein, E. *et al*. 1995. **A Conservation Assessment of the Terrestrial Ecoregions of Latin America**. WWF/World Bank; CIFOR/UNESCO. 1999. **World Heritage Forests**. The World Heritage Convention as a Mechanism for Conserving Tropical Forest Biodiversity. Workshop Proceedings; Prance, G. and T. Lovejoy 1985. **Amazonia**. Pergamon; Colchester, M. 1995. Forest Politics in Suriname. International Books; Eden, M. J. 1992. **Ecology and Land Management in Amazonia**. Belhaven Press.

iii) **Consultations:** 9 évaluateurs indépendants, fonctionnaires du ministère des Réserves naturelles du Suriname, STINASU, Conservation International et WWF-Suriname.

iv) **Visite du site:** Jim Thorsell, février 2000.

2. RÉSUMÉ DES CARACTÉRISTIQUES NATURELLES

La Réserve naturelle du Suriname central (RNSC) couvre 1,6 million d'hectares de forêt primaire tropicale au centre-ouest du Suriname, dans les limites phylogéographiques de l'Amazonie. La Réserve protège le haut bassin versant du fleuve Coppename et contient toute une gamme de reliefs et d'écosystèmes. Le site proposé est une des deux plus grandes réserves des plateaux du bouclier guyanais (l'autre étant le Bien du patrimoine mondial de Canaima, au Venezuela, qui couvre 3 millions d'hectares). La RNSC est importante pour la conservation en raison de son état de région inhabitée, intacte, où il n'y a pas de chasse. Les forêts de montagne et de plaine contiennent une grande diversité de plantes avec près de 6000 espèces de plantes vasculaires répertoriées à ce jour. Il y a aussi des régions de forêt marécageuse, de savane et de végétation xérophyte sur les affleurements granitiques. L'avifaune de la réserve comprend 400 espèces et il y a des populations viables d'animaux typiques de la région tels que le jaguar, le tatou géant, la loutre géante, le tapir, les paresseux et huit espèces de primates. Une bonne partie de la RNSC doit encore être inventoriée et l'étendue réelle de la diversité de la région n'est pas totalement connue.

On trouve dans le site plusieurs formations géologiques et physiques distinctes dont plusieurs inselbergs de granit qui s'élèvent jusqu'à 360 mètres au-dessus de la forêt tropicale. Le tepui le plus à l'est du bouclier guyanais se trouve dans la réserve et dans le sud, il y a une série de collines qui atteignent 1230 mètres. La RNSC a été créée en 1998 afin de relier trois réserves préexistantes qui sont maintenant incorporées dans le site.

3. COMPARAISON AVEC D'AUTRES AIRES PROTÉGÉES

Couvrant 1,6 million d'hectares, la RNSC occupe 11% du territoire terrestre du Suriname et c'est de loin, l'aire protégée la plus grande et la plus importante du pays. Si l'on établit une comparaison avec les pays voisins, la RNSC est beaucoup plus vaste et beaucoup plus intacte que les aires protégées du Guyana et de la Guyane française. Dans la province biogéographique guyanaise, elle est plus petite que le Bien du patrimoine mondial de Canaima (3 millions d'hectares) mais seuls 2 millions d'hectares de Canaima sont couverts de forêt et dominés par des tepuis. Canaima

présente un paysage et un relief beaucoup plus variés que ceux de la RNSC, et met en valeur de manière beaucoup plus spectaculaire les caractéristiques naturelles du bouclier guyanais et du système de «pantepui». La RNSC est aussi beaucoup plus petite que les parcs nationaux transfrontières Neblina qui couvrent 3,5 millions d'hectares entre le Brésil et le Venezuela mais ces derniers ont, pour l'essentiel, été dégradés par l'exploitation illicite de l'or et les établissements humains.

Bien que la RNSC ne soit pas dans le bassin versant amazonien, elle est surtout couverte de végétation du bassin amazonien (par exemple *Hylea amazonica*) et se trouve dans les limites phytogéographiques de l'Amazonie. Dans cette région, où les forêts tropicales les plus vastes et les plus diverses du monde subsistent encore, trois biens du patrimoine mondial ont été inscrits: Sangay (Équateur), Rio Abiseo (Pérou) et Manu (Pérou). Deux autres sont proposés pour évaluation en 2000: Jaú (Brésil) et Noel Kempff Mercado (Bolivie). En 1996, il y avait 60 aires protégées (Catégories I et II UICN) dans le bassin de l'Amazone qui, pour la plupart, sont d'importance mondiale (voir carte 1 ci-après) mais il n'existe pas de panacée pour identifier les sites les «plus exceptionnels». Diverses tentatives visant à assigner des priorités ont été faites (par exemple Dinerstein *et al.*, 1995). Dans cette étude, l'Amazone était divisée en 34 écorégions qui avaient chacune des caractéristiques distinctes mais aucun classement n'a été fait pour les réserves spécifiques.

On trouve des structures en dôme granitique dans plusieurs autres biens du patrimoine mondial, y compris Huangshan (Chine), Yakushima (Japon) et dans le Parc proposé du Kinabalu (Malaisie). Bien qu'elles soient, dans tous ces cas, plus hautes et plus nombreuses que les dômes de la RNSC, l'origine géologique n'est pas la même.

En conclusion, la RNSC présente un certain nombre de caractéristiques qui la distinguent des autres réserves de la région: 1) par sa taille, elle est l'une des 10 plus grandes réserves de forêt tropicale de la région de l'Amazone et du bouclier guyanais; 2) sa composition floristique, en raison de son emplacement à l'extrémité orientale du bouclier guyanais précambrien, présente un assemblage d'espèces aux différences substantielles par rapport au reste de la région; 3) elle est d'importance particulière pour plusieurs espèces de faune rares telles que le coq-de- roche et la loutre géante; 4) elle contient les caractéristiques géologiques distinctives des dômes granitiques et un relief supplémentaire, un tepui, dans la cordillère de Wilhelmina; et 5) dans la région amazonienne, c'est une des très rares régions de forêts non perturbées, inhabitée et inutilisée par l'homme.

4. INTÉGRITÉ

Alors que de vastes régions du bouclier guyanais et de l'Amazone sont en transformation rapide du fait de l'exploitation du bois, de la chasse, de l'exploitation minière et des établissements humains, la RNSC reste inaccessible, essentiellement intacte et n'est pas menacée par les activités anthropiques. Toutefois, à mesure que les pressions du développement s'intensifient autour de la réserve, il est probable que des menaces se feront sentir. Par exemple, à 60-100 kilomètres au nord et à l'ouest de la RNSC, des concessions minières et d'exploitation du bois sont accordées, principalement à des entreprises multinationales. Il y a actuellement une petite exploitation minière dans les réserves à l'est de la réserve et l'on sait qu'il existe un grand dépôt de bauxite à l'ouest des collines Bakhuis.

Les concessions mentionnées ci-dessous se trouvent en dehors du bassin versant de la RNSC mais la vigilance est de mise pour empêcher la propagation des activités de développement dans des régions d'importance critique pour le maintien des fonctions écologiques de la réserve. Cette vigilance est indispensable pour prévenir le risque de contamination au mercure dans la réserve ou la modification des fonctions hydrologiques vitales par le prélèvement d'eau et la sédimentation. Le développement des activités anthropiques et de transport qui accompagne la mise en valeur des concessions serait également une menace. L'établissement d'une zone tampon serait utile pour garantir une maîtrise stricte de toute forme de développement. La surveillance par imagerie satellite sera utilisée pour identifier tout changement dans la couverture forestière régionale.

Comme c'est le cas pour toutes les aires protégées du Suriname, la RNSC souffre d'une pénurie généralisée de ressources et de capacités au sein des agences gouvernementales qui empêche l'application des réglements liés au statut d'aire protégée et explique l'absence d'infrastructure de gestion nécessaire au parc. Jusqu'ici, la RNSC a été protégée par son éloignement mais celui-ci a aussi eu pour effet de ralentir les activités de conservation publiques dans la réserve. Des trois aires protégées existantes qui ont été reliées pour former la RNSC, seule la Réserve naturelle de Raleighvallen présente une infrastructure et un plan de gestion. Les préparatifs d'un plan pour l'ensemble de la réserve sont commencés; le processus prendra du temps car il faudra organiser des consultations avec les communautés locales (qui résident dans un rayon de 60 à 100 kilomètres en dehors de la RNSC).

Afin de garantir la capacité nécessaire et le financement à long terme pour la gestion de la RNSC (et des autres aires protégées du Suriname), le gouvernement du Suriname, Conservation International et le PNUD/FEM ont lancé un projet

de six ans qui s'intéresse au renforcement des capacités et à la fourniture d'installations sur le site. Plus de USD 1 million ont été investis à ce jour et un total de USD 18 millions sont versés dans un fonds d'affectation qui sera géré par la nouvelle Fondation de conservation du Suriname.

5. AUTRES COMMENTAIRES

La création de la RNSC a encouragé le Gouvernement français à créer le Parc de Guyane dans la partie sud de la Guyane française. Le gouvernement du Guyana a également récemment agrandi la superficie du Parc national de Kaieteur. Il y a peut-être là une occasion formidable de coopération régionale entre les trois pays avec la création éventuelle d'un corridor de conservation dans toute la région (bien que les trois sites ne soient pas contigus).

6. APPLICATION DES CRITÈRES DU PATRIMOINE MONDIAL

L'inscription de la RNSC est proposée au titre des quatre critères. Elle complète un bien du patrimoine mondial existant dans la même Province biogéographique (Canaima). C'est une bonne candidate à l'inscription sur la base des critères naturels (ii) et (iv):

Critère (ii): processus écologiques

La RNSC contient une vaste portion du secteur le plus à l'est du bouclier guyanais, une couche ancienne, riche en minerais, de la croûte terrestre, autrefois reliée à l'Afrique continentale. En tant que centre de spéciation géologiquement stable, la région a produit un ensemble bien défini de faune et de flore, y compris de nombreuses espèces endémiques. La superficie couverte par la réserve se trouve dans l'un des 26 refuges amazoniens définis par Prance et Lovejoy (1985). La RNSC comprend un relief vertical, une topographie et des conditions de sols importants qui ont donné naissance à toute une gamme d'écosystèmes. Une telle variation des écosystèmes sur tous les gradients écologiques est nécessaire afin de permettre aux organismes de se déplacer pour faire face aux perturbations, s'adapter aux changements et pour maintenir l'échange génétique entre les populations. La superficie de la RNSC, son état non perturbé (ce qui est rare dans les parcs forestiers d'Amazonie) et la protection de l'ensemble du bassin versant de la Coppename permettront le fonctionnement à long terme de l'écosystème. L'UICN considère que le site proposé remplit ce critère.

Critère (iv): diversité biologique et espèces menacées

Il reste, certes, un gros travail d'inventaire à réaliser dans les portions non explorées de la RNSC mais il est clair que celle-ci est un réservoir essentiel pour la faune et la flore et la région. La RNSC est importante à l'échelle mondiale pour la grande diversité des espèces (6000 espèces de plantes vasculaires, 8 espèces de primates), dont un certain nombre sont endémiques au bouclier guyanais et sont menacées. L'UICN considère que le site proposé remplit ce critère.

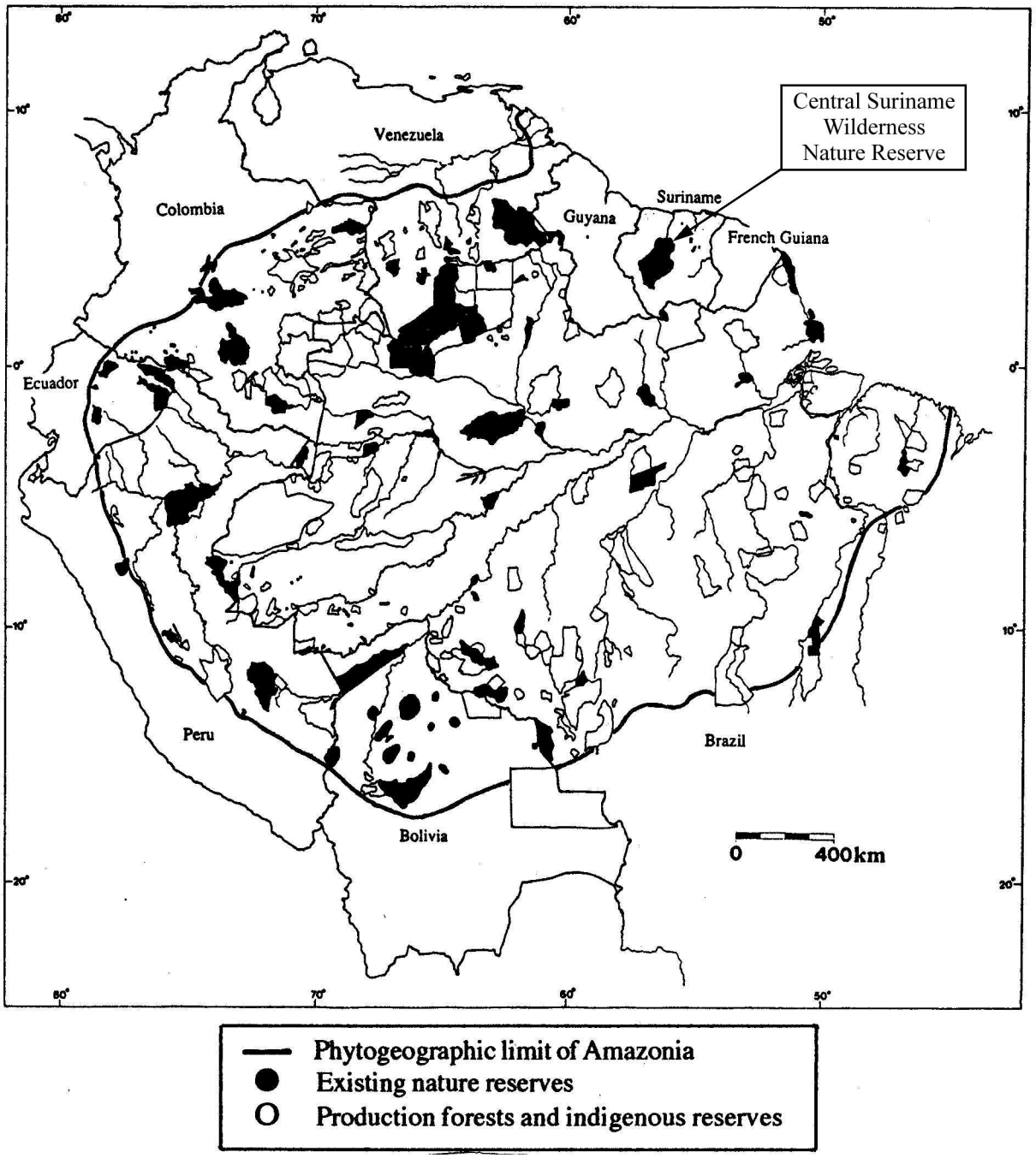
Les critères naturels (i) et (iii) ne sont pas justifiés de manière convaincante dans le dossier et les deux critères sont mieux illustrés dans le Bien du patrimoine mondial de Canaima. Bien que la RNSC présente de grandes valeurs géologiques et paysagères, celles-ci sont considérées comme secondaires par rapport aux valeurs évoquées au titre des critères (ii) et (iv).

Le site satisfait à toutes les «conditions d'intégrité» connexes décrites au paragraphe 44 (vi) des Orientations mais il serait bon d'encourager le travail de préparation du plan de gestion et la mise en œuvre de celui-ci.

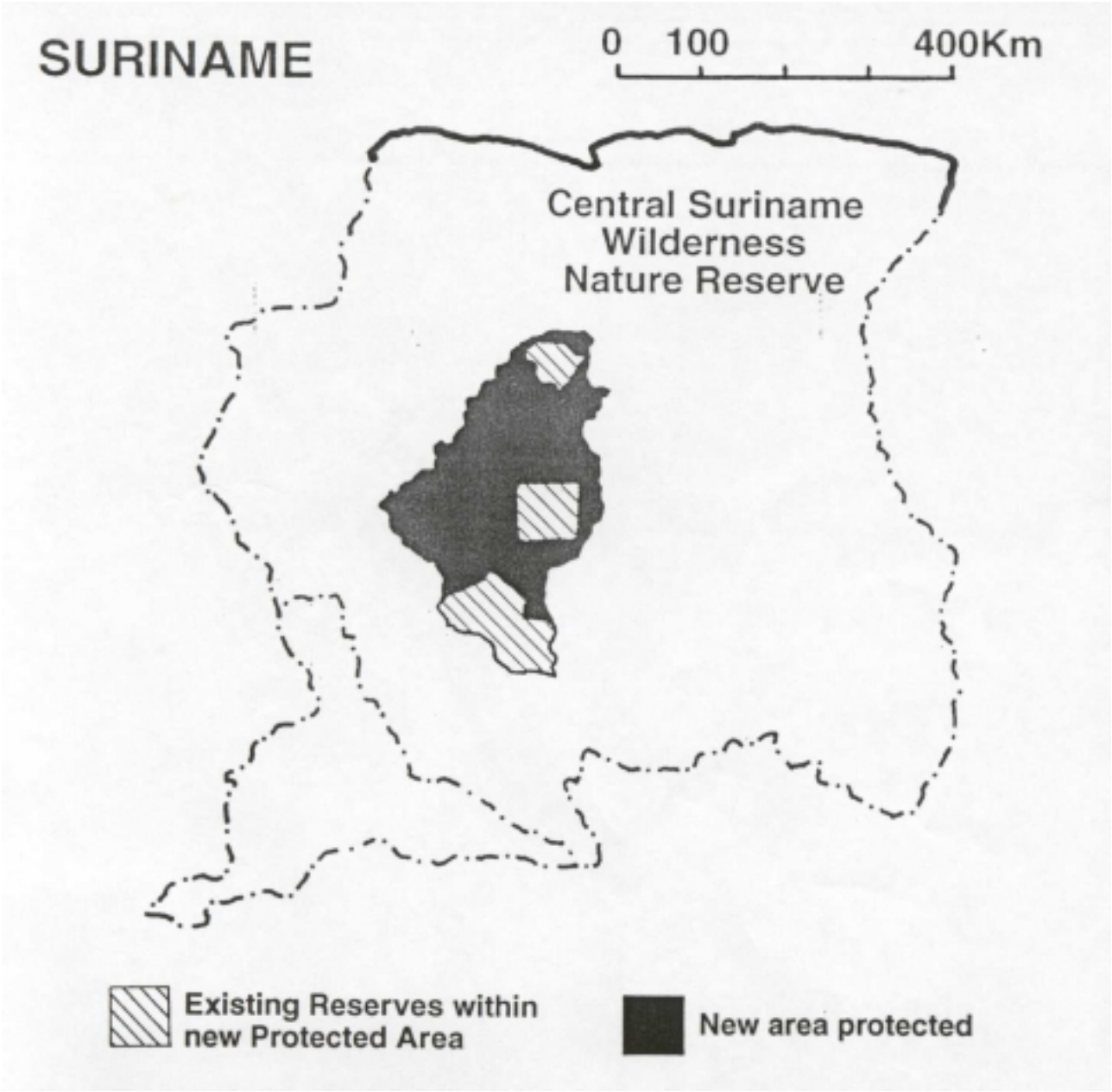
7. RECOMMANDATION

Le Bureau recommande au Comité d'**inscrire** la Réserve naturelle du Suriname central sur la Liste du patrimoine mondial sur la base des critères (ii) et (iv). Le Bureau a noté que le site comprend un relief vertical, une topographie et des conditions de sols importants qui ont donné naissance à toute une gamme d'écosystèmes. Cette variation des écosystèmes permet aux organismes de se déplacer à l'intérieur des ces écosystèmes pour faire face aux perturbations, s'adapter aux changements et maintenir l'échange génétique entre les populations. La superficie de la RNSC, son état non perturbé (ce qui est rare dans les parcs forestiers d'Amazonie) et la protection de l'ensemble du bassin versant de la Coppename permettront le fonctionnement à long terme de l'écosystème. Le site contient une grande diversité d'espèces animales et végétales, dont beaucoup sont endémiques au bouclier guyanais et menacées mondialement.

Le Bureau encourage l'État partie à terminer le Plan de gestion de la Réserve et le félicite, ainsi que ses partenaires, pour avoir établi le Fonds d'affectation de 18 millions US$ qui soutient la protection du site : cette réalisation pourrait servir de modèle pour d'autres sites.



Carte 1: Localisation – Réserve naturelle du Suriname central



Carte 2: Carte du site – Réserve naturelle du Suriname central