

Arusha Region

The catchment forest reserves and proposed catchment forest reserves of Arusha region are in six districts, Arumeru, Babati, Hanang, Mbulu, Monduli and Ngorongoro. Altogether there are 19 reserves, of which four are Local Authority reserves proposed to be placed under catchment forest management (GELAI, KITUMBEINE, LOLIONDO and LONGIDO) and three are not yet gazetted (KINGARANI, KISOLDARE and OLOSHO). Many catchment reserves in the region cover peaks of tall isolated volcanic mountains that act as condensers in otherwise arid country, and are very important sources of water for local people and pastoralists (BURKO, ESSIMINGOR, GELAI, HANANG, KITUMBEINE, MONDULI and UFIOME) with the volcanoes of LAKE DULUTI and MERU also supplying areas of high population density and intensive agriculture. Other isolated peaks that are important catchments for the same reason, but are on basement rocks, are the reserves on Loliondo mountain (KINGARANI, KISOLDARE, LOLIONDO, OLOSHO) and LONGIDO. Three reserves on the Mbulu highlands (HASSAMA HILL, MARANG and NOU) cover extensive areas of upland above the Lake Manyara rift. They supply water to Lake Manyara, rich agriculture areas in the southern part of the rift and to communities living on the Mbulu highlands. Another extensive upland area is covered by BEREKU which is predominately woodland with the rather smaller, forested HARAA on its northern edge. Both of these reserves are important local catchments.

Many of the Arusha region reserves contain dry montane forest which is an important source of valuable timber such as Loliondo, East African Cedar and Podo. The silviculture of these species is relatively well known and they could be readily regenerated. East African Cedar in particular is a pioneer species which regenerates following fire and, providing fire is subsequently controlled, is well suited to establishment in secondary grasslands that have replaced forest in reserves on volcanic mountains. The extensive upland reserves of MARANG and NOU are suitable for the production of broad-leaved hardwoods and Podo through regeneration in natural forest, and NOU has potential for some areas of industrial plantation.

Biodiversity values of the forests are relatively low in terms of species richness, with most of the species being widespread in Africa. However many reserves are important for wildlife, a resource which will increasingly generate foreign exchange revenues through tourism, especially in Arusha and Kilimanjaro regions which are the centres of Tanzania's tourist industry. In this context, some reserves have high amenity values (MERU, MONDULI, LAKE DULUTI, HANANG), and could be developed to generate income that will offset management costs. It is important to bear in mind that management for water catchment has no direct financial return; and regeneration of indigenous valuable timbers has a long term return. Initially there should be high degree of control over access to the reserves during a pilot period of amenity zone establishment until infrastructural developments match visitor demand. Demand is difficult to estimate, and is likely to build up slowly which mitigates against constructing costly buildings. A cost, and administration, effective method of doing this would be to issue permits from the regional and district offices. Visitors should be accompanied by forest attendants or knowledgeable local people who are approved by the Catchment Forest office. It is important that exploitation of amenity potential should directly benefit local communities, for example by employing local guides or by encouraging locally run visitor oriented services.

A number of the reserves are relatively remote and not under a great deal of population pressure. However, most of them are subject to some form of utilisation which in some cases is highly destructive. One of the main issues is reducing exploitation of forest products such as timber, firewood and building poles to a sustainable level, whilst supplying local needs through boundary plantations and regenerating timber stocks. Another issue is cattle grazing in reserves. Traditionally cattle grazing has been associated with fires which increase the area of grassland at the expense of forest. In some forests there are large areas of dense secondary tangles which may be the result of clearing to sustain high cattle populations about a hundred years ago. However it should be possible to reverse this process by introducing a type of Tungya system. In return for grazing rights, cattle herders clear secondary thicket and control fire in areas where enrichment planting is being carried out. By maintaining a system of glades, long term grazing value of regenerated areas could be maintained whilst increasing timber and catchment values.

Arumeru District

There are two Catchment Forest Reserves in Arumeru District, MERU and LAKE DULUTI, both of which are volcanic in origin. MERU is a large reserve on the second tallest mountain in Tanzania, whereas LAKE DULUTI covers a small crater lake. Another possible catchment forest reserve is USA SPRING.

Babati District

There are three Catchment Forest Reserves in Babati District. UFIOME covers an isolated peak immediately west of Babati town; and HARAA covers a peak on the edge of BEREKU which covers an extensive area of ridge and peaks.

Hanang District

There is one Catchment Forest Reserve in Hanang District, HANANG which covers the isolated volcanic peak of Mt. Hanang.

Mbulu District

There are three Catchment Forest Reserves in Mbulu District. NOU covers an extensive area of the southern Mbulu highlands and is half in Babati District. MARANG covers much of the northern Mbulu highlands and part of the Manyara escarpment, as does HASSAMA HILL which is between the two much larger reserves.

Monduli District

Monduli District has three Catchment Forest Reserves, BURKO, ESSIMINGOR and MONDULI. A further three reserves, GELAI, KITUMBEINE and LONGIDO were gazetted as Local Authority reserves, but records indicate that it was always the intention there should be some Central Government control as they were regarded as important catchment areas. All of these reserves cover isolated peaks which act as condensers of moisture in otherwise dry country.

Ngorongoro District

Five forest reserves were originally proposed in Ngorongoro District to cover catchment areas around Loliondo mountain. Of these, only one, LOLIONDO was gazetted, and that as a Local Authority reserve. The other four, namely LODARE, KISAMISI, KINGARANI and OLOSHO are not yet gazetted although they were originally proposed as central government reserves in 1951 and their importance as catchment areas repeatedly stressed by the Forest Department in reports. Since the initial surveys, it was proposed to combine LODARE and KISAMISI into a single reserve, KISOLDARE, so currently only four reserves are under consideration.

LAKE DULUTI Catchment Forest Reserve

Arumeru District, Arusha Region

Year of establishment	:	1965
Declaration	:	GN 314 of 2/7/1965
Variation order	:	None
Border map	:	Jb 559 (1:25 000) 1962
Topographical map	:	55/4
Special map	:	Monduli and Lake Duluti Catchment Forest Reserves (1:25 000) 1991.
Gazetted area	:	46 acres (19 ha)
Measured area	:	19 ha
Gazetted boundary length	:	3 km
Measured border length	:	520 metres

LOCATION: 3_ 23' S 36_ 47' E

12 km from Arusha. Access is from Tengeru. The reserve covers the inner slopes of a small crater around Lake Duluti on the southern foothills of Mt. Meru, west of Tengeru settlement, at an altitude of 1260 m.

SOILS:

Humic on volcanic deposits, mollic subtype under the closed forest, with transitions to ferral soils; ochric subtype in the open woodland area.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Tengeru. Estimated rainfall: 1100 mm/year with ground-water. Dry season: June - Oct. Estimated temperatures: 21_ C max. (Mar.), 17_ C min (July).

VEGETATION:

Vegetation type is largely determined by the presence of ground-water. The main forest type is submontane forest which occurs where ground water is available around the lake, about 5-10 m above the lake water table and 20-50 m from the lake shore. Dry montane forest occurs on the upper slopes where ground water is not available. A small area of fire maintained woodland occurs on the southern crater rim. Near the north shore of the lake there is a floating island of papyrus (*Cyperus papyrus*). The measured area of forest is 16 ha with 3 ha of scrub (1989-1990 air photography).

Submontane forest over ground water. Canopy 12-25 m tall with emergent *Newtonia buchananii* to 30-40 m. Larger trees include: *Albizia schimperiana*, *Cordia* sp., *Cussonia* sp., *Newtonia buchananii*, *Olea capensis*, *Rauvolfia caffra*, *Sorindeia madagascariensis* and *Trichilia emetica*. On the northern shore there is a large clump of *Raphia* palm. The shore line is overhung by the large fig trees *Ficus sycomorus* and *Ficus vallis-choudae*. Smaller trees include: *Bridelia micrantha*, *Chaetacme aristata*, *Croton megalocarpus*, *Drypetes gerrardii*, *Tabernaemontana stapfiana* and *Vangueria madagascariensis*. Shrubs include: *Allophylus africana*, *Psychotria lauracea*, *Solanum seforthianum*, *Pavetta oliveriana*. The ground layer is formed by *Aframomum* sp. and *Nephrolepis* sp.

Dry montane forest. This forest type represents the climax vegetation in areas without ground water. It is dense and shady, with nettle trees (*Obetia radula*). It does not occupy a large area, as this belt is under cultivation and grazing.

Open woodland. Derived from dry montane forest following burning and grazing. Trees include: *Azanza garckeana*, *Combretum molle*, and *Ozoroa insignis* subsp. *reticulata*.

CATCHMENT VALUES:

The inner forested crater slopes are the catchment for Lake Duluti, probably supplemented by underground flow from Mt. Meru. The reserve supplies water to Tengeru settlement, the Agricultural Training Institute and surrounding coffee farms from a water plant established on the eastern lake edge. Although coming from a volcanic crater, the water is not saline indicating that its source is rainwater.

TIMBER VALUES:

Newtonia buchananii, *Trichilia emetica*, *Bridelia micrantha* and *Olea capensis* occur, though not in quantity.

BIODIVERSITY:

The vegetation is largely composed of widespread species. Though *Chaetacme aristata* is rare and is an interesting dioecious tree with sexual dimorphism.

HUMAN IMPACTS:

Not significant. The swamp forest is quite intact, except cattle grazing, along the lake shore. The inside walls of Duluti crater were left for "equestrianism and pedestrianism" during the German administration when farms were laid out in the area. The area was subsequently gazetted as a forest reserve following concern by local residents over the vulnerable position of the forest. A sign posted path has been cleared around the lake and it is used by visitors from the nearby Mountain View lodge.

MANAGEMENT PROPOSALS:

The outer edge should be protected from further burning. To ensure clean water, grazing should be prohibited in the inner slopes.

The reserve has a high recreational value. A camping site occupies the eastern edge and there is a good path around the lake. The lake surface reflects the peaks of Mount Meru and is near to the main road. Malihai Clubs plan to establish a conservation education centre on the lake shore.

A further 5 acres adjacent to the reserve and formerly owned by Prof. Grzimek, has been suggested as an addition to the reserve.

Proposed zonation: Catchment zone: On steeper slopes. Amenity zone: Around the lake edge.

MERU Catchment Forest Reserve

Arumeru District, Arusha Region

Year of establishment	:	1920
Declaration	:	GN 232 of 1920
Variation orders	:	GN 242 of 17/6/60, GN 546 of 18/9/64, GN 84 of 24/2/67
Border map	:	Jb 639 sheets 1-4 (1:50 000) 1967
Topographical maps	:	55/1, 55/2, 55/3, 55/4
Special map	:	Mount Meru Forest Reserve, Sweden, 1987
Gazetted area	:	65 343 acres (26 433 ha)
Gazetted boundary length	:	196.3 km

LOCATION: 3_ 15' S 36_ 45' E

20 km north of Arusha, 5 km from Olmotonyi. Access is from Olmotonyi. The reserve covers the outer slopes of Mount Meru in a U-shape, open to the east, from approximately 1500-1800 to 3000 m. Arusha National Park covers the crater floor and a corridor to it from the east.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall stations: Arusha, Olmotonyi. Estimated rainfall: South-western slopes up to 2000 mm/year; northern slopes 500-600 mm/year; mist effect at higher altitudes. Dry season: June - Oct. Temperatures: mean annual temperature 20 to 17_C at lower altitudes.

SOILS:

Andosols on young volcanic stone (basalt lava) rich in nutrients and alkaline (soda). At higher altitudes the soil is leached forming acidic lithosols.

VEGETATION:

Dry montane forest occurs on the eastern, north-western and northern slopes at 1500-2600 m altitude. In the north, above Oldonyo Sambu, it forms the forest line above plantation forest; while on the east is restricted to lower altitudes (up to 2000 m). Montane forest occurs on the eastern and western slopes between 1500 and 2400 m, and also occupies large areas in Arusha National Park. Small patches of a tall type of montane forest occur in damp valleys on the southern slopes between 1900 and 2400 m. In upper montane forest, bamboo thickets cover large areas on the southern wet slopes between 2300 and 2700 m altitude, and *Hagenia abyssinica* forests occur at 2600 and 3000 metres forming the forest line. Subalpine heath and grassland form the uppermost vegetation above the forest. Large and productive plantation forests have been planted on the northern, western and south-western slopes below the reserve.

Dry montane forest: Canopy open, 20-30 m tall dominated by: *Juniperus procera* and *Olea europaea* subsp. *africana*, with *Juniperus* and *Podocarpus falcatus* in the east. The shrub layer is dense. Tall *Juniperus procera* occur outside forest on ridge tops at 2200-2800 m.

Montane forest. Canopy 15-30 m tall with: *Albizia gummifera*, *Calodendrum capense*, *Cassipourea malosana*, *Croton macrostachyus*, *Bersama abyssinica*, *Diospyros abyssinica*, *Ekebergia capensis*, *Ficus thonningii*, *Casearia battiscombei*, *Dombeya burgessiae*, *Nuxia congesta*, *Olea capensis*, *Prunus africana*, *Teclea nobilis* and *Xymalos monospora*. The shrub layer is usually sparse and the herb layer rich, for example in *Impatiens*. In damp valleys on the southern slopes, emergents to 40-50 m tall occur, larger trees include: *Entandophragma excelsum*, *Cornus volkensii*, *Polyscias fulva*, *Olea capensis* and *Podocarpus latifolius*. Smaller trees include: *Anthocleista grandiflora*, *Tabernaemontana holstii*, *Neoboutonia macrocalyx* and *Macaranga kilimandscharica*. Large herbs include *Lobelia gibberroa*. *Ocotea usambarensis* and *Cyathea* spp. appear to be absent, in contrast to Mt. Kilimanjaro where both are common under similar conditions. This may be related to soil properties.

Upper montane forest: Bamboo thickets of *Sinarundinaria alpina* form dense stands 2-12 m tall with scattered emergent broad-leaved trees including: *Nuxia congesta*, *Cornus volkensii* and *Schefflera myriantha*. Shrubs include: *Maesa lanceolata* and *Rapanea melanophloeos*. The undergrowth is poor in species, usually *Selaginella kraussiana* forms a carpet with abundant *Laportea alatis*. Open canopy *Hagenia abyssinica* forests with *Kiggelaria africana* and *Peddiea fischeri* occur between 2600 and 3000 metres forming the forest line. *Parochaetus communis*, *Asplenium loxoscaphoides*, *Cyperus ajax* and *Plectranthus edulis* are common in the undergrowth. Above 2800 m altitude, where the canopy becomes more open, afroalpine elements occur, such as *Alchemilla johnstonii* and *Kniphofia thomsonii*.

Subalpine heath and grassland: On wetter southerly slopes above 2800-3000 m *Erica arborea* forms 4-8 m tall heaths, which become bushy at 3400 m, giving way to alpine *Pentaschistes* tussock grassland. In wetter areas, and on the western slopes in deep valleys, giant groundsels (*Senecio johnstonii*) and *Lobelia deckenii* occur with many other afroalpine species such as *Anemone thomsonii*, *Disa stairsii*, *Gladiolus watsonioides* and *Swertia kilimanjarica*. On the drier western, northern and eastern slopes *Stoebe kilimanjarica* bushes replace ericaceous heath, with *Artemisia afra*, *Anthospermum usambarense* and *Adenocarpus mannii*. In absence of fire, both types of subalpine heaths have a gradual transition to forests around 3000 m altitude with isolated subalpine bush patches in the openings of *Hagenia abyssinica* forest at 2700-2800 m altitude and *Hagenia abyssinica* forest patches in protected valleys at 3240 m.

CATCHMENT VALUES:

Rivers flowing south-east join the Ruvu river flowing to Nyumba ya Mungu dam, and then to the Pangani river and Hale Hydropower station. Seasonal rivers flow on the north eastern side. The reserve supplies water to Arusha town and to many settlements in the dry but densely inhabited Arumeru District where it is used for irrigation of coffee plantations, and water supply to the inhabitants and large cattle population.

TIMBER VALUES:

The most valuable species include: Pencil Cedar (*Juniperus procera*), *Podocarpus* spp., *Entandophragma excelsum* and *Olea* spp.

BIODIVERSITY:

Juniperus procera and *Podocarpus* spp. stands are important as seed trees. The *Hagenia abyssinica* forests and subalpine *Erica* spp. heaths are rich in species of restricted distribution and rare afroalpine species.

HUMAN IMPACTS:

In the past the forest was extensively exploited by Olmotonyi, Narok and Usa sawmills. Grazing in the *Hagenia abyssinica* forest and fires set by hunters and beekeepers in the subalpine heath cause extensive damage. Firewood is taken from the reserve and plantations for small scale brandy distillation. Pencil Cedar is cut for building poles.

MANAGEMENT PROPOSALS:

Better patrolling is needed. Enrichment planting of valuable species in montane forest to replace logged trees. Cattle grazing and fires need to be controlled. Woodlots need to be planted in surrounding villages for building poles and firewood. The height of Meru and proximity to Arusha offers substantial amenity potential.

Proposed zones: Catchment zone: On steeper slopes, ridge tops and stream sides. Biodiversity zone: Upper slopes and peak; suitable stands of *Juniperus procera* and *Podocarpus* spp. for seed. Amenity zone: Suitable route

to the peak. Productive zone: Montane forest for regeneration and selective felling of valuable species; plantation forests.

LITERATURE:

Kashenge, S.S. 1986. Management Plan for Catchment Forests, Arusha Region. Ministry of Natural Resources and Tourism. Forest Division, Catchment.

Vesey-Fitzgerald. Undated. Vegetation of Arusha National Park. Unpublished MS.

BEREKU Catchment Forest Reserve

Babati District, Arusha Region

Year of establishment	:	1941
Declaration	:	GN 294 of 5/9/41
Variation order	:	None recorded but there is a 1969 border map and 1960 resurvey, and major difference between gazetted and measured area.
Border map	:	Jb 63. Jb 596 (1:10 000) 1969 (1964 on special map)
Topographical maps	:	85/3, 85/4
Special map	:	Bereku Catchment Forest Reserve (1:25 000) 1991
Gazetted area	:	24 600 acres (9956 ha)
Measured area	:	6111 ha
Gazetted boundary length	:	75.1 km (beacons 1-26)
Measured boundary length	:	65.7 km

LOCATION: 4_ 19' - 4_ 23' S 35_ 43' - 35_ 51' E

30 km south of Babati. Access is from the Babati to Kondoa road which forms part of the north western boundary and then traverses the south-western part of the reserve. The reserve covers the Bereku ridge and Gedabosh mountain north-west of the Babati and Kondoa district borders, and south of Haraa FR, with an elevation range of 1280 to 1810 m.

SOILS:

The soil is red with clay to red-brown and sandy with more fertile humic soils in the valleys and some areas of seasonally waterlogged depressions. There are volcanic craters in the north east part of the reserve with brown friable soils.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall stations: Bereku and Galappo. Estimated rainfall: 750-1000 mm/year; with a mist effect on the higher ridges. Dry season: June - Oct. Temperature: 21_ C max. (Nov./Dec.), 16.5_ C min (July) at lower altitudes.

VEGETATION:

The reserve is covered by woodland dominated by *Brachystegia microphylla* with areas of seasonally waterlogged grassland and occasional small clumps of dry montane forest in the higher north western part. With the exception of erosion caused by cattle on slopes near villages and areas cleared in the past for tsetse control, the vegetation of the reserve is in good condition.

Woodland: Continuous light canopy 8-10 m tall over grassland. Trees include: *Acacia* spp., *Albizia versicolor*, *Brachystegia microphylla*, *Brachystegia spiciformis*, *Cussonia arborea*, *Markhamia obtusifolia*, *Parinari curatellifolia*, *Strychnos* sp., *Syzygium guineense* subsp. *guineense*, *Vitex* sp. Bamboo is reported from the upper valleys of the Kikore and Madege rivers.

Seasonally waterlogged grassland: Edged by *Bridelia micrantha* and *Syzygium cordatum*.

Dry montane forest: Trees 5-10 m tall with *Croton macrostachyus* and *Rauvolfia caffra*.

TIMBER VALUES:

The dominant, Miombo (*Brachystegia microphylla*), represents substantial stocks of low grade timber, but few large trees were seen. The form of most trees has suffered from fire. *Albizia versicolor* was extracted under the name of 'Mninga', but stocks are now reported to be exhausted. *Podocarpus* sp. is reported from Buai peak.

BIODIVERSITY:

The forest is composed of widespread species.

CATCHMENT VALUES:

Water is piped from the permanent Matsi stream to Bonga village. On the western side, Kikore and Madege rivers supply permanent water. Many other streams are seasonal.

HUMAN IMPACTS:

Tsetse fly clearing was carried out in 1945 to 1948 on the eastern slopes at Kikore, Hannarah, Gedabosh and Buai villages. Cattle grazing is practised throughout the reserve and in some places has caused erosion. Recent movement of cattle from eroded areas near Kondoa may have increased numbers of cattle in the reserve. In 1966 encroachment was reported on the western side above Kikore. Some building poles and firewood are taken for local use. Beehives are hung in the forest and can be a source of fires when honey is gathered. Mushrooms are gathered and wild fruits (from *Syzygium* spp. and *Vitex* sp.) eaten by cattle herders.

MANAGEMENT PROPOSALS:

About 20 km of boundary has been cleared. Boundary clearing needs to continue and the boundaries planted. The nearest nursery is the district council nursery near Bonga village adjacent to the road and FR boundary.

Timber stocks are low and the reserve has little importance as a timber producing area. Regeneration of *Albizia versicolor* and *Podocarpus* sp. should be encouraged. Fuel wood and building poles for local use could be extracted under license if control of fire and grazing results in sufficient regeneration. In areas close to villages, fuel wood and building pole plantations are needed.

Apart from extensive cattle grazing, local population pressure is relatively low. In the past grazing was permitted during the dry season and closed during the rainy season. Grazing was not allowed on steep slopes and water catchments. In return for grazing rights the cattle owners helped to clear the boundary. Grazing helps to reduce grass cover and so control fire.

A system of grazing licenses should be re-introduced to control numbers of cattle, soil erosion, raise revenue and involve local people in forest management such as patrolling, boundary clearing and planting. Licensed beekeeping should also be introduced and encouraged, with control to prevent fires.

Proposed zonation: Catchment zone: On steeper slopes, around springs, streams and valley heads. Productive zone: Dry season cattle grazing under license; fuel wood and building pole extraction for local use in areas of sufficient regeneration; plantations near villages; beekeeping under license.

LITERATURE:

Kashenge, S.S. 1986. Draft Management Plan for Catchment Forests, Arusha Region 1st July 1986 - 30th June 1991. Mimeograph, Forest Division, Dar es Salaam.

Paresso, D.T. 1966. Investigation and assessment of Bereku forest reserve - May 1966. Forest Division, Mbulu.

There must also be reports from the Tsetse control work.

HARAA Catchment Forest Reserve

Babati District, Arusha Region

Year of establishment : Boundary demarcation 1939, not gazetted until 1970.

Declaration	:	239 of 21/8/1970
Variation order	:	None
Border map	:	Jb 653 (10 000) re drawn 1989.
Topographic maps	:	85/3, 85/4
Special map	:	Ufiome and Haraa Catchment Forest Reserves (1:25 000) 1991
Gazetted area	:	626 ha
Measured area	:	605 ha
Gazetted boundary length	:	13.4 km (beacons 1-29).
Measured boundary length	:	13.063 km

LOCATION: 4_ 17' S 35_ 46' E

35 km south of Babati. Access is from the Babati to Kondoa road above Bonga village and then north to Haraa village. The reserve covers Ipini Hill from 1600 m to the peak at 1830 m. It is separated from Bereku FR to the south by a cultivated valley.

SOILS:

Under forest: Light brown, sandy with humus. Under wooded grassland: Light brown with quartzite stones on the south east side and with volcanic stones on the east side.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall stations: Bereku and Galappo. Estimated rainfall: 1200-1500 mm/year on the forest; 750 mm/year on the grasslands. Dry season: June - Oct. Temperature: 21_C max. (Nov./Dec.) 16.5_C min (July).

VEGETATION:

The reserve is mostly fragmented dry montane forest with large areas of tangled secondary growth; and a small area of wooded grassland on the eastern side. There is a small (0.25 ha) *Cupressus* plantation on the north east side. Leopards occur.

Dry montane forest. Highly disturbed forest with a broken canopy and large areas of tangled secondary growth. On the northern side the forest patches are somewhat larger, and the open secondary areas have standing dead trees. The remaining trees are 15-20 m tall. Trees include: *Albizia gummifera*, *Bersama abyssinica*, *Calodendrum capense*, *Cassipourea malosana*, *Clausena anisata*, *Cordia abyssinica*, *Croton macrostachyus*, *Diospyros abyssinica*, *Dombeya torrida*, *Ehretia cymosa*, *Fagaropsis angolensis*, *Ficus thonningii*, *Lepidiotrichilia volkensii*, *Ochna holstii*, *Prunus africana*, *Rauvolfia caffra*, *Teclea simplicifolia* and *Vepris stolzii*.

Wooded grassland: Open wooded grassland with tree clumps. Trees in the grassland 4-5 m tall with: *Carissa edulis*, *Combretum molle*, *Cussonia arborea*, *Dodonea viscosa*, *Dombeya rotundifolia*, *Erythrina abyssinica*, *Osyris lanceolata*, *Protea madiensis*. Trees in the tree clumps 5-10 m tall with: *Apodytes dimidiata*, *Bridelia micrantha*, *Ekebergia capensis*, *Maesa lanceolata*, *Pittosporum viridiflorum*, *Rapanea melanophloeos*.

TIMBER VALUES:

Low grade timbers of such as *Albizia gummifera*, *Calodendrum capense*, *Cassipourea malosana*, *Cordia abyssinica*, *Ekebergia capensis*, *Fagaropsis angolensis* and *Prunus africana* occur, but not in any quantity or quality. Yellow wood (*Podocarpus*) is reported.

BIODIVERSITY:

The forest and woodland are composed of widespread species.

CATCHMENT VALUES:

On the forest edge and just inside the forest there are small permanent springs and seasonal streams used for local water supply and irrigation. Kaye stream which supplies Bonga village is permanent.

HUMAN IMPACT:

The area was cultivated before being officially gazetted and it is possible that the large secondary tangles are remains of former disturbance for cultivation. In 1967 Paresso reports finding large burnt logs in the tangles,

indicating that fire may have been used for clearing the forest. In some forest areas forest clearance by fire is practised to provide glades for grazing and this may also be the cause of the tangled glades. In addition some logging in the past was reported and so some disturbance may result from this. Currently much of the secondary tangle is impenetrable, though there is a certain amount of goat grazing on the northern edge. Zero grazing of goats, using browse gathered from the FR, is practised on the north east side because of leopards. Some collecting of medicine is practised and some building poles are cut. The grassland area is crossed by a footpath.

MANAGEMENT PROPOSALS:

The boundary has recently been re-surveyed. 13 km of the boundary was cleared last year and some *Eucalyptus* planted; however many transplants died as they were planted too late in the season. The boundary needs to be completely cleared and planted. Timber stocks are low and the secondary tangles should be replanted with species such as *Albizia gummifera*, *Cordia abyssinica* and *Podocarpus* sp. The FR is surrounded by cultivation but this appears to be well managed on the north east side with many trees (*Grevillea robusta*) in coffee fields. Local population pressure on this side of the reserve does not seem to be particularly high. On the northern side pressure is greater with more paths entering the reserve, and some agricultural extension would be useful here.

Proposed zones: Catchment zone: To cover the forested ridge, streams and springs. Productive zone: To cover the tangled secondary areas with regeneration of indigenous timber tree species.

LITERATURE:

Parezzo, D.T. 1967. Reconnoitre report on floristic composition of Haraa forest reserve. Regional Forest Office, Arusha.

Kashenge, B.S. 1986. Draft management plan for catchment forests, Arusha Region 1st July 1986 - 30th June 1991. Mimeograph, Forest Division, Dar es Salaam.

UFIOME Catchment Forest Reserve

Babati District, Arusha Region

Year of establishment	:	1932
Declaration	:	GN 18 of 19/1/1932
Variation order	:	None
Border map	:	Jb 717 (1:25 000) 1968
Topographical maps	:	85/2, 85/4
Special map	:	Ufiome and Haraa Catchment forest reserves (1:25 000) 1991
Gazetted area	:	11 979 acres (4848 ha)
Measured area	:	5635 ha
Gazetted boundary length	:	30.7 km (beacons 1-52)
Measured boundary length	:	30.473 km

LOCATION: 4_ 10' - 4_ 16' S 35_ 46' - 35_ 52' E

3 km from Babati. Access is directly from Babati or from the Babati to Galappo road which runs along the southern edge of the FR. The reserve covers a flat topped mountain to the east of Babati and north of Haraa and Bereku FRs with an elevation range of 1310 to 2415 m on the peak of Kwaraha. To the north and east are dry cultivated plains with more hilly country in the south and west.

SOILS:

Soil under woodland and thicket: brown, sandy over quartzite rocks and schists with areas of rocky outcrop. Under forest: dark brown, rich in humus. The soils appear to be volcanic soils over crystalline rocks.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall stations: Babati and Galappo Mission. Estimated rainfall: 1000-1200 mm/year over forest; 750-1000 mm/year over woodland; with a marked mist effect over forested areas and limited mist effect on woodland and thicket. Dry season: June - Oct. Estimated temperatures: 21_C max. (Nov.), 16.5_C min (July) at lower altitudes.

VEGETATION:

The lower slopes are covered by dense secondary thicket and scrub up to 1750 m with forest in the valleys and woodland on rocky soils. Stunted woodland and open grassland occur in rocky areas with forest clumps at higher altitudes. Dry montane forest covers the upper slopes above 1750 m. Fire and grazing appears to have played a role in modifying the vegetation of the lower slopes and the forest edge may be fire maintained. The forest itself is much disturbed by logging. Elephants and buffalo are reported.

Woodland and thicket: Thicket 2-3 m tall with: *Allophylus* sp., *Clausena anisata*, *Dodonea viscosa*, *Euclea divinorum*, *Grewia* sp., *Hoslundia oppositifolia*, *Phyllanthus* sp. and trees 5-8 m tall with *Acacia* sp., *Combretum molle*, *Croton macrostachyus*, *Dombeya rotundifolia*, *Flacourtia indica*, *Kigelia africana*, *Markhamia obtusifolia*, *Vitex* sp. Riverine trees include *Garcinia* sp., *Ficus* sp., *Kiggelaria africana*, *Rauvolfia caffra*, *Ziziphus* sp. At 1500 m *Brachystegia microphylla* occurs with a more open woodland of 3 m tall *Acacia karoo*, *Carissa edulis*, *Combretum molle*, *Dodonea viscosa*, *Dombeya rotundifolia*, *Erythrina abyssinica*, *Faurea saligna*, *Heteromorpha* sp., *Osyris lanceolata*, *Parinari curatellifolia*, *Protea madiensis*, *Psorospermum febrifugum*, *Strychnos* sp. and tree clumps 5-8 m tall with *Bridelia micrantha*, *Maesa lanceolata*, *Prunus africana*, *Rhus* sp.

Dry montane forest: Canopy broken, much disturbed, 15-25 m tall with *Calpurnia aurea* thickets. Trees include: *Albizia gummifera*, *Bersama abyssinica*, *Calodendrum capense*, *Cassipourea malosana*, *Catha edulis*, *Cordia abyssinica*, *Croton macrostachyus*, *Diospyros natalensis*, *Dombeya torrida*, *Ekebergia capensis*, *Fagaropsis angolensis*, *Olea capensis*, *Olea europea* subsp *africana*, *Prunus africana*, *Rauvolfia caffra*.

TIMBER VALUES:

Cordia abyssinica, *Olea capensis*, *Fagaropsis angolensis* and other low grade timbers occur, though no trees of any timber value were seen. Some trees of value may be present elsewhere in more inaccessible parts of the forest. *Brachystegia microphylla* occurs in the woodlands, but no trees of any size were seen.

BIODIVERSITY:

The forests and woodlands are relatively species poor and largely composed of widespread species. Elephant migration routes are reported.

CATCHMENT VALUES:

The forests provide water via a pipeline to Babati town and Gallapo mission. On the south-east side permanent streams are Endalaghay and Yanas providing water to Gallapo and Ngaranaro village; and Ohim stream providing water to Halla village. Endalaghay stream is on the surface in the upper parts of the reserve and then goes underground at the base of the hill. The streams are listed in Paresso's 1963 report.

HUMAN IMPACTS:

Timber has been extensively extracted from the reserve over the last ten years and trees of around 20 cm d.b.h. are now being taken. Timber continues to be commercially extracted. Glades in the reserve may have resulted from the use of fire to clear dry season grazing areas. Fire is reported to now be under control. Beehives are kept in the forest and are a source of fire. Other forest products used locally are: building poles, firewood (*Rhus* sp. is a preferred species), thatching grass, papyrus for basket weaving, and *Dombeya rotundifolia* bark for rope. Stones for building are collected from the lower part of the reserve.

MANAGEMENT PROPOSALS:

About 10 km of boundary has been cleared on the southern side and there are plans to continue. Boundary markers are rotten and boundary planting is needed. Following exploitation, timber stocks appear low. The lower part of the reserve could be enriched by planting *Cordia abyssinica*. *Olea capensis* and *Fagaropsis angolensis* should be regenerated in the upper parts. Cultivation comes right up to the edge of the reserve and covers the surrounding plains which are now virtually treeless. Fuel wood and building pole plantation should be established along the border of the reserve. Agricultural extension work is needed to promote tree planting for firewood and building poles, as well as introduction of zero grazing and controlling cattle stocks. A system of permits for dry season grazing and gathering of forest produce for local use should be considered. Water pipes

should be installed to carry water outside the reserve as currently cattle are being watered inside the reserve from the same source used by the local people.

There is potential for specialist tourism, though the scenery is not exceptional and the reserve is some distance from other tourist centres.

Proposed zones: Catchment zone: Steeper slopes, upper forested plateau, springs and stream sides. Biodiversity zone: Wildlife migration routes. Amenity zone: Suitable routes to the summit and an area around the summit lake. Productive zone: Lower slopes, especially those adjacent to population centres and lower parts of the forest on less steep slopes with regeneration of indigenous timber tree species.

LITERATURE:

Paresso, D. 1963. Investigation and assessment of Ufiome forest reserve (Kwaraha mountain) 9th January 1963. Mimeograph.

Kashenge, S.S. 1986. Draft management plan for catchment forest, Arusha Region 1st July 1986 - 30th June 1991. Mimeograph, Forest Division, Dar es Salaam.

HANANG Catchment Forest Reserve

Hanang District, Arusha Region

Year of establishment	:	1936
Declaration	:	GN 162 of 1/11/1936
Variation order	:	None
Border map	:	Jb 41 (1:25 000) re drawn 1979
Topographical map	:	84/4
Special map	:	Hanang Catchment Forest Reserve (1:25 000) 1991.
Gazetted area	:	14 080 acres (4698 ha)
Measured area	:	5871 ha
Gazetted boundary length	:	31 km
Measured boundary length	:	35.676 km

LOCATION: 4_ 25' - 4_ 35' S 35_ 20' - 35_ 25' W

4 km from Katesh and 45 km from Babati. Access is directly from Katesh on the southern side and from Giting on the eastern side. The reserve covers an isolated volcanic peak with three summits rising from the Barabaig plains with an elevation range of 1860 to 3418 m. The soda lake of Balangida lies to the north west.

SOILS:

Under forest: dark brown to grey brown humus rich loams over volcanic rocks. Under grasslands: dark brown to orange brown. Under bushland: reddish brown to orange red. Under upland moorland: very dark brown to black and rather sandy.

On the western side stony soils with quartz pebbles and mica occur overlying gneiss and granites. A large area of the mountain is too steep to support vegetation and is bare rock.

CLIMATE:

Oceanic rainfall with continental temperatures. There may be some convectional rainfall from Lake Balangida and thunderstorms occur. Nearest rainfall station: Katesh. Estimated rainfall: 750-1000 mm on the western side to 1200-1500 mm/year on the eastern side: >2000 mm/year at higher altitudes with a marked mist effect; condensation on the upper slopes creates a high water table on the lower slopes which supports forest by ground water; rainfall rather variable. Dry season: June - Oct. Estimated temperature: 20.5_C min (July) at lower altitudes.

VEGETATION:

Forest occurs between 1800-3300 m with montane and upper montane forest on the wetter southern, eastern and northern slopes, and dry montane forest on the western slopes. The belt of forest is broken by rock faces and

grassland and thicket resulting from fires. Above the forest grassland and bushland occurs from 2100-2700 m. Above 2700 m upland moorland occurs. Landslides occurred on the western side in heavy rains during 1990.

Thicket at edge of forest, 2 m tall with: *Calpurnia aurea*, *Cussonia* sp., *Olea europea* subsp. *africana*, *Rhamnus prinoides*, *Vernonia* sp.

Montane forest. Canopy 15-20 m with the trees: *Albizia gummifera*, *Cassipourea malosana*, *Calodendrum capense*, *Catha edulis*, *Cussonia* sp., *Ekebergia capensis*, *Fagaropsis angolensis*, *Ficus* sp., *Hagenia abyssinica*, *Mystroxydon aethiopicum*, *Nuxia* sp., *Podocarpus* sp., *Prunus africana*, *Teclea simplicifolia*.

Upper montane forest. Canopy <15 m. Trees include: *Cassipourea malosana*, *Ilex mitis*, *Ocotea usambarensis*, *Prunus africana*, *Teclea hanangensis*.

Dry montane forest. Canopy 15-20 m with the trees: *Cassipourea malosana*, *Catha edulis*, *Juniperus procera*, *Olea europea* subsp. *africana*, *Olinia rochetiana*, *Podocarpus* sp., *Schrebera alata*.

CATCHMENT VALUES:

The height of Hanang peak makes it an important condenser in an otherwise arid area. Water is piped from the southern side to Katesh, and a number of permanent springs exist on the north-east side which are channelled for irrigation. On the drier western side the springs are seasonal. The number of streams on the mountains varies with season and year, presumably in relation to the rather variable rainfall. In 1911 four streams were seen, in 1933 in October ten streams were seen, in 1946 in February six streams were seen, in 1968 in October 21 streams were seen (Greenway, 1955; Carmichael, 1968). Hanang is considered to be the best source of water in Masailand (Carmichael, 1968).

TIMBER VALUES:

No trees of good form or great value were seen. Species of value recorded in the reserve include: East African Cedar (*Juniperus procera*), East African Camphor (*Ocotea usambarensis*), and Yellow wood (*Podocarpus* sp.). Of these only Cedar occurs in any quantity. A number of lower grade timber species occur including: *Albizia gummifera*, *Calodendrum capense*, *Cassipourea malosana*, *Ekebergia capensis*, *Fagaropsis angolensis*, *Hagenia abyssinica*, *Olea europea* subsp. *africana* and *Prunus africana*.

BIODIVERSITY:

The wide elevation range and rainfall gradient make the reserve comparatively rich in species for the area. It is a potentially useful provenance for timber species seed. A species of restricted distribution is *Teclea hanangensis*.

HUMAN IMPACTS:

Fires set to open up areas for grazing has historically had a major impact on the extent and regeneration of forest. Currently on the eastern side areas of cultivation are separated from the reserve boundary by a band of land several hundred metres across that is used for grazing. This area is burnt every year and can result in fire entering the forest. Pit sawing for *Fagaropsis angolensis* and *Podocarpus* sp. took place about two years ago on the northern side, and extraction of *Juniperus procera* is reported from elsewhere in the reserve. Trees have been felled by honey gatherers, and there is hunting for small animals. Some cutting of building poles for local use occurs.

MANAGEMENT PROPOSALS:

The boundary is clear in most areas as a result of grazing up to the edge, but about 15 km have become overgrown. Resurveying and boundary planting are needed.

Fire was noted as having a major effect on the vegetation in 1946 when a large area of Cedar forest was burnt (Greenway, 1955). In 1968 the regeneration of Cedar was considered satisfactory and it was thought that it would become a good timber stand (Carmichael, 1968). This area needs to be re-assessed. Fire needs continued control. Areas of bushland near the boundary that appear to be a successional stage following fire could be enriched with *Podocarpus* sp. or *Hagenia abyssinica*. Natural *Podocarpus* sp. regeneration under climber tangles in the forest could be assisted by careful clearing.

Local population pressure on the forest is relatively low, though there should be some encouragement to plant more trees in surrounding agricultural areas.

Hanang mountain has substantial potential for specialist tourism where the remarkable local scenery and vegetation could be exploited to provide revenue for forest management and the local communities. Simple self catering accommodation could be constructed near a water source close to Giting with views over Lake Balangida. Access from other tourist centres such as Ngorongoro would be over the Mbulu Highlands and through Dareda.

Proposed zones: Catchment zone: Steeper slopes, springs and stream sides. Biodiversity zone: A suitable forest area and stands of valuable species as seed sources. Amenity zone: Suitable routes to the summit. Productive zone: Lower slopes, especially those adjacent to population centres and lower parts of the forest on less steep slopes with regeneration of indigenous timber tree species.

LITERATURE:

Carmichael, W. 1968. Investigation and assessment of Hanang Forest Reserve. Mimeograph.

Greenway, P.J. 1955. Ecological observations on an extinct East African volcanic mountain. *Journal of Ecology* 43: 544-563.

Kashenge, B.S. 1986. Draft management plan for catchment forest, Arusha Region 1st July 1986 - 30th June 1991. Mimeograph, Forest Division, Dar es Salaam.

HASSAMA HILL Catchment Forest Reserve

Mbulu District, Arusha Region

Year of establishment	:	1931
Declaration	:	GN 12 of 1931 and 83 of 1934
Variation order	:	None
Border map	:	Jb 25a Jb 25b (1:10 000) re-drawn 1965
Topographical map	:	69/3
Special map	:	Hassama Hill Catchment Forest Reserve (1:25 000) 1991
Gazetted area	:	12 000 acres (4856 ha)
Measured area	:	5101 ha
Gazetted boundary length	:	18 or 31.2 km
Measured boundary length	:	31.272 km

LOCATION: 3_ 51' - 3_ 57' S 35_ 39' - 35_ 42' E

28 km west of Mbulu. Access is from Nahasey village. The reserve covers the Sambanika peak and an area of steep rocky escarpment above the southern Manyara valley from an elevation range of 1065 to 2135 m.

SOILS:

Brown with mica, humic under forest, shallow over rocky areas. Some waterlogged grassy places. Extensive rock cliffs.

CLIMATE:

Oceanic rainfall with continental temperatures, probably some convectional rainfall from Lake Manyara. Nearest rainfall station: Mbulumbulu. Estimated rainfall: 1200-1500 mm/year; with a mist effect at higher altitudes. Dry season: June - Oct. Temperature: 19_C max. (Mar.) to 15_C min (July) at lower altitudes.

VEGETATION:

The upper edge of the reserve at 2000 m is fire maintained grassland on the boundary, becoming fire maintained thicket and bushland within the reserve and then upper montane forest at 2000 m on the upper ridges and montane forest below 2000 m on the slopes and valleys. The eastern side of the reserve is the

Manyara rift wall. The forest is in good condition, though some logging was carried out in the past. Elephant and buffalo occur.

Bushland and thicket: Thicket 2-3 m tall dominated by *Dodonea viscosa* with clumps of trees 5-8 tall with: *Albizia gummifera*, *Bersama abyssinica*, *Clusia abyssinica*, *Dombeya torrida*, *Rauvolfia caffra*.

Upper montane forest: Mossy forest with a canopy 10 m tall with: *Casearia battiscombei*, *Cassipourea malosana*, *Teclea simplicifolia*, *Vepris stolzii*, *Xymalos monospora*.

Montane forest: Canopy 20-30 m with emergents to 35 m. Large trees include: *Albizia gummifera*, *Casearia battiscombei*, *Entandrophragma excelsum*, *Ochna holstii*, *Prunus africana*, *Strombosia scheffleri*, *Syzygium guineense* subsp. *afromontanum*. Smaller trees include: *Dasylepis integra*, *Ekebergia capensis*, *Fagaropsis angolensis*, *Lepidiotrichilia volkensii*, *Olea capensis*, *Oxyanthus* sp., *Peddiea fischeri*, *Tabernaemontana* sp., *Teclea simplicifolia*. Shrubs include: *Clausena anisata*, *Dracaena afromontana*, *Lasianthus kilimandscharica*, *Mostuea* sp., *Piper capense*. Secondary areas are dominated by *Neoboutonia macrocalyx*.

CATCHMENT VALUES:

The Dofa river arising in the forest is permanent and supplies Shauri Moyo village and estates in Babati District. The Slahati river starts in Nahasey village, passes through the forest, and then supplies Vicky estate in Babati District. Another permanent river starts in Nahasey village and supplies Darakuta Ranch.

TIMBER VALUES:

Mbokoboko (*Entandrophragma excelsum*) of good form occurs, though not in high density. Mkumbiri (*Casearia battiscombei*) is a preferred species and is said to occur in some quantity though some have already been extracted. *Ekebergia capensis*, *Olea capensis* and *Albizia gummifera* are also preferred for timber, though none occur in any quantity.

BIODIVERSITY:

The forest is species rich, though most of the species are relatively widespread. Some of the timber species are of good form, notably *Albizia gummifera*, *Casearia battiscombei*, and *Entandrophragma excelsum* and so are an important provenance for seed. In particular the *Albizia gummifera* trees are of exceptional form for that species.

HUMAN IMPACTS:

Timber extraction is relatively recent and was halted in 1989. A path cuts through the forest from Nashey to Magara village and is used to reach Babati. There is little cultivation near the forest because of crop damage by game, and fields in the area have been abandoned. Generally there is little disturbance within the forest.

MANAGEMENT PROPOSALS:

The boundary needs to be cleared and marked on the western side. The eastern side is the Manyara rift wall. Some *Eucalyptus* are present as boundary markers, but many of these are in poor condition or damaged by game, and only a short distance has been planted. There has been logging for *Entandrophragma excelsum*, *Casearia battiscombei* and *Albizia gummifera*, though some stocks still remain. Logged areas should be regenerated or replanted, for example it may be possible to plant *Entandrophragma excelsum* in *Casearia battiscombei* logging sites as a means of enriching the forest and making a species rotation. Local population pressure is low, but some consideration needs to be given to the problem of game damage to crops near the forest.

Proposed zones: Catchment zone: Steeper slopes, springs and stream sides, ridges. Biodiversity zone: To protect stands of *Albizia gummifera*, *Casearia battiscombei* and *Entandrophragma excelsum* of good form for seed. Productive zone: Selective logging and regeneration of valuable species.

LITERATURE:

None known.

MARANG Catchment Forest Reserve

Mbulu District, Arusha Region

Year of establishment	:	1938
Declaration	:	GN 89 of 1938
Variation order	:	None
Border map	:	Jb 32 Jb 48 Jb 570 (1:50 000) 1962
Topographical maps	:	69/1, 69/2, 69/3
Special map	:	Marang Catchment Forest Reserve (1:50 000) 1991
Gazetted area	:	87 473 acres (35 400 ha)
Measured area	:	24 901 ha
Gazetted boundary length	:	85.6 km
Measured boundary length	:	84.767 km

LOCATION: 3_33' - 3_47' S 35_35' - 35_44' E

15 km from Mbulu. Access to the western side is from the Mbulu to Karatu road, and to the eastern side from Maji Moto in Manyara NP. The reserve covers the plateau and escarpment on the western side of Lake Manyara, starting near the lake shore from an altitude of 975 to 2040 m with most of the reserve between 1500 to 1900 m.

CLIMATE:

Oceanic rainfall with continental temperatures with some convectional rain from Lake Manyara. Nearest rainfall station: Mbulumbulu. Estimated rainfall: 1200-1500 mm/year; with a mist effect at higher altitudes. Dry season: June - Oct. Estimated temperatures: 19_C max. (Mar.), 15_C min (July) on the western boundary.

SOILS:

Ferralitic latosols or andosols occur depending on the parent rock. The rocks are mainly crystalline, overlain with volcanic deposits. Seasonally inundated depressions give rise to vertisols.

VEGETATION:

On the plateau dry montane forest covers ridge tops and montane forest occurs in valleys and the central part of the reserve. Drier semi-evergreen montane forests occur on the western most projection of the forest reserve, covering the slopes of an east-west running ridge. Natural glades, valley grasslands and swamps (including papyrus swamp) occur in the deeper longitudinal depressions among the ridges. On the escarpment, submontane and lowland forests should occur. Buffalo and elephant occur.

Dry montane forest: Trees include: *Albizia gummifera*, *Bersama abyssinica*, *Clausena anisata*, *Croton* sp. (rare), *Ekebergia capensis*, *Erythrina* sp., *Fagaropsis angolensis*, *Teclea nobilis* and *T. simplicifolia*. In the shrub layer *Piper capense* is common with *Rhamnus prinoides*. In dry semi-evergreen forests, canopy dominants are *Croton* sp. and *Olea africana*.

Montane forest: Canopy 30-40 m. Dominants: *Casearia battiscombei* or *Olea capensis*, with *Albizia gummifera*, *Cassipourea malosana*, *Macaranga* sp., *Nuxia* sp., *Prunus africana* and *Podocarpus latifolius*.

CATCHMENT VALUES:

Most of the rivers run eastwards into the Manyara rift supplying large commercial farms south of the National Park and Lake Manyara. To the west, Endabash river supplies Endabash.

TIMBER VALUES:

Fagaropsis angolensis and *Loliondo* (*Olea capensis*) occur in quantity. *Podocarpus latifolius* also occurs.

BIODIVERSITY:

The area is not well known botanically, but is likely to be composed of widespread species. Good stands of valuable species will be important for seed.

HUMAN IMPACTS:

Human impact is relatively limited. Serious encroachment for cultivation occurred on the western edge, near Buger village. Intensive pit sawing for Loliondo is carried out in some areas. Emeralds are mined in the reserve.

Along the western border there is a one kilometre broad belt of degraded forest where regular logging and grazing takes place. In this belt the canopy is very broken and replaced by a tangle of secondary thicket.

MANAGEMENT PROPOSALS:

The borders should be cleared and planted. Logging and encroachment needs to be controlled by regular patrolling. The degraded border zone and other disturbed areas should be regenerated by enrichment planting of valuable species. Woodlots for building poles and firewood should be established along the edge of the reserve. There is a proposal to include the reserve within Manyara National Park.

Proposed zones: Catchment zone: On steeper slopes, ridges and stream sides. Amenity zone: Escarpment and plateau area above Maji Moto in Manyara NP. Productive zone: Selective logging and regeneration of valuable species; building pole and fuelwood woodlots along the border near villages.

LITERATURE:

None known.

NOU Catchment Forest Reserve

Mbulu and Babati Districts, Arusha Region

Year of establishment	:	1933
Declaration	:	GN 94 of 1933
Variation order	:	None
Border map	:	Jb 886 Northern (1:25 000) 1925 Jb 222 Southern (1:25 000) 1954 Jb 873 Extension (1:50 000) 1933
Topographical maps	:	68/4, 69/3, 84/2, 85/1
Special map	:	Nou Catchment Forest Reserve (1:50 000) 1991
Gazetted area	:	77 236 acres plus a 2100 acre extension (32 107 ha)
Measured area	:	30 334 ha
Gazetted boundary length	:	126.8 km
Measured boundary length	:	99.384 km

LOCATION: 3_ 54' - 4_ 4' S 35_ 27' - 35_ 32' E

8 km from Mbulu, 30 km from Babati. Access to the western side is from the Bashnet to Dongobesh to Mbulu road, and to the eastern side from the Mbulu to Kweremth road. The reserve covers the southern part of the Mbulu highland plateau from an altitude of 1800 to 2416 m, with most of the reserve above 2150 m.

SOILS:

Under forest: acidic lithosols and ferralitic latosols over granite and gneiss crystalline basement rocks. Under drier conditions: rankers. In seasonally inundated depressions: vertisols.

CLIMATE:

Oceanic rainfall with continental temperatures, possibly with some convectional rain from Lake Manyara. Nearest rainfall station: Mbulumbulu. Estimated rainfall: 700 mm/year on drier western slopes; 1500 mm/year on higher eastern slopes; marked mist effect at higher altitudes. Dry season: June - Oct. Estimated temperature at 1800 m: 19_C max. (Mar.), 15_C min (July) at lower altitudes.

VEGETATION:

Dry montane forest covers large areas on the drier western side, for example on Guay Hill south of Mbulu town. Montane forest is restricted to the eastern slopes facing the rain carrying winds. Upper montane forest dominates the higher parts of the plateau from 2200 to 2400 m. Natural glades occupy flat waterlogged valley

bottoms, and ridges on shallow soil; and secondary grassland replacing forest covers extensive areas of the plateau.

Dry montane forest: Canopy 15-18 m with: *Calodendrum capense*, *Croton macrostachyus*, *C. megalocarpus*, *Olea africana*, *Teclea nobilis* and *Teclea simplicifolia*.

Montane forest: Canopy 25-40 m with: *Podocarpus latifolius*, *Ocotea usambarensis* and *Entandrophragma excelsum*. *Olea capensis* is important in certain habitats.

Upper montane forest: Canopy 18-20 m with: *Bersama abyssinica*, *Casearia battiscombei*, *Cassipourea malosana*, *Ekebergia capensis*, *Nuxia congesta*, *Podocarpus latifolius*, *P. falcatus*, *Teclea simplicifolia* and *Xymalos monospora*. Secondary scrub includes: *Agauria salicifolia*, *Galiniera saxifraga*, *Olinia rochetiana* and *Rhamnus prinoides*. Glades in the forest are of different age with montane forest being replaced by *Hypericum-Crotalaria agathiflora* scrub, then *Pteridium aquilinum* (bracken fern) stands and finally dry secondary grassland.

Secondary grassland: Dominated by the grass *Pennisetum schimperi* with *Eleusine jaegeri* and *Loudetia simplex*. Other herbs include: *Helichrysum* spp, *Solanum* spp, *Tephrosia* spp and *Indigofera* spp.

CATCHMENT VALUES:

The catchment values are high. The dry and agriculturally important Mbulu and Dongobesh basins depend on irrigation water from the reserve. On the eastern slopes the Gichani River supplies a densely populated agricultural area. The Bubu river supplies Dareda.

TIMBER VALUES:

A number of valuable timbers occur in quantity, for example: Podo (the two *Podocarpus* species), *Fagaropsis angolensis*, East African Camphor (*Ocotea usambarensis*), Loliondo (*Olea africana*) and Mahogany (*Entandrophragma excelsum*).

BIODIVERSITY:

The area is not well investigated botanically, but is likely to be largely composed of widespread species. The Northern Highland endemic balsam, *Impatiens meruensis* subsp. *cruciata* is common in the forests.

HUMAN IMPACT:

Historically, forest has been cleared for grazing by burning. This practise has fragmented the forest into a mosaic of successional stages from grass glades to scrub with open areas mostly on the slopes and summit ridges. Currently there is no heavy grazing in the reserve.

Large scale pit sawing for Podo, Camphor and Mahogany has recently taken place.

MANAGEMENT PROPOSALS:

The boundaries need to be cleared and marked. Fire and grazing control in the glades would allow natural successional processes to regenerate forest. Protected *Hypericum-Crotalaria* scrub will develop into forest; and bracken stands will develop into scrub. The dry summit grasslands are more difficult to regenerate as they have already suffered from severe soil compacting and erosion. Enrichment planting in scrub and bracken should be with: Camphor on the eastern slopes, *Podocarpus latifolius* and *Fagaropsis angolensis* on the plateau area. In favourable sites Loliondo should be tried. On the drier northern and western slopes in the dry forest belt *Fagaropsis angolensis* would be suitable. Protection and regeneration should start with smaller glades protected from fires, and then in the bigger glades on the sides less degraded. During reforestation of the big glades firebreaks should be established to protect new plantations.

Grazing has always been practised within the reserve, but an efficient system of licensing in return for help in reserve management, such as fire control and regeneration, should be worked out.

An earlier management proposal was to establish plantations of exotic on degraded land. This would certainly be important for continued timber supply in the area. Suitable exotic for plantations are *Pinus patula* and *Grevillea robusta*. Further logging of natural forest timber should be properly controlled and patrolling

substantially increased. Fuelwood and building pole woodlots should be established on the boundary near villages.

There once was a proposal to plant tea in the area, but this was never implemented.

Proposed zones: Catchment zone: Steeper slopes, stream sides and ridge tops. Productive zone: Selective logging and regeneration of valuable species in forest; regeneration of forest and valuable species in glades; plantations near roads; fuelwood and building pole woodlots on the boundary near villages; grazing under license.

LITERATURE:

Pereira, H.C. 1958. Reconnaissance report on proposals for tea planting in the Nou forest catchment area. Mimeograph. Muguga.

Kerfoot, O. Undated. Report on the Nou forest catchment areas, Mbulu District, Tanganyika Territory. Mimeograph. (Describes vegetation).

Kerfoot, O. Undated. Report on the Nou forest catchment areas, Mbulu District, T.T. Mimeograph. (Describes landuse and future development).

BURKO Catchment Forest Reserve

Monduli District, Arusha Region

Year of establishment	:	1955
Declaration	:	GN 90 of 18/3/1955
Variation order	:	None
Border map	:	Jb 223 (1:10 000) 1954 There is also a 1968 map
Topographical map	:	54/3
Special map	:	Essimingor and Burko Catchment Forest Reserves (1:25 000) 1991
Gazetted area	:	1 432 acres (580 ha)
Measured area	:	579 ha
Gazetted boundary length	:	35 836 ft + some 500 ft (11 km)
Measured boundary length	:	11.023 km

LOCATION: 36_ 11' - 36_ 14' E 3_ 17' - 3_ 40' S

50 km from Monduli, 67 km from Arusha and 11 km from the Arusha to Dodoma road. Access is from the Arusha to Dodoma road to Lepurko village. The reserve covers the forested south eastern side of Burko Hill, which is a steep north east to south west hilly ridge with an elevation range of 1670 m to 2136 m.

SOILS:

Dark brown volcanic loam with humus over a volcanic breccia. Rock outcrops occur in the lower part of the reserve.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Monduli. Estimated rainfall: 1200-1500 mm/year on the forest with mist effect; 750-1000 mm/year on the woodland. Dry season: June - Sep. Estimated temperature: 15.4_C max (Dec.), 11.5_C min (July) at lower altitudes.

VEGETATION:

The reserve is mostly dry montane forest with wooded grassland on the lower slopes and fire maintained grassland and thicket on the upper slopes. The forest is in quite good condition. In common with other forests in the region there are many open areas with tangled herbaceous vegetation. Buffalo occur in the forest in the dry season.

Wooded grassland. Trees 3-4 m tall with: *Acacia* sp., *Balanites aegyptica*, *Dombeya rotundifolia*, *Erythrina abyssinica*.

Dry montane forest. Canopy 15-20 m tall with open tangled areas. Trees include: *Acokanthera* sp., *Albizia gummifera*, *Calodendrum capense*, *Cassipourea malosana*, *Celtis africana*, *Drypetes reticulata*, *Ekebergia capensis*, *Euclea divinorum*, *Fagaropsis angolensis*, *Ficus thonningii*, *Ochna holstii*, *Olea africana*, *Nuxia congesta*, *Teclea simplicifolia*. Fire maintained grassland and thicket with *Leonotis* sp. and *Lantana* sp.

CATCHMENT VALUES:

There are no permanent streams, though a permanent spring called Obunyu Tarita is reported in the peak area. The reserve presumably supplies ground water to other surface water sources.

TIMBER VALUES:

No timber trees of value were seen. Low value species such as *Albizia gummifera*, *Cassipourea malosana* and *Ekebergia capensis* occur but not in quantity and of poor form.

BIODIVERSITY:

The forest is composed of widespread species.

HUMAN IMPACTS:

Fires set annually by pastoralists maintain the edge of the forest and grassland and thicket areas. Building poles for local use are cut from the forest. Beehives are made from *Celtis africana* and *Albizia gummifera* and hung in the wooded grassland in the lower part of the reserve and surrounding area.

MANAGEMENT PROPOSALS:

The boundary needs to be cleared. Some *Eucalyptus* boundary markers exist, but further demarcation is needed. Protection of the forest edge from fire would enable planting of fire maintained thickets with valuable species. A system of dry season grazing licenses or concessions should be considered. Building pole woodlots should be planted on the forest edge. Game control is needed to protect farms at Lepurko. Housing should be constructed for a forest attendant or a local person should be recruited.

Proposed zones: Catchment zone: Steeper slopes, ridge top and springs. Productive zone: Forest edge for building pole woodlots and open areas for licensed grazing.

LITERATURE:

Carmichael, W. 1967. Investigation and assessment of Burko Forest Reserve. Mimeograph.

Kashenge, B.S. 1986. Draft management plan for catchment forests. Arusha Region 1st July 1986 - 30th June 1991. Mimeograph, Forest Division, Dar es Salaam.

ESSIMINGOR Catchment Forest Reserve

Monduli District, Arusha Region

Year of establishment	:	1954
Declaration	:	GN 187 of 2/7/1954
Variation order	:	None
Border map	:	Jb 165 (1:25 000) 1956
Topographical map	:	54/3
Special map	:	Essimingor and Burko Catchment Forest Reserves (1:25 000) 1991
Gazetted area	:	15 000 acres (6070 ha)
Measured area	:	6433 ha
Gazetted boundary length	:	28 km
Measured boundary length	:	29.613 km

LOCATION: 36_03' - 36_08' E 3_21' - 3_26' S

60 km from Monduli, 90 km from Arusha and 10 km from the Arusha to Dodoma road. Access is from the Arusha to Dodoma road through Ugoro's (Essimangor) farm or through the Makuyuni JKT camp. The reserve covers the rugged and steeply dissected Essimangor mountain from an elevation range of 1520 to 2195 m.

SOILS:

Brown volcanic soils. Over volcanic rock.

CLIMATE:

Oceanic rainfall with continental temperatures. There may be some convectional rainfall from the nearby Lake Manyara. Nearest rainfall stations: Monduli and Mto wa Mbu. Estimated rainfall: 750-1000 mm/year on the lower slopes; >1500 mm/year on the upper slopes; mist effect at higher altitudes. Dry season: June - Oct. Estimated temperature: 15.4_C (Dec.), 11.5_C (July) at lower altitudes.

VEGETATION:

Lower slopes grassland with scattered trees. Dry montane forest with fire maintained grassland on the upper slopes from 1675 to 2195 m. There are about 4850 ha of forest and 1210 ha of grassland. Buffalo occur.

Wooded grassland. Trees include: *Acacia* sp., *Combretum* sp., *Dombeya rotundifolia*, *Euphorbia* sp.

Dry montane forest. Trees include: *Albizia gummifera*, *Calodendrum capense*, *Cassipourea malosana*, *Catha edulis*, *Cussonia* sp., *Ekebergia capensis*, *Fagaropsis angolensis*, *Nuxia congesta*, *Olea capensis*.

CATCHMENT VALUES:

Although there are no permanent streams issuing from the reserve, springs arise on the mountain and water is piped from the eastern side to farms on the lower slopes. A spring on the southern slopes is not utilised. The reserve presumably contributes to ground water supplies below the mountain.

TIMBER VALUES:

Some trees of timber value are reported to occur such as: *Albizia gummifera*, *Calodendrum capense*, *Cassipourea malosana*, *Ekebergia capensis*, *Fagaropsis angolensis*, and *Olea capensis*. However the remoteness of the reserve means that little or no extraction has taken place.

BIODIVERSITY:

The forest is composed of widespread species. The lack of exploitation may mean that selection of seed trees or useful provenances of timber species may be possible.

HUMAN IMPACTS:

Annual fires set by pastoralists determine the forest limits. Population pressure is low.

MANAGEMENT PROPOSALS:

The boundary needs to be cleared and planted. Fire control will allow the forest to regenerate in currently fire dominated areas.

The occurrence of game, geographical isolation but relative proximity to the Arusha to Dodoma and Mto wa Mbu roads suggest a possibility for specialist tourism.

Proposed zones: Catchment zone: Steeper slopes, ridge tops, springs and stream sides. Biodiversity zone: Wildlife migration routes; suitable stands of timber trees for seed. Productive zone: Selective logging and regeneration of valuable species.

LITERATURE:

Carmichael, W. 1967. The investigation and assessment of Essimangor Forest Reserve July 1967. Mimeograph.

Kashenge, B.S. 1986. Draft management plan for catchment forests. Arusha Region 1st July 1986 - 30th June 1991. Mimeograph, Forest Division, Dar es Salaam.

GELAI Local Authority Reserve, proposed Catchment Forest Reserve

Monduli District, Arusha Region

Year of establishment	:	1955
Declaration	:	
Variation order	:	
Border map	:	
Topographical maps	:	
Gazetted area	:	6050 acres (2448 ha)
Gazetted boundary length	:	

Location: 2_ 40' S 36_ 5' E

More than 200 km from Monduli. Access is from Kitambeihe. The reserve covers the remote Gelai mountain to an altitude of 2942 m.

SOILS:

Volcanic.

CLIMATE:

Oceanic rainfall with continental temperatures. There may be conventional rain from Lake Natron. Nearest rainfall station: Longido. Estimated rainfall: 500-750 mm/year; marked mist effect at higher altitudes. Dry season: May - Oct. Estimated temperatures: 22_C max. (Mar.), 17_C min (July).

VEGETATION:

Grass and shrubs dominate below 2130 m, with dry montane forest at higher altitudes, but with a closed canopy only in ravines.

Shrubland: *Acacia* spp., *Clausena anisata*, *Combretum* sp., *Commiphora* spp., *Cussonia spicata*.

Dry montane forest: *Hagenia abyssinica*, *Olea capensis*, *Olea europea* subsp. *africana*, *Juniperus procera*, *Teclea* sp.

CATCHMENT VALUES:

The reserve covers an isolated mountain which is an important condenser of moisture in otherwise dry country. There are seventeen named streams crossing the forest reserve boundary, of which seven have running water and the others are seasonal. The water from Lumbwa river supplies three cattle watering troughs and also supplies Gelai village. Water from Okeju Ordo river is piped to Merungai trading centre. Nearly all the Masai, domestic animals and game in and around Gelai depend on these two rivers.

TIMBER VALUES:

Although valuable species such as Loliondo (*Olea capensis*) and East African Cedar (*Juniperus procera*) occur, the reserve is not considered to contain harvestable quantities.

BIODIVERSITY:

Biological data is extremely limited, but the vegetation is likely to be composed of widespread species. The area is probably important for game.

HUMAN IMPACTS:

Fire is reduced the area of forest. Encroachment is reported

MANAGEMENT PROPOSALS:

The high catchment value and lack of management suggest that the reserve be transferred from Local Authority management to Catchment Forest management.

Proposed zones: Catchment zone: on steeper slopes and ridge tops.

LITERATURE: Carmichael, W. 1966. Investigation and assessment of Gelai Local Authority Forest Reserve. Mimeo.

KITUMBEINE Local Authority Reserve, proposed Catchment Forest Reserve

Monduli District, Arusha Region

Year of establishment	:	1955
Declaration	:	
Variation order	:	
Border map	:	
Topographical maps	:	40/3, 40/4
Gazetted area	:	32 100 acres (12 991 ha)
Gazetted boundary length	:	

LOCATION: 2_ 50' S 36_ 15' E

Several hundred km from Monduli. Access is from Kitumbeine. The reserve covers the isolated peak of Kitumbeine to an altitude of 2860 m.

SOILS:

Volcanic. The lower slopes and surrounding country are covered with loose stones and boulders.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Longido. Estimated rainfall: 500-750 mm/year; with a mist effect at higher altitudes. Dry season: May - Oct. Estimated temperatures: 22_C max. (Mar.), 17_C min (July) at lower altitudes.

VEGETATION:

The lower slopes are covered in dry woodland from 1370-1670 m. Dry montane forest occurs above 1670 m. Grassland occurs on ridge tops between tongues of dry montane forest, and two large glades known as Sekalet Glades occur at 2680 m.

Dry woodland: *Acacia* spp., *Balanites* sp., *Boscia* sp., *Combretum* sp., *Cordia* sp., *Osyris* sp.

Dry montane forest: *Calodendrum capense*, *Cassipourea malosana*, *Cussonia spicata*, *Erythrina abyssinica*, *Euphorbia candelabrum*, *Ficus sycomorus*, *Juniperus procera*, *Olea europea* subsp. *africana*, *Olea capensis*, *Teclea* sp. At higher altitudes *Juniperus procera* is concentrated in some places and scattered in others with: *Cassipourea malosana*, *Clausena anisata*, *Ekebergia capensis*, *Hagenia abyssinica*, *Olea capensis*, *Prunus africana* and *Teclea* sp.

Grassland: *Cynoden dactylan*, *Cyperus* spp, *Eleusine jaegeri*, *Juncus* spp.

CATCHMENT VALUES:

There are seventeen named streams coming off Kitumbeine, of which nine have water flow. Water from Ngare Longishu is piped to Kitumbeine village and is the only water supply on the east side of the mountain. It is used by people, domestic animals and game. Langata Dabesh river flows south, and on the north Olivakini stream supplies Ol'oriento and their domestic stock.

TIMBER VALUES:

The largest concentration of East African Cedar (*Juniperus procera*) is on the south side near Olkeju Rongai where a sawmill operated, and it also occurs on the west. Loliondo (*Olea capensis*) is abundant on the west side. Other timbers include: *Albizia gummifera*, *Calodendrum capense*, *Cassipourea malosana*, *Ekebergia capensis*, *Olea europea* subsp. *africana* and *Prunus africana*.

BIODIVERSITY VALUES:

A survey of the reserve is needed, but the plants are likely to be widespread. The area is probably important for game.

HUMAN IMPACTS:

Timber was logged. Fire has pushed much of the forest back. Encroachment was recorded in 1966 and is probably worse now.

MANAGEMENT PROPOSALS:

The high catchment value and lack of management suggest that the reserve be transferred from Local Authority management to Catchment Forest management.

Proposed zones: Catchment zone: on steeper slopes and ridge tops.

LITERATURE:

Carmichael, W. 1966. Investigation and assessment of Kitumbeine Local Authority Forest Reserve, November 1966. Mimeo.

LONGIDO Local Authority Reserve, proposed Catchment Forest Reserve

Monduli District, Arusha Region,

Year of establishment	:	1954
Declaration	:	
Variation order	:	
Border map	:	Jb 394 (1:25 000) 1964
Topographical map	:	41/1
Gazetted area	:	4980 acres (2015 ha)
Gazetted boundary length	:	

LOCATION: 2_ 40' S 36_ 40' E

150 km from Monduli. Access is from the Arusha to Namanga road through Longido village. The reserve covers the Longido ridge to an altitude 2637 m.

SOILS:

Red earths over crystalline basement rocks.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Longido. Estimated rainfall: 500-750 mm/year with a mist effect at higher altitudes. Dry season: May - Oct. Estimated temperatures: 22_C max. (Mar.), 17_C min (July) at lower altitudes.

VEGETATION:

Dry montane forest covers the upper parts of the reserve, with grassland above 2440 m, and scrub forest in drier parts which is a mixture of dry woodland and dry montane forest species. There are extensive areas of rock outcrop with a massive forming the peak. The northern side going down from the peak has much exposed rock with forest, whereas the west side is a shear rock.

Dry montane forest: Dominated by *Olea europea* subsp. *africana* with: *Clausena anisata*, *Ekebergia capensis*, *Juniperus procera*, *Olea capensis*, *Prunus africana* and *Teclea* sp.

Scrub forest: *Acacia* spp. *Buddleja* sp., *Calodendrum capense*, *Carissa edulis*, *Clausena anisata*, *Cordia ovalis*, *Croton macrostachyus*, *C. megalocarpus*, *Cussonia* sp., *Dodonea viscosa*, *Dombeya rotundifolia*, *Erythrina abyssinica*, *Euphorbia candelabrum*, *Grewia bicolor*, *Juniperus procera*, *Kigelia africana*, *Rhus vulgaris*.

CATCHMENT VALUES:

The reserve is an important catchment area in otherwise dry country. There are twenty streams arising in the forest, of which twelve have dry season flow. To the south Olkeju-longishu river supplies Longido village, to the west there is Lendikir stream and to the north is Kimakow stream. The water is used by local people and cattle.

TIMBER VALUES:

There are few trees of timber value, but East African Cedar (*Juniperus procera*) does occur. Other timbers include: Loliondo (*Olea capensis*), *Olea europea* subsp. *africana*, *Ekebergia capensis* and *Prunus africana*.

BIODIVERSITY:

The reserve is not well known biologically, but is likely to be composed of widespread species. It is probably important for wildlife.

HUMAN IMPACTS:

Fire is a serious problem and there is cattle grazing on the north side.

MANAGEMENT PROPOSALS:

The high catchment values and lack of management suggest that the reserve be transferred from Local Authority management to Catchment Forest management.

Proposed zones: Catchment zone: on steeper slopes and ridge tops.

LITERATURE:

Carmichael, W. 1966. Investigation and assessment of Longido proposed Local Authority reserve, October 1966. Mimeo.

MONDULI Catchment Forest Reserve

Monduli District, Arusha Region

Year of establishment	:	1941 (revised)
Declaration	:	Cap. 132 p 1342
Variation order	:	None
Border map	:	Jb 912 (1:25 000) 1977
Topographical maps	:	54/2, 54/4, 55/1, 55/3
Special map	:	Monduli and Lake Duluti Catchment Forest Reserves (1:25 000) 1991
Gazetted area	:	14 968 acres (6058 ha)
Measured area	:	7539 ha
Gazetted boundary length	:	39 km
Measured boundary length	:	38.140 km

LOCATION: 3_ 14' - 3_ 18' S 36_ 24' - 36_ 31' E

1 km from Monduli and 42 km from Arusha. Access is from Monduli town and Monduli Juu. The south west side is traversed by the Monduli to Monduli Juu road, which then runs near to the northern boundary. The reserve covers Monduli mountain from an altitude of 1615 m to 2660 m.

SOILS:

Dark brown humus rich soils over volcanic rocks.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Monduli. Estimated rainfall: 750-1000 mm/year on woodland; 1200-1500 mm/year on forest; with marked mist effect at higher altitudes. Dry season: June - Sep. Estimated temperatures: 15.4_C max. (Dec.), 11.5_C min. (July) at lower altitudes.

VEGETATION:

The reserve is mostly covered by dry montane forest with grassy glades and some seasonally inundated valleys. Thicket and woodland occurs in the south west. There is a large game animal population with buffalo and elephant.

Thicket and woodland: Thick scrub 2-3 m tall with trees to 5 m including: *Acacia* sp., *Clausena anisata* and *Croton macrostachyus*.

Dry montane forest: Closed forest with a canopy 15-20 m tall dominated by *Olea europea* subsp. *africana*. Other trees include: *Albizia gummifera*, *Bersama abyssinica*, *Cassipourea malosana*, *Catha edulis*, *Celtis africana*, *Fagaropsis angolensis*, *Juniperus procera*, *Myroxylon aethiopica*, *Teclea simplicifolia*, *Turraea* sp.. At higher altitudes there is closed forest with grazed grassy glades. *Juniperus procera* is dominant in patches, other areas are mixed species stands with: *Dombeya torrida*, *Kiggelaria africana*, *Lepidiotrichilia volkensii*, *Maesa lanceolata*, *Maytenus mossambicensis*, *Nuxia congesta*, *Prunus africana*, *Rhamnus prinoides*, *Xymalos monospora*.

CATCHMENT VALUES:

Most of the streams are seasonal. Monduli town is supplied by water from the reserve through a pipe, but this dries up in dry years and the town is then supplied from the nearby Army camp which has piped water from Mt. Meru. Monduli Juu is also supplied with piped water from the reserve.

TIMBER VALUES:

The most valuable trees are: East African Cedar (*Juniperus procera*) which occurs in quantity, and large trees of *Olea europea* subsp. *africana*. *Albizia gummifera* is also logged.

BIODIVERSITY:

The stands of *Juniperus procera* and *Olea europea* subsp. *africana* are potential provenances of seed for plantation. Otherwise the forest is composed of relatively widespread species. There is a game migration route near Monduli Juu.

HUMAN IMPACTS:

The reserve is heavily grazed in parts and is traditionally a dry season and dry year grazing ground for pastoralists who set fires to improve grazing. Firewood (notably *Olea europea* subsp. *africana*) and building poles (*Juniperus procera* and *Cassipourea malosana*) are extracted commercially. *Olea europea* subsp. *africana* trees are felled by setting fire to the base of the tree and then waiting until it burns through, the trees usually create a large gap when they fall. Power saws have been used in the past to cut *Olea europea* subsp. *africana*. Medicine (from *Maesa lanceolata*) and Ghat (from *Catha edulis*) is extracted commercially. *Juniperus procera* is used for beehives which are hung in the reserve.

MANAGEMENT PROPOSALS:

The boundary has mostly been cleared, border and gap planting is proceeding. Preliminary survey results suggest that there has been encroachment for cultivation near Monduli Juu. The extensive felling of *Olea europea* subsp. *africana* for firewood should be stopped as it is a waste of an export grade fine furniture timber. Control and regeneration of timber and building pole stocks is needed. Fire control is important. Population pressure on some edges of the reserve is high. Other areas have low pressure and east of Monduli Juu an area should be set aside as a game corridor to prevent future problems of damage to cultivation. The 2660 m high peak of Monduli, game populations and proximity to Arusha give the area potential for revenue generating tourism.

Proposed zones: Catchment zone: Steeper slopes, ridge tops, stream sides and springs. Biodiversity zone: Suitable stands of *Juniperus procera* and *Olea europea* subsp. *africana* for seed. Game migration track east of Monduli Juu. Amenity zone: Suitable route up to the peak, such as the track east of Monduli Juu. Productive zone: Selective exploitation and regeneration of *Olea europea* subsp. *africana* and *Juniperus procera*.

LITERATURE:

Kashenge, B.S. 1986. Draft management plan for catchment forests. Arusha Region 1st July 1986 - 30th June 1991. Mimeograph, Forest Division, Dar es Salaam.

KINGARANI Proposed Catchment Forest Reserve

Ngorongoro District, Arusha Region

Year of establishment	:	Proposed
Declaration	:	Proposed

Variation order	:	
Border map	:	Survey 1964
Topographical map	:	
Gazetted area	:	6638 acres proposed (2686 ha)
Gazetted boundary length	:	10.8 km proposed

LOCATION: 2_ 25' - 2_ 27' S 36_ 26' - 36_ 28' E

East of Loliondo. Access is from the Loliondo to Narok road. The reserve borders Kisolidare FR to the west.

SOILS:

Over basement rocks.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Loliondo. Estimated rainfall: 750-1000 mm/year. Dry season: June - Oct. Estimated temperatures: 17.4_C max. (Mar.), 14.3_C min (July).

VEGETATION:

The reserve is covered by dry montane forest with grassy glades.

Dry montane forest: Canopy to 20 m. Trees include: *Cassipourea malosana*, *Ekebergia capensis*, *Juniperus procera*, *Olea capensis*, *Olea europea* subsp. *africana*, *Podocarpus falcatus*, *Prunus africana*, *Teclea nobilis*.

CATCHMENT VALUES:

The Kingarani river arises in the reserve. The Olamunyi and Kingarani rivers flow into the Ngarwa river, which flows north-east into the Sonjo plains.

TIMBER VALUES:

There are stands of Podo (*Podocarpus falcatus*), East African Cedar (*Juniperus procera*) and Loliondo (*Olea capensis*).

BIODIVERSITY:

The reserve is not well known biologically, but is likely to be composed of widespread species. The area is important for wildlife.

HUMAN IMPACTS:

The area is grazed by cattle. Valuable species are logged.

MANAGEMENT PROPOSALS:

The area should be gazetted as a Catchment Forest Reserve.

Proposed zones: Catchment zone: on steeper slopes and ridge tops.

LITERATURE:

Carmichael, W. 1966. Loliondo Safari Report. Mimeograph

Kashenge, S.S. 1986. Management plan for Catchment Forests, Arusha Region. Mimeograph, Forest Division.

Mlilo, F.M. 1988. Review of Catchment Forest Reserves. Mimeograph.

KISOLIDARE Proposed Catchment Forest Reserve

Ngorongoro District, Arusha Region

Year of establishment	:	Proposed
Declaration	:	Proposed
Variation order	:	
Border map	:	Jb 1571

Topographical map	:	
Gazetted area	:	1544 ha proposed
Gazetted boundary length	:	25.8 km proposed.

LOCATION: 2_ 25' - 2_ 27' S 36_ 26' - 36_ 28' E

5 km east of Loliondo. Access is from Loliondo. The reserve combines Kisamisi and Lodare proposed FRs and is adjacent to Loliondo FR and covers the valley on both sides of the Loliondo streams.

SOILS:

Over basement rocks.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Loliondo. Estimated rainfall: 750-1000 mm/year. Dry season: June - Oct. Estimated temperatures: 17.4_C max. (Mar.) - 14.3_C min (July).

VEGETATION:

The area contains dry montane forest with a closed canopy below the escarpment. There are areas of grassland in the north and north east.

Dry montane forest: Trees include: *Bersama abyssinica*, *Buddleja polystachya*, *Cassipourea malosana*, *Clausena anisata*, *Cussonia spicata*, *Dombeya rotundifolia*, *Fagaropsis angolensis*, *Juniperus procera*, *Podocarpus falcatus*, *Teclea* sp.

CATCHMENT VALUES:

The reserve is an important catchment area. The water supply for Loliondo is piped from a point on the Kisimisi river at 2256 m.

TIMBER VALUES:

There are stocks of East African Cedar (*Juniperus procera*) and Podo (*Podocarpus* sp.).

BIODIVERSITY:

The forest is not well known biologically, but is likely be composed of widespread species. The area is probably important for wildlife.

HUMAN IMPACTS:

Population pressure is low. The area is grazed by cattle. Valuable timbers of East African Cedar and Podo have been exploited

MANAGEMENT PROPOSALS:

The area should be gazetted as a Catchment Forest Reserve.

Proposed zones: Catchment zone: steeper slopes and ridge tops.

LITERATURE::

Carmichael, W. 1966. Loliondo Safari Report. Mimeograph.

Kashenge, S.S. 1986. Management plan for Catchment Forests, Arusha Region. Mimeograph, Forest Division.

Mligo, F.M. 1988. Review of Catchment Forest Reserves. Mimeograph.

LOLIONDO Local Authority Reserve, Proposed Catchment Forest Reserve

Ngorongoro District, Arusha Region

Year of establishment	:	1957
Declaration	:	GN 307 of 13/9/57
Variation order	:	
Border map	:	Jb 329

Topographical map :
Gazetted area :
Gazetted boundary length :

LOCATION: 2_ 25' - 2_ 27' S 36_ 26' - 36_ 28' E

South of Loliondo. Access is from Loliondo. The reserve is adjacent to Kisolidare FR in the north.

SOILS:

Over basement rocks.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Loliondo. Estimated rainfall: 750 - 1000 mm/year. Dry season: June - Oct. Estimated temperatures: 17.4_C max. (Mar.), 14.3_C min (July).

VEGETATION:

Dry montane forest.

CATCHMENT VALUES:

Nanchota, Wasso and Sarian springs arise in the reserve.

TIMBER VALUES:

No data.

BIODIVERSITY:

The forest is not well known biologically, but is likely to be composed of widespread species. The area is probably important for wildlife.

HUMAN IMPACTS:

No data.

MANAGEMENT PROPOSALS:

The high catchment value and lack of management suggest that the reserve be transferred from Local Authority management to Catchment Forest Management.

Proposed zones: Catchment zone: steeper slopes and ridge tops.

LITERATURE:

Kashenge, S.S. 1986. Management plan for Catchment Forests, Arusha Region. Mimeograph, Forest Division.

OLOSHO Proposed Catchment Forest Reserve

Ngorongoro District, Arusha Region

Year of establishment	:	Proposed
Declaration	:	
Variation order	:	
Border map	:	Survey 1964 and 1987
Topographical map	:	
Gazetted area	:	4 800 acres proposed (1 943 ha)
Gazetted boundary length	:	10.8 km proposed

LOCATION: 2_ 25' - 2_ 27' S 36_ 26' - 36_ 28' E

The reserve is south of Kingarane FR

SOILS:

Over basement rocks.

CLIMATE:

Oceanic rainfall with continental temperatures. Nearest rainfall station: Loliondo. Estimated rainfall: 750-1000 mm/year. Dry season: June - Oct. Estimated temperature: 17.4_C max. (Mar.), 14.3_C min (July).

VEGETATION:

The reserve is covered by dry montane forest with grassy glades.

Dry montane forest: Canopy to 20 m. Trees include: *Cassipourea malosana*, *Ekebergia capensis*, *Juniperus procera*, *Olea capensis*, *Olea europea subsp. africana*, *Podocarpus falcatus*, *Prunus africana*, *Teclea nobilis*.

CATCHMENT VALUES:

The Losho river passes through the centre of the reserve.

TIMBER VALUES:

There are stands of Podo (*Podocarpus falcatus*), East African Cedar (*Juniperus procera*) and Loliondo (*Olea capensis*).

BIODIVERSITY:

The reserve is not well known biologically, but is likely to be composed of widespread species. The area is important for wildlife.

HUMAN IMPACTS:

The area is grazed by cattle. Logging for valuable species.

MANAGEMENT PROPOSALS:

The area should be gazetted as a Catchment Forest Reserve.

Proposed zones: Catchment zone: steeper slopes and ridge tops.

LITERATURE:

Carmichael, W. 1966. Loliondo Safari Report. Mimeograph.

Kashenge, S.S. 1986. Management plan for Catchment Forests, Arusha Region. Mimeograph, Forest Division.

Mligo, F.M. 1988. Review of Catchment Forest Reserves. Mimeograph.