



**Government of the Union of Myanmar  
Ministry of Forestry  
Forest Department**



**Detection of Changes in Forest Cover of  
Some Forest Reserves in Pegu Yoma Area Using  
Sequential Aerial Photographs**

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ပဲခူးရိုးမ ကြိုးဝိုင်းတောအချို့၏ ပျက်စီးပြုန်းတီးမှု အခြေအနေကို  
ကောင်းကင်ဓါတ်ပုံများ အသုံးပြုခြင်းဖြင့် ဆန်းစစ်လေ့လာခြင်း။

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သစ်တောသုတေသနဌာန

### စာတမ်းအကျဉ်းချုပ်

လွန်ခဲ့သောနှစ်များအတွင်း၊ လူဦးရေတိုးတက်လာမှု၊ လယ်ယာမြေတိုးချဲ့မှုကြောင့် သစ်တောမြေများသည် လယ်ယာမြေများအဖြစ် အသွင်ပြောင်းလျက်ရှိပါသည်။ နိုင်ငံအတွင်း လောင်စာထင်းရှားပါးလာမှု ကြောင့်လည်း အဖိုးတန် သစ်တောများမှာ တန်ဖိုးနည်း တောပျက်များ အဖြစ်သို့ ပျက်စီးဆုတ်ယုတ်သွား ခြင်းများ ဖြစ်ပေါ်လျက်ရှိပါသည်။ ဤစာတမ်းတွင် ကောင်းကင်ဓါတ်ပုံဖတ်ရှုလေ့လာခြင်း နည်းအားဖြင့်၊ လွန်ခဲ့သော အနှစ်(၃၀)ခန့်က ကြိုးဝိုင်းတောများ၏ ယခင်အခြေအနေနှင့် ယခုအခြေအနေပြောင်းလဲမှုကို တိုင်းတာခန့်မှန်းခြင်းနှင့် သစ်တောများပြုန်းတီးမှုနှင့် လူဦးရေ ထူထပ်ခြင်း၊ လမ်းပမ်းဆက်သွယ်ရေး တိုးတက်လာမှုတို့၏ ဆက်စပ်မှုကို လေ့လာခြင်း ဖြစ်ပါသည်။

# **Detection of Changes in Forest Cover of Some Forest Reserves in Pegu Yoma Area Using Sequential Aerial Photographs.**

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## **Abstracts**

Due to the population pressure and land hunger, a substantial amount of forest areas has been converted to agricultural lands within the past decades. Moreover fuelwood cutting in the country has converted productive forest lands into less productive scrub lands, degrading the forest cover extensively. This is an estimate of the magnitude of denudation that has taken place during the past 30 years. A simple study with photographic interpretation was used. The significance and location of disforestation was linked to the populated areas and their development.

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## 1. Introduction

Burma has an area of approximately 261,000 square miles with the forest covered area estimated to be 150,000 square miles or 57% of the total land area as interpreted from aerial photographs in the 1950 's. The forest sector is a major factor in the overall economy of Burma. It is one of the major sources of foreign exchange and provides large amount of fuelwood and household building materials (Anon, 1979).

About 80 percent of the population lives in rural areas closes close to forested areas where they can obtain their domestic, agriculture and piscatorial needs from nearby forests (Anon, 1978).

In the past, local supply forests were designated in the vicinity of the villages to provide form the day to day needs of the local people, while the reserved forests were set aside from commercial use. These reserved forests are well defined, legally constituted forests, and under the complete control of the Forest Department (Anon, 1979).

Due to the population pressure and the scarcity of land for agriculture, most of the reserves close to the populated areas are heavily encroached upon. Moreover, the fuelwood cutting in the country converts productive forest lands into less productive scrub lands, thereby degrading the forest cover. <sup>1/</sup>

This is an estimate of the magnitude of denudation that has taken place during the past 30 years by a simple study with photographic interpretation. The significance and location of deforestation examined in the light of pressure of use from expanding population areas.

## 2. Literature Review

Forest destruction in Asia and the South Pacific region threatens the existence of millions of Asians who depend on the forests for their livelihood. Five million hectares of Asian forests are reported to be lost every year and millions more degraded by improper use. Countries like Indian, Burma and Sri Lanka have systematic working plans to harvest the forests on a sustained yield basis. The actual harvest of forest produce, however, is much higher due to illegal exploitation for fuelwood and timber (Ranjitsinh, 1979). Norman Meyers (1980), during a survey conducted on the conversion of Tropical Moist Forests between July 1978 and April 1979, placed Burma under the category of areas undergoing moderate conversion at intermediate rates. He made a conservative estimate that appreciable areas at Burmese lowland forests will be converted by the year 2000 or earlier due to forest farming and timber exploitations.

Different approaches have been tried for monitoring changes in forest cover overtime. Some used a very complicated method of using Satellite imagery assisted by computer classification while others are still relying on conventional aerial photographs which is much simple and less costly. In Brazil for monitoring deforestation, an interpretation was carried out on film overlays of black and white

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<sup>1/</sup>

Forest Dept. Head office letter No. 95-116/85 la Nga/ Ah Kha/ 004 Dt. 2.1.85.

print in imagery of MSS band 5 at a 1:500,000 scale. Interpretation was carried out for the periods 1973 to 1975 and 1976 to 1978. The areas from the first period were drawn in outline and those from the second period were shaded, to obtain a graphic presentation of the progress or incidence of deforestation over time. Areas of deforestation were then measured with a dot grid (Baltaxe, 1980).

The Royal Forest Department of Thailand, in determining the existing area of forest for the whole country, carried out interpretations on black and white prints of imagery of MSS bands 5 and 7 at a scale of 1:500,000 recorded in 1973. This information was supplemented by information from 1.1 million Diazo color composites of some areas, some analysis from a Color Additive Viewer, interpretation of aerial photographs of selected areas, and then field checks carried out on a small number of 25 x 25 m sample plots (Morain and Klankamsorn, 1978). Miller et al. (1978) studied the dynamics of monitoring deforestation in Northeastern Thailand on an area of 292 km<sup>2</sup> by computer analysis of a time series of dry season Landsat images covering the years 1972 through 1977.

J.P. Lanly (1969), in estimating the deterioration of the dense forest in the Ivory Coast, made a photo-interpretation comparison of a sample of old and new photographs corresponding to the same units of terrain. He developed a high degree of accuracy in the regression of the dense forest areas between 1956 and 1966 using statistical techniques.

In 1980 under the FAO / UNDEP project a quick appraisal of the forest cover of Burma was carried out using 1:1,000,000 scale Landsat imagery of the years 1972-75. Two methods were used to assess the rate of deforestation. The first one was based on the comparison of 1950 aerial photographs at a scale of 1:20,000 and 1:50,000 and enhanced by Landsat imagery of 1:1,000,000 scale taken between 1973 and 1979. The second method used, based on census records, made projections of the number of people practicing shifting cultivation, which is the principle factor in deforestation. According to the first method, the rate of deforestation was estimated to be 1.45% in twenty years (0.07 % annually) or 23,320 ha ( 57,623 ac) annually. With the second method, an annual deforestation was estimated at 95,000 ha (447,450 ac) (FAO.1981.).

Another quick appraisal of the forest cover Burma using 1979-81 Landsat Satellite imagery at 1:1,000,000 scale was made based on the same forest classification. Comparing the Landsat imagery of the years 1979-1981 as updated to 1980's to the 1973-79 adjusted to 1975 Landsat imagery, the results indicated that forest depletion was much greater than that envisaged by the 1981 report. This method reported estimate of 600,000 ha (1, 482, 600 ac) of forest depletion annually (Allen, 1984).

### **3. Materials and Methods**

The area under study consists of some forest reserves of the Pegu Yoma area, as shown in figures 1 & 2. These include portions of Forest Reserves (Taungnyo, Kaing, Ngalaik, Palwe and Yonbin) in East Pegu region and (Kinmundaung, Kyaukmigyaung and Yabe) Forest Reserves on the western side.

These reserves are managed under various working plans covering the Teak Selection Working Circle (TSWC) and Hardwood Supply Working Circle (HSWC).

The TSWC includes all teak bearing forests. Teak logs from any part of the forest can be floated down stream. All teak extraction is organised under this working

circle. Forests included in the HSWC are those situated close to the main transportation routes such as railway lines, main roads and main rivers. Some TSWC areas overlap the HSWC. Within the reserved forests, no unauthorised fellings, grazing or trespassing is permitted by law.

Interpretation was done on aerial photographs of the study area, made available by the National Forest Inventory and Survey project, covering two different time periods. The earlier photograph was taken in 1953-54 at a scale of 1:24,000 and the recent photography was taken in 1983-84 at a scale of 1:25,000.

To be consistent with the previous assessments, the same broad forest types (type 1-4) were adhered to. For the remaining two categories a slight change was made to place more emphasis on the cultivated areas, and the rest put under Others. A new category, forest plantation was added. Previous surveys included forest plantation in forest land. Extensive plantations made since 1960 were easily detected on the 1983-84 photos.

The seven different types are as follows:

- (1) Closed forest (CF)
- (2) Closed forest affected by shifting cultivation (CFS)
- (3) Degraded forests (DF)
- (4) Degraded forests affected by cultivation (DFC)
- (5) Cultivation (C)
- (6) Forest plantations (FP)
- (7) Others (O)

The method used in this study was based on interpretation of sequential aerial photographs combined with occasional field checks. Based on the above seven different types, photo-interpretation was done for the two different set of photographs, by two interpreters, and differences cross-checked before final drafting.

The type boundaries as determined on the photos (1:24,000 scale in 53-54 photos and 1:25,000 scale in the 83-84 photos) were transferred to the base map of 1:50,000 scale by free hand methods and use of the Vertical Sketchmaster for detail. Area estimates for the individual types were made using a dot grid laid over two type maps produced. Sequential change in forest cover were evaluated using the reciprocal vegetation sequence method in which different type units were counted and recorded in a "cross table".

#### **4. Result and Discussion**

Table. 1 shows the comparative areas in different categories of all cover types as estimated from the 1953-54 and the 1983-84 aerial photographs of the study area.

As seen from the table, the closed forest area of 162, 292 acres in 1953-54 had been reduced by 76,245 acres or 47% in 1984-85. Out of which 53,672 or 33% had been transformed into degraded forest, 7,905 acres (4.9%) to degraded forest with cultivation while the cultivated areas and forest plantations had taken up 7,701 (4.7%) and 6,967 acres (4.3%) respectively.

Similarly, 2,581 acres of forest already degraded in 1953-54 had been replaced by 143 (5.5%) and 775 acres (30%) of degraded forest affected by cultivation or an annual increase of 550 acres.

Concerning with the degradation of the forest reserves, a close study of the maps prepared from the interpretation of 1983-84 photographs, reveals that a number of reserves were affected. Taungnyo and Kaing Reserves were heavily encroached by

cultivation and almost no closed forest of sizable area can be detected. However, old plantations can be depicted in Kaing Reserve. New plantations of remarkable size can be observed in Taungnyo Reserve. In the Ngalaik Reserve, areas along the Ngalaik stream were heavily encroached by cultivation, and the rest had been degraded. Here again plantations can be observed close to the encroached areas. The lower part of Palwe Reserve was also degraded while the down stream areas of Palwe stream had been invaded by cultivations. However, the upper portion of the reserve still holds a closed formation.

The Yonbin Reserve seems to be the least affected by any kind of disturbances. The other reserves in the western aspect of Pegu Yoma indicate some degree of disturbances. The presence of road networks in a small badly degraded area indicates heavy extraction has occurred in that area.

**Table 1. Comparison of forest cover types interpreted at an interval of 30 years.**

1953-54 1983-84	CF	CFS	DF	DFS	C	FP	O	(acres) TOT.
CF	86,047	-	-	-	-	-	-	86,047
CFS	-	-	-	-	-	-	-	-
DF	53,672	-	1,663	-	-	-	-	55,335
DFC	7,905	-	143	-	-	-	-	8,048
C	7,701	-	775	-	2,703	-	-	11,179
FP	6,967	-	-	-	-	1,081	-	8,048
O	-	-	-	-	-	-	1,357	1,357
TOT.	162,292	-	2,581	-	-	1,081	1,357	170,014

CF Closed forest  
 CFS Closed forest affected by shifting cultivation  
 DF Degraded forests  
 DFC Degraded forests affected by cultivation  
 C Cultivation  
 FP Forest plantations  
 O Others

Generally, speaking, the mode of encroachment usually starts close to the villages situated within the exclusion areas of the reserves, and proceeds upstream into the forests. Areas on no either side of encroachments usually become subjected to some degree of cutting, resulting in the degradation of such areas.

## 5. Conclusion

1. Although in the previous assessments, shifting cultivation practices were considered to be the principal factor of deforestation, the present study indicates that permanent cultivation encroachments are also one of the main components of deforestation and poses serious problem which needs immediate attention.

2. Based on the distribution on different forest cover types in the study area (Fig. 3 & 4), it is quite evident that the forest reserves have undergone a



substantial amount of degradation within the past 30 years period at the rate of approximately 2500 acres annually.

3. About 550 acres of forest lands are begin converted to cultivation annually with the probable increase in the coming years due to population production and land scarcity, If this process is allowed to continue, the productive forest lands may become very diminished within a very short period.

4. The gradual increase in forest plantations could be treated as a remedy against this depletion of valuable forest lands and should be encouraged in areas undergoing degradation.

The present study also demonstrates a relatively cheap and more rapid method of obtaining an over-all assessment in monitoring changes over time. It is a preferred method suitable for the estimation of cultivation encroachments into forest reserves compared to regular field surveys.

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Fig. 1. Map showing different cover types in 1953-54 as interpreted from 1954 aerial photographs.

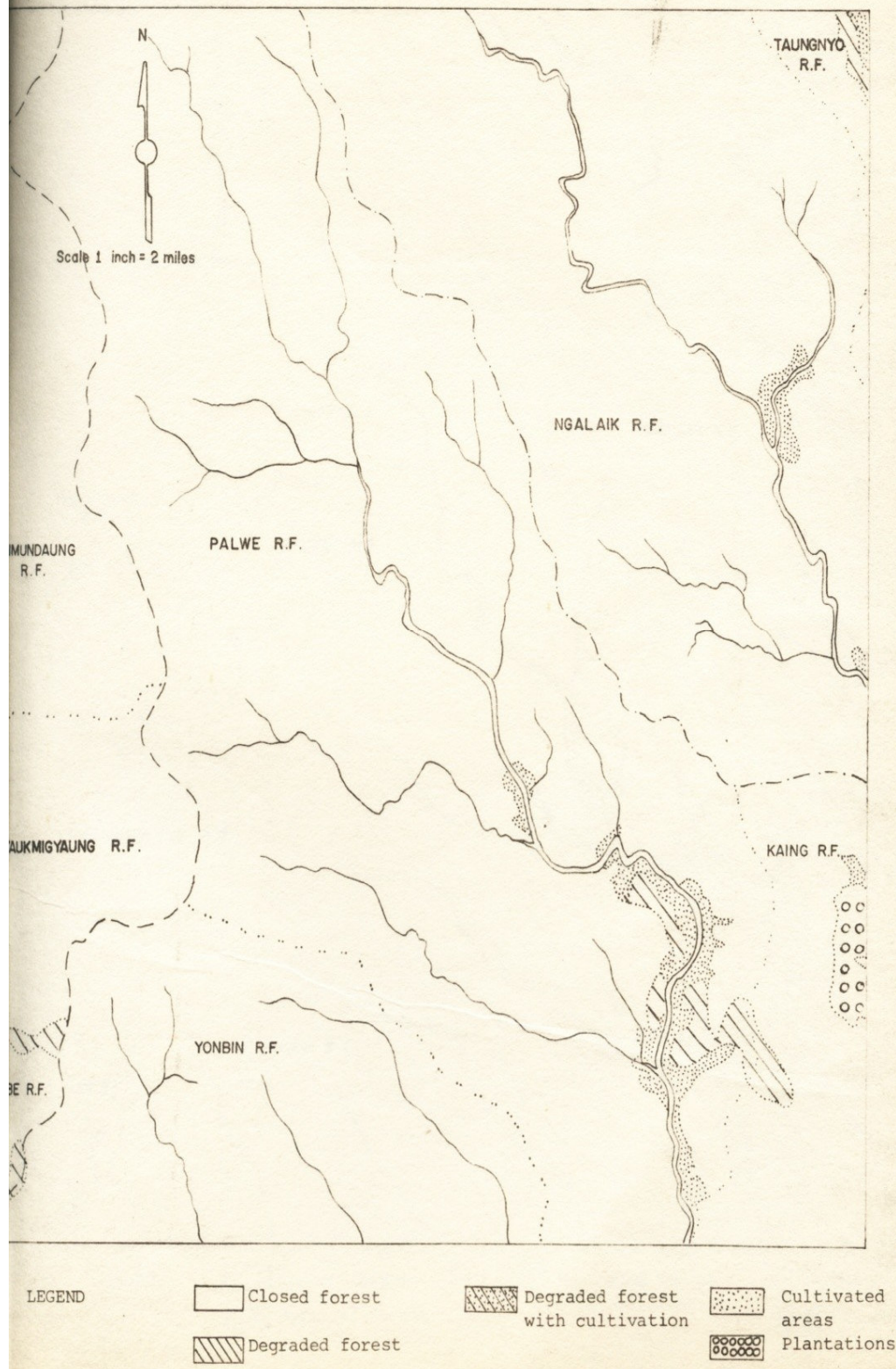




Fig. 2. Map showing different cover types in 1983-84 as interpreted from 1984 aerial photographs.

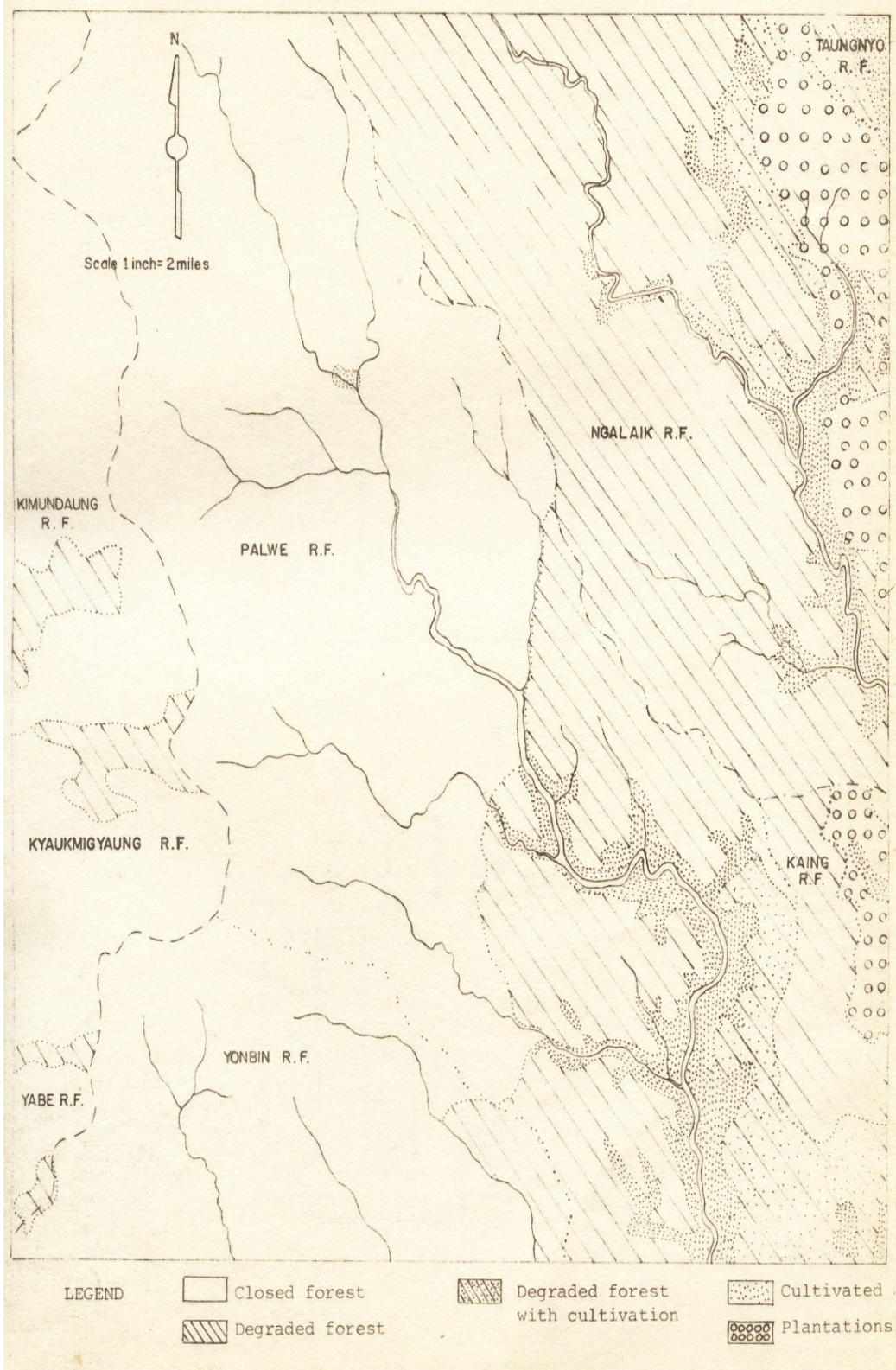


Fig. 3

Histogram showing the distribution of all Cover Types as interpreted from Aerial photographs taken in 1953-54.

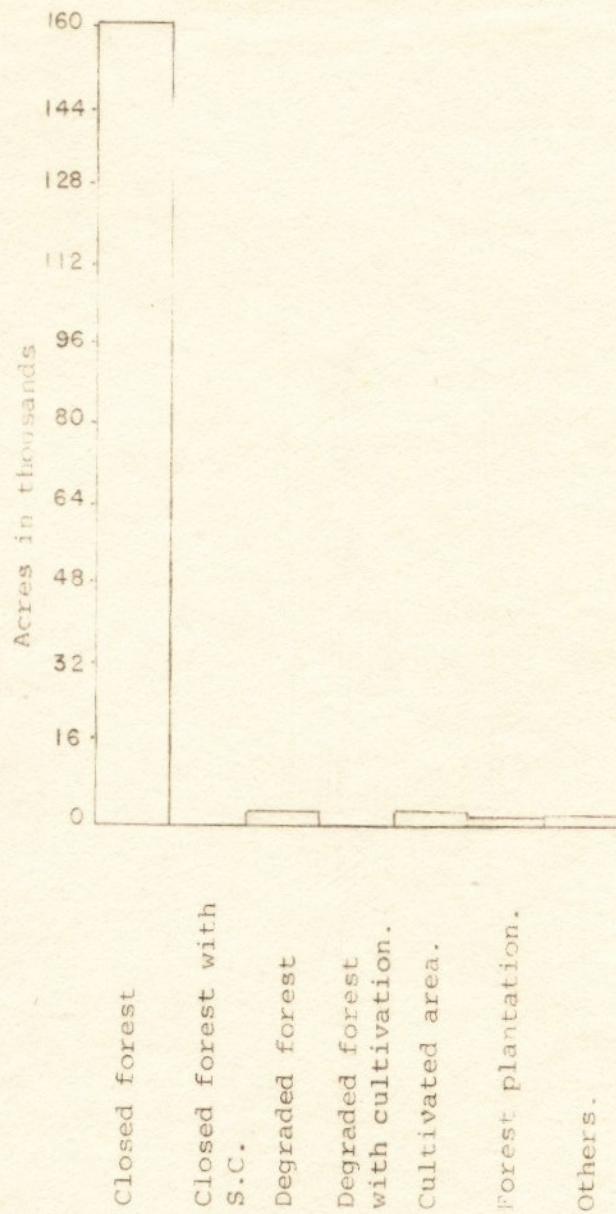


Fig. 4

Histogram showing the distribution of all Cover Types as interpreted from Aerial photographs taken in 1983-84.

