Projecto FAO TCP/BRA/0154

Relatorio Final de Consultoria

Contracto:

Periodo Consultoria: 4 May - 30 June 1992

Nome Consultor: Robert W. Klaver

Data Relatorio Final: 30 June 1992

Assinatura:

I. Introduction

Terms of Reference

Bajo la supervision del Department Forestal de FAO, el Lider del equipo tecnico del proyecto y en estrecha colaboracion con IBAMA, el consulator debe:

- En colaboracion con los consultores nacionales, internacionales y otros miembros tecnicos del equipo de trabajo del proyecto debe colectar y sistematizar toda la informacion relacionada con el manjo sustentable del recuros forestal, generada por los organismos nacionales y en lo posible, por los centros internacionales.

- Disenar la estructura de la base de datos mas apropiada para que sea utilizada por los organismos cuyas funcioners se relacionen con el manejo sustentable del recurso forestal y el mecanismo de recoleccion, procesamiento y difusion de esa informacion. La estructura informatica disenada, sera la base para us Sistema de Informacion Geografico, cuya central operara en IBAMA.

- Preparar y entregar us reporte tecnico en su area de especialiadad.

- Estar disponible para ser contratado por un periodo de tres meses, de ser posible, dividido en dos etapas: del 1° de mayo al 31 de julio, y del 2° al 31 de enero. El lugar de trabajo es Brasilia, D.F.

I discussed data needs and sources of data with:

Dr. Sergio Castillo Martinez, Project Leader, TCP
Dr. Tarcisio Pereira, TCP
Dr. Marnio Neyra Roman, TCP
Dr. Susana de Moura Lara Resenda Leewenberg, TCP
Dr. Edison Mileski, TCP
Dr. Gordon Armstrong, ODA
Dr. Helena Lucarrelli, IBGE, Brasilia
Dr. K.D. Singh, TFA, FAO, Rome
Dr. Norman Bliss, USGS, Souix Falls, SD, USA
Dr. Clare Billington, World Conservation Monitoring Centre, England
Dr. Eduardo Lleras Perez, EMBRAPA-CENARGEN
Dr. Sergio Almeida, IBAMA-CSR
Dr. Celio Paiva dos Santos Filho, IBAMA-CSR
Bernardo Brummer, IBAMA-DIREC
Joao Antonio Raposo Pereira, IBAMA-PREVFOGO
Dr. Carlos Alcebiades Barros Cavalcanti, CODEVASF

Dr. Paulo Afonso Silva, CODEVASF
Alberto Ricardo Calderon Canessa, CODEVASF
Dr. James Verdin, U.S. Bureau of Reclaimation
Rionaldo Rolo de Almeida, IBAMA-Tapajos Forest, Santarem
Dr. Jose Natalino Macedo Silva, EMBRAPA-CPATU, Belem
Dr. Maria van der Berg, Museu Emilio Goeldi, Belem
Dr. Waldenei Travassos de Queiroz, FCAP, Belem
Nilma Sarmeuto, IBAMA, Belem
Kozuhivo Notizuko, IBAMA, Belem
Jose , IBAMA, Belem
Agusto Nunez do Silva, SUDAM, Belem

II. Results and Principle Conclusions

A. Database Requirements. Basic, not interrupted, data need to be collected stored in a data base so that a variety of resource managers may interrupt these data in whatever manner they require for their disciplines. The data base needs to be able to show interrelationships between different data sets. For example, what soils are in fauna home ranges. Often the only method of showing these types of interrelationships is through common locations. IBAMA wants the database to serve as the structure for all National Forests data bases in Brazil. A common structure for all data bases would allow IBAMA to gather, store, and interrupt information nationwide (ie. a standard or "corporate" database).

B. Database Design. A Conceptual Database Design is in Anexo 1. This design was developed in consultation with all staff on the project. Except for the inventory portion, the design is preliminary since no actual data exists. As methods are developed to gather information into the other sections on the database, these portions will need to be refined. There will need to be a continuous feedback cycle between database design, data gathering, and data analysis to insure the system is providing the proper structure. After the system is developed on the Tapajos National Forest, it will need to be tested and refined on other National Forest in several regions of Brazil to insure it covers all the needs of the National Forest System.

There are currently several types of forest inventory data available on the Tapajos National Forest. There is a Survey Inventory for the whole Forest; two Pre-Investment Inventories that cover the whole forest; three Commercial Forest Inventories for the 5.000 ha to be immediately logged which provides for 100 per cent inventory of the commercial trees and amostragem plots of the non-commercial trees; and the beginning of a Continuous Forest Inventory. The database design modifies somewhat the existing information to meet the needs of the other consultants and to provide more specific information in the future. The BASIC and dBase III programs used in converting the FCAP BASIC files into the new data format are in Anexo 2.

An important feature in the database design is the recording of all locational information. The staff on the Tapajos is currently doing an excellent job of recording relative location for their data. In the future, it will be critical to record as much locational information about each data set as possible because the simplest method of relating disparate information to each other is through their locations.

C. Recommended Data Structure. Because of the need to keep track of locational information and to interrelate information between different resources, the preferred database structure is a Geographic Information System (GIS) that uses a relational database management system (RDBMS) to hold the tabular information that describes the map information.

D. Available Maps. Spatial information is available from maps and satellite images. Anexo 3 shows which maps and satellite images cover the Tapajos National Forest. Anexo 3 has the availability of Landsat TM data from INPE from 1984 to 1990 and Spot data between 1988 and 1990. Also in Anexo 3 are plots showing the location of the Tapajos National Forest on the scenes for Landsat 12&3, Landsat 4&5, and for Spot 1&2 satellites.

SUDAM in Belem and other organizations have digital data for the Tapajos National Forest and other reserves in the Amazon (Anexo 4). The data from SUDAM were automated using SGI software from INPE. I converted the data for the Tapajos National Forest into ARC/INFO coverages using software developed by Alberto Ricardo Calderon Canessa, CODEVASF. Until INPE develops SPRING software (it will be available only on a Sun workstation) to include export options, this software is the only method I know of to convert SGI data to another GIS. Only the line information is converted and all labelling must be done manually.

SUDAM has an comprehensive map library which includes aerial photographs and mosaics, satellite images, topographic and planimetric maps, RADAM images and cartography. Special maps are available including maps of Indian Reserves; Municipio boundaries; soil, vegetation, geology, and potential use maps of Legal Amazon; alteration of the natural vegetation in the state of Para; and maps of biological parks, reserves, and forests in Legal Amazon.

E. Map Scale. An important decision that needs to be made by the forest management staff in IBAMA is the choice of map scale(s) to compile their information. While map scale is not important once the information is in a GIS, map scale determines the basic accuracy of the data when it is entered into the computer. There may be a need to use more than one map base because of the different needs of the organization; this will require more time and money for the GIS implementation. Since the local forest management staff requires the most detailed information for their on-the-ground management, I recommend that they determine the map scale. Regional and national offices can use this information in a more generalized manner. To let staff visualize map scales better, Anexo 5 shows how different map scales depict different size areas.

F. Data Entry Methods. The development of a GIS data base is expensive. Approximately 70 per cent of the cost of a GIS system is the development and maintenance of the data base. One method to reduce this cost is to incorporate existing procedures that record locations in building the GIS database.

The Forest is currently surveying boundaries and roads. These survey notes may be directly entered into computer programs like Traverse PC (P.O. Box 105, Florence, Oregon 97439, USA) and added to a GIS. What is needed is the correct geodetic control (ie latitude and longitude or UTM coordinates) of the starting point of the survey.

Locations of the commercial trees are recorded when the inventory is conducted. The maps of these trees are extremely useful for forest management but are currently difficult and expensive to produce. These data may be directly input into a GIS which would easily produce these same maps. Anexo 6 list the dBase III commands to convert the original X and Y data to the new coordinate system required by the GIS. If the UTM coordinates of the southwest corner of the block were known and added to the new coordinates, then these data would be easily related to other information in the GIS like soils, water, roads, and vegetation types. I converted the tree information for Quadra 3, Bloco 1 into ARC/INFO coverages to let forestry staff see the use of GIS in analyzing these data.

Forest staff are recording the location of culverts and bridges by the number of kilometres along a road. This is an efficient method of recording this type of information into a GIS. I recommend that the locations be recorded to at least the nearest 0.1km from the beginning of the road.

Currently, the easiest method of obtaining geodetic control is through Geographic Positioning Satellite (GPS) receivers. GPS locations may be as accurate as 2-5m using two receives [with one receiver the accuracy is about 15m when selective availability (SA) is not in effect and approximately 50m when SA is in effect]. GPS may be also used to map roads, boundaries, plots, transects, and other features in addition to supplying the required geodetic control for surveys, existing maps without control, and to satellite images.

Satellite images may be used to prepare base maps. Landsat TM images may be used to develop base maps at 1:50.000 scale and Spot data may be used if base maps are required at 1:25.000 scale. Currently, the largest scale base map is at 1:100.000 which is probably at too small of scale for developing forest management projects. GPS locations will need to be used to register and rectify the satellite image(s).

If elevation, slope, and aspect information is required, using

existing 1:40.000 aerial photographs and an analytical stereoplotter that records the information in computer readable files is probably to most economical method. An alternative method would be to use overlapping Spot black and white images to create the elevation information using an image processing program like ERDAS.

G. Software Requirements. To implement the above needs, the GIS software requires intergraded graphics and RBDMS. The GIS software should be a fully functional GIS not a Computer Aided Design (CAD) system nor an intelligent graphics program. Most important is the software's ability to import and export data into and out of the system so information may be gathered from and shared with as many organizations throughout Brazil. The usual GIS overlay commands like union and intersect as well as buffer, reselect, eliminate, and dissolve are required. The system needs to be able to use satellite images as a backdrop for on-screen editing at a specified map scale. Dynamic segmentation and COGO data entry are also required.

H. Hardware Needs. IBAMA in Brasilia will require a workstation type of system for their GIS needs. Currently, most GIS vendors place their best and most complete products on workstations. IBAMA in Brasilia will want and need to have all the software features in their GIS since they will undoubtedly need to be the lead in organizing and servicing GIS for the National Forests.

What is required for the Tapajos National Forest is harder to specify. Many software vendors have both PC and workstation products. Tapajos may be able to have better hardware maintenance support for a PC and find staff more familiar with DOS and PC database software like dBase than with a UNIX workstation. However, if Tapajos is going to get the most out of GIS, it will need to commit itself to hiring good people for their GIS program. It may be just as easy to train good staff in workstations, UNIX, and GIS as it would be to train this same staff in GIS on a PC. An advantage to Tapajos obtaining a workstation would be that it would have the same equipment as the Brasilia office and applications developed in Brasilia would be directly usable on the Forest without conversion. Additionally, staff in Brasilia would perhaps be able to help with hardware/software problems since they would have the same equipment. If the plans for a UNIX database system using Ingress RBDMS are implemented at IBAMA, the use of a workstation on the forest may be less of a problem.

I. Infrastructure. Using GIS software is a large commitment in staff and money. IBAMA will need to have an organizational commitment to GIS. The use of GIS will help IBAMA organize and development a "Corporate Database" for forest management.

Presently, data for Tapajos National Forest are literally spread over all of Brazil and none of the raw data are located on the Forest. When management information, like timber inventories, are collected on the Forest, the raw information needs to be kept on the Forest. If contractors enter information into a computer system, then they need to provide the computerized information. When IBAMA decides on a standard RBDMS, contactors will need to supply the information in a format that will be easily added to it.

GIS and remote sensing need to be intergraded into the forest management organization. GIS staff needs to be located in the forest management department in Brasilia and, more importantly, on the national forests. Fulltime GIS and remote sensing people need to be hired in the forest management organization. That way there can be a synergy developed between the GIS and traditional forest managers that will help prompt the development of useful applications.

III. Suggestions

IBAMA should continue to develop the conceptual database design, implement a physical database design using whatever software is decided, add information to the database, and use the information. The selected software should be fully relational so the physical database may be implemented using third normal data structures.

A GIS system should be purchased so staff may be become familiar with the concepts and advantages of GIS. The software should be expandable to meet the needs of Forest Management. I suggest PC ARC/INFO using dBase as a initial system and soon purchasing the hardware and software for workstation ARC/INFO.

IBAMA, with FAOs assistance, should begin recruiting and training staff for GIS work in forest management. This staff should be located in the Forest Management division so they may work closely with the end-uses of the system.

An important data layer is vegetation. Currently, there is no information on the vegetation of the Forest except for the commercial trees. For the goal of intergraded forest management to be obtained, basic information is required on vegetation that may be used by all disciplines. In the United States, a lot of money has been spent on single use surveys. Brazil can avoid repeating these mistakes by developing a vegetation map based on the biology of the stands. I recommend that IBAMA work with a group of botanist and forest managers to develop the mapping guidelines. The mapping should be carried out at the map scale chosen for the other basic information.

To facilitate locating bridges and culverts in the GIS, the Tapajos National Forest should develop a standardized road numbering/naming system. While it may seem premature to do so now, it will be better to have the system developed rather than going back in a few years and redoing the road system that developed on its own.

Cooperative agreements should be made with other organizations gathering similar information to the forestry database. I believe that areas especially suitable for this would be in economic/business statistics and in population data. A cooperative project with Museu Emilio Goeldi to develop the species name and use database could be very productive.

To help IBAMA take control of its data, it needs to become more computerized. While travelling to Tapajos and Belem, I saw very few computers in the offices. If IBAMA had its own computers, other organizations would not be in a position to collect, analyze, and keep basic forest management information. IBAMA needs to develop standard contract language to insure that basic forest

information is returned to the National Forest System and in the proper format.

To help the staff think in terms of GIS, I suggest a manual GIS application for determining the location of new National Forest. TCP consultants are in the process of selecting sites for further study. There are several maps available for Brazil at 1:5.000.000. These maps could be used on a light table to give an initial screening of locations. This would be especially valuable if a set of criteria could be developed where National Forests are NOT wanted. Maps available at 1:5.000.000 are:

Mapa de Vegetacao do Brasil (also available in digital)
FAO Soils of the World (also available in digital)
Biological Priorities for Conservation in Amazonia
Unidades Descentralizadas do IBAMA
Unidades de Conservacao Federais e Estatuais e Areas Indigenas.

Maps in digital format that could be plotted at 1:5.000.000 are:

Plano de Desenvolviment da Amazonia (SUDAM)
EMBRAPA biodiversity database
NASA and/or INPE deforestation maps.

These maps with other information like potential hydroelectric sites and impoundment areas could be viewed in combination to eliminate unsuitable sites and to determine sites requiring more detailed analysis.

IV. Anexos

Anexo 1. Conceptual Data Base Design.

Inventory Data

Commercial Inventory
- Quadra
- Bloco
- Date
- Tree
- Species Code
- CAP
- DAP
- Height Fuste
- Height Commercial
- Defect Pathological
- Defect Mechnical
- Volume Fuste
- Volume Commercial
- Volume Fuste Net
- Volume Commercial Net
- Basal Area
- Management Status - ie a tree to cut or to leave as a seed source
- Quality
- Line Number
- X Orginal
- Y Orginal
- X
- Y

Plot Data like Amostragem of the Commercial Inventory, Pre-Investment Inventories, and the Survey Inventory.

Plot Data, Header
- Quadra
- Bloco
- Plot
- SubPlot
- Date
- Forest Type
- Intervention Type - ie 0 none, 1 logging, 2 agriculture
- Names

Plot Data, Trees
- Quadra
- Bloco

Plot
SubPlot
Date
Tree
Species Code
CAP
DAP
Height Fuste
Height Commercial
Volume Fuste
Volume Commercial
Volume Fuste Net
Volume Commercial Net
Basal Area
Quality
Defect Pathological
Defect Mechnical

Continueous Forest Inventory

Varas
Quadra
Bloco
Plot
SubPlot
Date
Forest Type
Location
Names

Quadra
Bloco
Plot
SubPlot
Tree
Identification Class of Fuste
Species Code
Quality
DAP

Mudas
Quadra
Bloco
Plot
SubPlot
Date
Forest Type
Location
Names

Quadra
Bloco

Plot
SubPlot
Tree
Identification Class of Fuste
Species Code
Quality

Flora and Fauna

Species
Species Code
Order
Family
Genus
Species

Common Name
Species Code
Common Name

Endangered and Threatened Species
Species Code
Status
Year
Reason

Species Used
Species Code
Part
Use
Local or Trade
Amount per Individual

Species Not Used
Species Code
Reason

Studies
Reseacher
Address
Telephone

Study
Reseacher
Date Begin
Date End

Study
Objective

Study
Results

Study
Publication

Management
Species Code
Management Objectives

Vegetation
Vegetation Type
Species Code
Frequency
Canopy Coverage

Biophysical

Soils
Soil Map Unit
Compaction
Productivity
Depth to Seasonally High Water
Drainage
Infiltration
Erosion Class

Hydrology
Stream Name
Km beginning
Km ending
Stream Flow Regime

Infrastructure

Roads
Road Number
Km Beginning
Km Ending
Status

Road Number
Km Beginning
Km ending
Surface Type

Road Number
Km Beginning

Km Ending
Width

Road Number
Km Beginning
Km Ending
Speed

Road Number
Km Beginning
Km Ending
Season of Use

Road Number
Km Beginning
Km Ending
Date Maintained

Road Number
Km Beginning
Km Ending
Cost per Km
Usable Life

Bridges
Road Number
Km
Year Built
Design Load
Length
Material
Cost
Usable Life
Status

Culverts
Road Number
Km
Year Built
Design Load
Type
Material
Length
Size
Cost
Usable Life
Status

Timber Landings
Road Number
Km
Landing Number

Buildings
- Building Number
- Type
- Status
- Use
- Year Built
- Year Maintained

Docks
- Dock Number
- Status
- Use
- Usable Life

Social

Community
- Community Name
- Leader
- How to Position of Power

- Community Name
- Year
- Population

Parcels
- Parcel Number
- Hectare
- Owner
- Address
- Telephone

- Parcel Number
- Year
- Species Code
- Hectares
- Quanity Produced
- Quanity Sold
- Price
- Days per Person
- Number of Workers

- Parcel Number
- Year
- Species Code
- Cultural Activities - ie like soil preparation, seeds bought, chemicals used

- Parcel Number
- Species Code

Buyer

Parcel Number
Head of Household

Parcel Number
Number of Occupants
Annual Income
Length of Time on the Land

Parcel Number
Name
Sex
Age
Schooling
Length of Time on the Land
Emmigrant
Work on the Parcel

Economics

Species Code
Part
Location
Date
Volume Exported
Company

Species Code
Date
Value

Company
Year
Actual Capacity
Potential Capacity
Level of Technology

Company
Manager
IBAMA Registration Number
Category
Address
Telephone
Fax

IBAMA Registration Number
Date
Number of the Authority to Transport
Species Code

Group of Industrialization
Volume
Number of Fiscal Document
Data of Emissao

Company
Year
Raw Material In

Company
Year
Finished Material Out

Company
Year
Number of Employees

Company
Date
Organization Paid
Reason
Amount

Instutional

Anexo 2. BASIC and dBase III Programs

Program modified from a FCAP's BASIC program. This program reads their BASIC datafiles and writes the information to a text file that may be imported into dbase III.

```
40 DIM S$(282)
50 PI=3.1416
70 CLS
80 REM LOOP THROUGH THE 1ST NINE DATA FILES
90 FOR I = 1 TO 9
95 X = 0
100 PRINT "PROCESSING BLOCO ";I
101 REM DETERMINE THE FILE NAMES
110 I$ = STR$(I)
115 I$ = RIGHT$(I$,1)
120 FILE$ = "BLOCO"+I$
121 REM  THE DATA FILES WERE ALL ORIGINALLY STORED IN DIFFERENT
122 REM   SUBDIRECTORIES WITH THE SAME NAME OF DAT.DAT
130 DIR$ = "C:\BOB\TAPAJOS\" + FILE$ + "\DAD.DAT"
140 FILE$ = FILE$ + ".DAT"
150 OPEN"R",1,DIR$,20
160 OPEN "O",2,FILE$
170 FIELD 1,4 AS C$,4 AS D$,4 AS H$, 2 AS Q$, 2 AS V$
171 REM LOOP UNTIL END-OF-FILE
180 FOR J = 1 TO 99999!
190 GET 1,J
200 IF EOF(1) THEN 310
210 C=CVS(C$)
220 D=CVS(D$)
230 H=CVS(H$)
240 Q=CVI(Q$)
250 V=CVI(V$)
260 DAP=(D/PI)
270 VOL=.077476+.517897*(DAP/100)^2*H
280    PRINT#2,USING    "####";    X+1;C;:PRINT#2,USING
"####.#";D;DAP;:PRINT#2,USING    "####";H;:PRINT#2,USING
"###.###";VOL;:PRINT#2,Q
290 X=X+1
300 NEXT J
310 CLOSE
320 NEXT I
330 END
```

A program modified from FCAP's BASIC program. The program writes out the species code and the species common name to a text file that may be imported to dBase III.

```
40 DIM S$(282)
60 GOSUB 340
70 CLS
160 OPEN "O",1,"SPECIES.TXT"
180 FOR J = 1 TO 282
280 PRINT#1,USING "####";J;S$(J)
300 NEXT J
310 CLOSE
330 END
340 S$(1)="ABIU"
350 S$(2)="ABIU CASCA GROSSA"
360 S$(3)="ABIU CARAMURI"
370 S$(4)="ABIU CUTITE"
380 S$(5)="ABIU FOLHA LISA"
390 S$(6)="ABIU FOLHA MIUDA"
400 S$(7)="ABIU MANGABARANA"
410 S$(8)="ABIU MARFIN"
420 S$(9)="ABIU PITOMBA"
430 S$(10)="ABIU PRETO"
440 S$(11)="ABIU ROSADINHO"
450 S$(12)="ABIURANA VERMELHA"
460 S$(13)="ABIU VERMELHO"
470 S$(14)="ABIU UCUUBA"
480 S$(15)="ACOITA CAVALO"
490 S$(16)="AMAPA"
500 S$(17)="AMAPAI"
510 S$(18)="AMAPA DOCE"
520 S$(19)="AMAPA AMARGOSO"
530 S$(22)="ANANI"
540 S$(23)="ANDIROBA"
550 S$(24)="ANGELIM"
560 S$(25)="ANGELIM DA MATA"
570 S$(26)="ANGELIM VERMELHO"
580 S$(27)="AQUARIQUARA"
590 S$(28)="AQUARIQUARANA"
600 S$(29)="ARACA DA MATA"
610 S$(30)="ARARACANGA"
620 S$(32)="ACHICHA"
630 S$(33)="ACHUA"
640 S$(34)="BACURI"
650 S$(35)="BACURIA   MATA"
660 S$(36)="BREU"
670 S$(37)="BREU MANGA"
680 S$(38)="BREU VERMELHO"
690 S$(39)="BREU SUCURUBA"
700 S$(41)="CAJU-ACU"
710 S$(43)="CAQUI"
```

```
720 S$(44)="CAPITIU"
730 S$(45)="CARAIPE"
740 S$(46)="CARAPANAUBA AMARELA"
750 S$(47)="CARAPANAUBA"
760 S$(48)="CARAPANAUBA PRETA"
770 S$(50)="CASCA DOCE"
780 S$(51)="CASTANHA DE ARARA"
790 S$(52)="CASTANHA DO BRASIL"
800 S$(53)="CASTANHA SAPUCAIA"
810 S$(54)="CAUCHO"
820 S$(55)="CEDRO"
830 S$(56)="CEDRO BRANCO"
840 S$(57)="CEDRORANA"
850 S$(58)="CEDRO VERMELHO"
860 S$(59)="COCAO"
870 S$(60)="CONDURU"
880 S$(61)="CORACAO DE NEGRO"
890 S$(62)="COPAIBA"
900 S$(63)="CUIARANA"
910 S$(64)="CUMARU"
920 S$(65)="CUMARURANA"
930 S$(66)="CUPIUBA"
940 S$(67)="CUPIUBARANA"
950 S$(68)="EMBAUBA"
960 S$(69)="EMBAUBARANA"
970 S$(70)="ENVIRACANA"
980 S$(71)="ENVIRA PRETA"
990 S$(72)="ESCORREGA MACACO"
1000 S$(73)="FAVA"
1010 S$(74)="FAVA AMARELA"
1020 S$(75)="FAVA AMARGOSA"
1030 S$(76)="FAVA ARARA TUCUPI"
1040 S$(77)="FAVA BOLACHA"
1050 S$(78)="FAVA BOLOTA"
1060 S$(79)="FAVA BARBATIMAO"
1070 S$(80)="FAVA BARRIGUDA"
1080 S$(81)="FAVA FOLHA FINA"
1090 S$(82)="FAVA DE GRUDE"
1100 S$(83)="FAVA MARI-MARI"
1110 S$(84)="FAVA MAPUXIQUI"
1120 S$(85)="FAVA ORELHA DE NEGRO"
1130 S$(86)="FAVA DE ROSCA"
1140 S$(87)="FAVA TIMBAUBA"
1150 S$(88)="FREIJO BRANCO"
1160 S$(89)="FREIJO CINZA"
1170 S$(90)="FREIJORANA"
1180 S$(91)="GOIABINHA"
1190 S$(92)="GOMBEIRA BRANCA"
1200 S$(93)="GOMBEIRA BRANCA"
1210 S$(94)="GOMBEIRA VERMELHA"
1220 S$(95)="GUARIUBA"
1230 S$(96)="INGA"
```

```
1240 S$(97)="INGA BIRIBA"
1250 S$(98)="INGA XIXICA"
1260 S$(99)="ITAUBA"
1270 S$(100)="ITAUBA ABACATE"
1280 S$(101)="ITAUBA PRETA"
1290 S$(102)="ITAUBARANA"
1300 S$(103)="ITAUBA AMARELA"
1310 S$(104)="JANITA"
1320 S$(106)="JARANA"
1330 S$(107)="JUTAI-ACU"
1340 S$(108)="JUTAI-MIRIM"
1350 S$(109)="JUTAI POROROCA"
1360 S$(110)="JUTAIRANA"
1370 S$(111)="LACRE BRANCO"
1380 S$(112)="LOURO"
1390 S$(113)="LOURO ABACATE"
1400 S$(114)="LOURO AMARELO"
1410 S$(115)="LOURO PRECIOSA"
1420 S$(116)="LOURO TAMANCO"
1430 S$(117)="LOURO VERMELHO"
1440 S$(118)="LOURO MACACAUBA"
1450 S$(119)="MACARANDUBA"
1460 S$(120)="MACUCU"
1470 S$(121)="MAMORANA"
1480 S$(122)="MANDIOQUEIRA"
1490 S$(123)="MANDIOQ.ASPERA"
1500 S$(124)="MANDIOQ.LISA"
1510 S$(125)="MANDIOQ.ROSA"
1520 S$(126)="MAPARAJUBA"
1530 S$(127)="MARFIM PRETO"
1540 S$(128)="MARUPA"
1550 S$(129)="MATA-MATA"
1560 S$(130)="MATA-MATA BRANCO"
1570 S$(131)="MATA-MATA CI"
1580 S$(132)="MATA-MATA PRETO"
1590 S$(133)="MATA-MATA VERMELHO"
1600 S$(134)="MELANCIEIRA"
1610 S$(135)="MOROTOTO"
1620 S$(136)="MIRINDIBA DOCE"
1630 S$(137)="MUIRACATIARA"
1640 S$(138)="MUIRATAUA"
1650 S$(139)="MUIRAPIRANGA"
1660 S$(140)="MUIRATINGA"
1670 S$(141)="MUIRATINGA F.LISA"
     S$(142)="MUIRAPIXUNA"      240X1680
1690 S$(143)="MUIRAUBA"
1700 S$(144)="MUIRARENA"
1710 S$(145)="MUNGUBA"
1720 S$(146)="MUTUTI"
1730 S$(147)="MURUCI DA MATA"
1740 S$(148)="MURUPITA"
1750 S$(149)="MURURE"
```

```
1760 S$(150)="PAJURA DA MATA"
1770 S$(151)="PARACUTACA"
1780 S$(152)="PARA-PARA"
1790 S$(153)="PARICA"
1800 S$(154)="PARICARANA"
1810 S$(155)="PAU AMARELO"
1820 S$(156)="PAU DARCO FLOR AMARELA"
1830 S$(157)="PAU DARCO FLOR ROXA"
1840 S$(158)="PAU JACARE"
1850 S$(159)="PAU MULATO"
1860 S$(160)="PAU DE REMO"
1870 S$(161)="PAU ROSA"
1880 S$(162)="PENTE DE MACACO"
1890 S$(163)="PITAICA"
1900 S$(164)="PITOMBA"
1910 S$(165)="PIQUIA"
1920 S$(166)="PRECIOSA"
1930 S$(167)="QUINARANA"
1940 S$(168)="QUARUBARANA"
1950 S$(169)="QUARUBA VERDADEIRA"
1960 S$(170)="QUARUBA ROSA"
1970 S$(171)="COATAQUICAUA"
1980 S$(173)="SERINGUEIRA"
1990 S$(174)="SUCUBA"
2000 S$(175)="SUCUPIRA"
2010 S$(176)="SUCUPIRA AMARELA"
2020 S$(177)="SUCUPIRA PRETA"
2030 S$(178)="SUMAUMA"
2040 S$(179)="TACHI BRANCO"
2050 S$(180)="TACHI PRETO"
2060 S$(181)="TACHI VERMELHO"
2070 S$(182)="TATAJUBA"
2080 S$(183)="TAMANQUEIRA"
2090 S$(184)="TATAPIRIRICA"
2100 S$(185)="TAPEREBA"
2110 S$(186)="TAPEREBARANA"
2120 S$(187)="TARUMA"
2130 S$(188)="TAUARI"
2140 S$(189)="TAUARI CACHIMBO"
2150 S$(190)="TENTO"
2160 S$(191)="TENTO AMARELO"
2170 S$(192)="TENTO MULATO"
2180 S$(194)="UCUUBA T.FIRME"
2190 S$(195)="UCUUBARANA"
2200 S$(196)="UCUUBA VERMELHA"
2210 S$(197)="URUCUM DA MATA"
2220 S$(198)="URUCURANA"
2230 S$(199)="UXI DE MORCEGO"
2240 S$(201)="XIXUA"
2250 S$(202)="XIXUA VERMELHO"
2260 S$(204)="FAVA ESCAMOSA"
2270 S$(205)="FAVA CASCA GROSSA"
```

```
2280 S$(206)="TACHI"
2290 S$(207)="LOURO PRETO"
2300 S$(208)="SUCUPIRANA"
2310 S$(209)="FREIJO"
2320 S$(210)="UCUUBA AMARELA"
2330 S$(212)="JOAO MOLE"
2340 S$(213)="UXI LISO"
2350 S$(214)="ABIU PRETO"
2360 S$(215)="APEUA"
2370 S$(216)="ABIU CASCA DOCE"
2380 S$(217)="INGA VERMELHO"
2390 S$(219)="CUPUACU DA MATA"
2400 S$(220)="ENVIRA SURUCUCU"
2410 S$(221)="ANGELIM RAJADO"
2420 S$(222)="MURTA"
2430 S$(223)="GOIABARANA"
2440 S$(224)="CANELA DE VELHA"
2450 S$(225)="PURUI"
2460 S$(226)="ENVIRA"
2470 S$(227)="LACRE PRETO"
2480 S$(228)="INGA TAI"
2490 S$(229)="GINJA"
2500 S$(230)="CACAU DA MATA"
2510 S$(231)="MUIRAPINIMA"
2520 S$(232)="COPAIBARANA"
2530 S$(233)="PAPA TERRA"
2540 S$(234)="CUMARUI"
2550 S$(235)="TACHIRANA"
2560 S$(236)="ENVIRA LISA"
2570 S$(237)="MUUBA"
2580 S$(238)="UITAICI"
2590 S$(239)="TRIQUILHA"
2600 S$(240)="INAJARANA"
2610 S$(241)="EMBAUBA VERMELHA"
2620 S$(242)="FARINHA SECA"
2630 S$(243)="ENVIRA TAIA"
2640 S$(244)="BREU PRETO"
2650 S$(245)="PAU DE COBRA"
2660 S$(246)="PAU PARA TUDO"
2670 S$(247)="BREU BRANCO"
2680 S$(248)="ITAUBA BRANCA"
2690 S$(249)="PAIPAROLA"
2700 S$(250)="ARATACIURANA"
2710 S$(251)="PAPO DE MUTUM"
2720 S$(252)="ARATACIU"
2730 S$(253)="PAMA"
2740 S$(254)="PASSARINHEIRA"
2750 S$(255)="CAFERANA"
2760 S$(256)="ACACIA"
2770 S$(257)="BUCHEIRA"
2780 S$(258)="BREU BRANCO"
2790 S$(259)="ENVIRA AMARELA"
```

```
2800 S$(260)="CANELA DE JACAMIN"
2810 S$(261)="PEPINO DA MATA"
2820 S$(262)="EMBAUBA BRANCA"
2830 S$(263)="PAU DE COLHER"
2840 S$(264)="ENVIRA VERMELHA"
2850 S$(265)="URUAZEIRO"
2860 S$(266)="LACRE VERMELHO"
2870 S$(267)="JATAUBA"
2880 S$(268)="TAQUARI"
2890 S$(269)="TABOCAO"
2900 S$(270)="CUNARIO"
2910 S$(271)="MAPARANA"
2920 S$(272)="MUIRAPUAMA"
2930 S$(273)="PE DE GALINHA"
2940 S$(274)="CANELEIRA"
2950 S$(275)="PURI"
2960 S$(276)="BACABA"
2970 S$(277)="ARATICUM"
2980 S$(278)="CABECA DE URUBU"
2990 S$(279)="TUCUMA-ACU"
3000 S$(280)="ENVIRA FERRO"
3010 S$(281)="MULUNGU"
3020 S$(282)="PE DE CABRA"
3030 RETURN
```

```
*
* Program Build.Prg
*
*
*  Program converts the ASCII text file from BASIC programs into
*    dBase III files.
*
*
*   Method:
*
*      The ASCII data are first read into a dbase file (tmp1)
*          that exactly matches their format.  These data are then
*           entered into a similar dbase file (tmp2) but with the
*           new of Bloco and Quadra.  Fields Bloco and Quadra are
*          given the correct values.  These data are then appended
*           into the master data file Bloco.
*
*   Robert W. Klaver
*

ok = .T.

do while ok

accept "What is the Quadra?    " to mquad
accept "What is the Bloco?     " to mbloco
mfile = "bloco" + mbloco + ".dat"

use tmp1
append from &mfile type sdf
use tmp2
append from tmp1
replace all quadra with &mquad, bloco with &mbloco
use bloco
append from tmp2
use tmp1
delete all
pack
use tmp2
delete all
pack

accept "Do you want another block?   " to ans

if ans <> 'Y' .OR. ans <> 'y'
  ok = .F.
endif

enddo
```

```
*
*  Program VolTbl.Prg
*
*
*   Program reads data from BSORT and Writes to VolTbl.
*   The program converts the raw data into a Volume Table for each
*      species in each block
*
*   BSORT - Database BLOCO sorted by QUADRA, BLOCO, and CODE
*   VOLTBL - Database to hold the volume table
*            fields NT are for Number of Trees
*            fields VOL are the volumes
*            eg:
*            NT7 is  for the range 5  <= dap < 10
*            NT12                  10 <= dap < 15
*            NT50                  45 <= dap < 55
*            NT100                 95 <= dap < 105
*            NT150                 105 <= dap
*
*
*   Method:
*
*      open files
*      select file 1 (BSORT)
*      while not end-of-file
*       mbloco = BLOCO
*       while mbloco = BLOCO
*          zero out accumulators
*          mcode = CODE
*          while mcode = CODE
*             put data into groups
*             calc totals for CODE
*             SKIP
*          end
*          select file 2 (VOLTBL)
*          insert data
*          select file 1
*        end do
*       end do
*       close files
*
*   Robert W. Klaver
*
*


set talk off

select 1
use bsort
select 2
use voltbl
```

```
mquad = 3

select 1
do while .not. eof()

   mbloco = bloco
   ? "Bloco  " + str(mbloco)

   do while mbloco = bloco

   mcount7 = 0
   mcount12 = 0
   mcount17 = 0
   mcount22 = 0
   mcount27 = 0
   mcount32 = 0
   mcount37 = 0
   mcount42 = 0
   mcount50 = 0
   mcount60 = 0
   mcount70 = 0
   mcount80 = 0
   mcount90 = 0
   mcount100 = 0
   mcount150 = 0
   mcounttot = 0
   mvol7 = 0
   mvol12 = 0
   mvol17 = 0
   mvol22 = 0
   mvol27 = 0
   mvol32 = 0
   mvol37 = 0
   mvol42 = 0
   mvol50 = 0
   mvol60 = 0
   mvol70 = 0
   mvol80 = 0
   mvol90 = 0
   mvol100 = 0
   mvol150 = 0
   mvoltot = 0

   mcode = code
   ? "     Code  " + str(mcode)

   do while mcode = code
      do case
         case dap >= 5 .and. dap < 10
            mcount7 = mcount7 + 1
            mvol7   = mvol7 + vol
         case dap >= 10 .and. dap < 15
```

```
            mcount12 = mcount12 + 1
            mvol12   = mvol12 + vol
         case dap >= 15 .and. dap < 20
            mcount17 = mcount17 + 1
            mvol17   = mvol17 + vol
         case dap >= 20 .and. dap < 25
            mcount22 = mcount22 + 1
            mvol22   = mvol22 + vol
         case dap >= 25 .and. dap < 30
            mcount27 = mcount27 + 1
            mvol27   = mvol27 + vol
         case dap >= 30 .and. dap < 35
            mcount32 = mcount32 + 1
            mvol32   = mvol32 + vol
         case dap >= 35 .and. dap < 40
            mcount37 = mcount37 + 1
            mvol37   = mvol37 + vol
         case dap >= 40 .and. dap < 45
            mcount42 = mcount42 + 1
            mvol42   = mvol42 + vol
         case dap >= 45 .and. dap < 55
            mcount50 = mcount50 + 1
            mvol50   = mvol50 + vol
         case dap >= 55 .and. dap < 65
            mcount60 = mcount60 + 1
            mvol60   = mvol60 + vol
         case dap >= 65 .and. dap < 75
            mcount70 = mcount70 + 1
            mvol70   = mvol70 + vol
         case dap >= 75 .and. dap < 85
            mcount80 = mcount80 + 1
            mvol80   = mvol80 + vol
         case dap >= 85 .and. dap < 95
            mcount90 = mcount90 + 1
            mvol90   = mvol90 + vol
         case dap >= 95 .and. dap < 105
            mcount100 = mcount100 + 1
            mvol100   = mvol100 + vol
         case dap >= 105
            mcount150 = mcount150 + 1
            mvol150   = mvol150 + vol
endcase

mcounttot = mcounttot + 1
mvoltot   = mvoltot + vol

skip

enddo

select 2
insert blank
```

```
      replace quadra with mquad
      replace bloco with mbloco
      replace code with mcode
      replace nt7 with mcount7
      replace nt12 with mcount12
      replace nt17 with mcount17
      replace nt22 with mcount22
      replace nt27 with mcount27
      replace nt32 with mcount32
      replace nt37 with mcount37
      replace nt42 with mcount42
      replace nt50 with mcount50
      replace nt60 with mcount60
      replace nt70 with mcount70
      replace nt80 with mcount80
      replace nt90 with mcount90
      replace nt100 with mcount100
      replace nt150 with mcount150
      replace nttot with mcounttot
      replace vol7 with mvol7
      replace vol12 with mvol12
      replace vol17 with mvol17
      replace vol22 with mvol22
      replace vol27 with mvol27
      replace vol32 with mvol32
      replace vol37 with mvol37
      replace vol42 with mvol42
      replace vol50 with mvol50
      replace vol60 with mvol60
      replace vol70 with mvol70
      replace vol80 with mvol80
      replace vol90 with mvol90
      replace vol100 with mvol100
      replace vol150 with mvol150
      replace voltot with mvoltot

      select 1

      enddo
   enddo

   close all
```

```
*
*  Program AmVolTbl.Prg
*
*
*   Program reads data from AMSORT and Writes to AmVolTbl.
*   The program converts the raw data for Amstragem data into a
*   Volume Table
*      for each species in each block
*
*   AMSORT   - Database AMOSTR sorted by QUADRA, BLOCO, and CODE
*   AMVOLTBL - Database to hold the volume table
*              fields NT are for Number of Trees
*              fields VOL are the volumes
*              eg:
*              NT7 is  for the range 5  <= dap < 10
*              NT12                  10 <= dap < 15
*              NT50                  45 <= dap < 55
*              NT100                 95 <= dap < 105
*              NT150                 105 <= dap
*
*
*   Method:
*
*       open files
*       select file 1 (AMSORT)
*       while not end-of-file
*        mbloco = BLOCO
*        while mbloco = BLOCO
*           zero out accumulators
*           mcode = CODE
*           while mcode = CODE
*              put data into groups
*              calc totals for CODE
*              SKIP
*           end
*           select file 2 (AMVOLTBL)
*           insert data
*           select file 1
*         end do
*        end do
*        close files
*
*    Robert W. Klaver
*
*

set talk off

select 1
use amsort
select 2
use amvoltbl
```

```
mquad = 3

select 1
do while .not. eof()

   mbloco = bloco
   ? "Bloco  " + str(mbloco)

   do while mbloco = bloco

   mcount7 = 0
   mcount12 = 0
   mcount17 = 0
   mcount22 = 0
   mcount27 = 0
   mcount32 = 0
   mcount37 = 0
   mcount42 = 0
   mcounttot = 0
   mvol7 = 0
   mvol12 = 0
   mvol17 = 0
   mvol22 = 0
   mvol27 = 0
   mvol32 = 0
   mvol37 = 0
   mvol42 = 0
   mvoltot = 0

   mcode = code
   ? "     Code  " + str(mcode)

   do while mcode = code
      do case
         case dap >= 5 .and. dap < 10
            mcount7 = mcount7 + 1
            mvol7   = mvol7 + vol
         case dap >= 10 .and. dap < 15
            mcount12 = mcount12 + 1
            mvol12   = mvol12 + vol
         case dap >= 15 .and. dap < 20
            mcount17 = mcount17 + 1
            mvol17   = mvol17 + vol
         case dap >= 20 .and. dap < 25
            mcount22 = mcount22 + 1
            mvol22   = mvol22 + vol
         case dap >= 25 .and. dap < 30
            mcount27 = mcount27 + 1
            mvol27   = mvol27 + vol
         case dap >= 30 .and. dap < 35
            mcount32 = mcount32 + 1
            mvol32   = mvol32 + vol
```

```
            case dap >= 35 .and. dap < 40
               mcount37 = mcount37 + 1
               mvol37   = mvol37 + vol
            case dap >= 40 .and. dap < 45
               mcount42 = mcount42 + 1
               mvol42   = mvol42 + vol
      endcase

      mcounttot = mcounttot + 1
      mvoltot   = mvoltot + vol

      skip

      enddo

      select 2
      insert blank
      replace quadra with mquad
      replace bloco with mbloco
      replace code with mcode
      replace nt7 with mcount7
      replace nt12 with mcount12
      replace nt17 with mcount17
      replace nt22 with mcount22
      replace nt27 with mcount27
      replace nt32 with mcount32
      replace nt37 with mcount37
      replace nt42 with mcount42
      replace nttot with mcounttot
      replace vol7 with mvol7
      replace vol12 with mvol12
      replace vol17 with mvol17
      replace vol22 with mvol22
      replace vol27 with mvol27
      replace vol32 with mvol32
      replace vol37 with mvol37
      replace vol42 with mvol42
      replace voltot with mvoltot

      select 1

      enddo
enddo

close all
```

```
*
*   Program NFormat.Prg
*
*
*   Program converts the FCAP data into the new data base format
*
*
*   Method:
*
*       For each record in the data base.
*          determine if the diameter is < 45 cm.
*            If so, then it is not commercial and the height
*                    and volume are for fuste trees.
*                    If the quality of the tree is 1 or 2
*                      then calculate the net volume.
*                      else the net volume is 0
*              else
*                 the information is for commercial trees and
*                      height, volume, and net volume  are calculated
*
*               basal area is calculated for all tres.
*
*
*     Species data base has information on species code, commercial
*         group and defect.  The defects are for internal and what
*        was left in the forest after logging.  Data on defect were
*        from a study on the Tapajos or was estimated at 1% and 20%
*
*
*   Robert W. Klaver
*
*

select 1
use bloco

select 2
use species alias sp

select 1

set relation to code into sp

do while .not. eof()
   if dap < 45
      replace height_f with height
      replace vol_f    with vol
      if qf < 3
         mvol = vol - sp->defecto_i/100 * vol - sp->defecto_r/100
* vol
         replace vol_fnet with mvol
      else
```

```
            replace vol_fnet with 0
         endif
      else
         replace height_c with height
         replace vol_c with vol
         if qf < 3
            mvol = vol - sp->defecto_i/100 * vol - sp->defecto_r/100
* vol
            replace vol_cnet with mvol
         else
            replace vol_cnet with 0
         endif
      endif
      mbasal = 3.141592 * dap*dap / 4
      replace basal_area with mbasal
      skip
enddo
```

```
*
* Program RsBloco.Prg
*
*   Program to summarize the information in Bloco on a
*      per hectare basis.
*
*   Files:
*         bsort - bloco sorted by bloco and species code
*         species - file that has for each species its commercial
*                   group
*         blksize - file that list the number of hectare in a
*                   block.
*
*   Method:
*
*      open files
*      while not the end-of-file
*         read the bloco
*         while bloco is the same
*            clear the accumulators
*            read the code
*               go to species file and get group
*               go to the blksize file and get the number of
*                              hectares
*               while code is the same
*                  total number of trees, volume, net volume, & b
*                  skip to the next record
*               convert totals to per hectares
*               put information into rsbloco
*      close files
*
*
*   Robert W. Klaver
*
set talk off

select 1
use bsort

select 2
use species alias sp

select 3
use blksize alias ha

select 4
use rsbloco

select 1
mquad = 3
do while .not. eof()
   mbloco = bloco
```

```
   ? "Bloco " + str(mbloco)
   do while mbloco = bloco
      mnt       = 0
      mvol_f    = 0
      mvol_fnet = 0
      mntc      = 0
      mvol_c    = 0
      mvol_cnet = 0
      mba       = 0
      mcode     = code
      set relation to code into sp
      mgrupo = sp->grupo
      set relation to bloco into ha
      mha       = ha->size
      ? "Bloco " + str(mbloco) + " Code " + str(mcode) + " Grupo "
+ str(mgrupo)
      do while mcode = code
         mnt       = mnt + 1
         mvol_f    = mvol_f    + vol_f
         mvol_fnet = mvol_fnet + vol_fnet
         mba       = mba       + basal_area
         if dap >= 45
            mntc      = mntc + 1
            mvol_c    = mvol_c    + vol_c
            mvol_cnet = mvol_cnet + vol_cnet
         endif
         skip
      enddo
      mnt       = mnt / mha
      mvol_f    = mvol_f / mha
      mvol_fnet = mvol_fnet / mha
      mba       = mba / mha
      mntc      = mntc / mha
      mvol_c    = mvol_c / mha
      mvol_cnet = mvol_cnet / mha
      select 4
      insert blank
      replace quadra with mquad
      replace bloco with mbloco
      replace code with mcode
      replace grupo with mgrupo
      replace nt with mnt
      replace vol_f with mvol_f
      replace vol_fnet with mvol_fnet
      replace ntc with mntc
      replace vol_c with mvol_c
      replace vol_cnet with mvol_cnet
      replace basal_area with mba
      select 1
   enddo
enddo
close all
```

```
*
*    Program RSBLOCO3.prg
*
*    Program converts database RSBLOCO3 so only the top 20 species
*       in each bloco are kept.
*
*    Database RSBLOCO1 is derived from RSBLOCO by
*       sorting it by QUADRA, BLOCO, and NT.  NT is sorted from
highest
*      to lowest (non-default sort).
*      ie USE RSBLOCO
*         SORT TO RSBLOCO1 ON QUADRA, BLOCO, NT /D
*
*      RSBLOCO3  is a copy of RSBLOCO1 before this program is
*        executed.
*      ie USE RSBLOCO1
*         COPY TO RSBLOCO3
*
*
*     Method
*       use rsbloco3
*       while not end-of-file
*         mbloco = BLOCO
*         skip 20
*         while mbloco = BLOCO
*            delete
*            skip
*         end do
*       end do
*       make the changes permeant
*       close all files
*
*
*    Robert W. Klaver
*
*

set talk off

use rsbloco3

do while .not. eof()
   mbloco = bloco
   skip 20
   do while mbloco = bloco
      delete
      skip
   enddo
enddo
pack
close all
```

```
*
*    Program RSBLOCO4.prg
*
*    Program converts database RSBLOCO4 so only the top 20 species
*       in each bloco are kept.
*
*    Database RSBLOCO2 is derived from RSBLOCO by
*       sorting it by QUADRA, BLOCO, and VOL_CNET.   VOL_CNET is
sorted
*         from highest to lowest (non-default sort).
*      ie USE RSBLOCO
*         SORT TO RSBLOCO2 ON QUADRA, BLOCO, VOL_CNET /D
*
*       RSBLOCO4   is a copy of RSBLOCO2 before this program is
executed.
*      ie USE RSBLOCO2
*         COPY TO RSBLOCO4
*
*
*     Method
*       use rsbloco4
*       while not end-of-file
*         mbloco = BLOCO
*         skip 20
*         while mbloco = BLOCO
*            delete
*            skip
*         end do
*       end do
*       make the changes permeant
*       close all files
*
*
*    Robert W. Klaver
*
*
set talk off

use rsbloco4

do while .not. eof()
   mbloco = bloco
   skip 20
   do while mbloco = bloco
      delete
      skip
   enddo
enddo

pack
close all
```

Anexo 3. Maps and Satellite Images Available for the Tapajos National Forest

Maps

1:1.000.000

Sheet	Status	Source
SA 21	Completed 1982	IBGE
SB 21	Completed 1970	IBGE

1:500.000

Sheet	Status	Source
SA 21 Z	Not Finished	
SB 21 X	Not Finished	

1:250.000

Sheet	Status	Source
SA 21 Z B	Completed 1983	DSG
SA 21 Z D	Completed 1983	DSG
SB 21 X B	Completed 1983	IBGE

1:100.000

Sheet	Status	Source
527	Completed	DSG
528	Completed	DSG
588	Completed	DSG
589	Completed	DSG
651	Completed	DSG
652	Completed	DSG
718	Not Finished	
719	Not Finished	

Special Maps

Floresta National do Tapajos	1:400.000
Localizacao das Unidades Amostras do Inventario Prelimar	1:250.000
Flora do Tapajos Mapa de Rede de Drenagem, Acpectos, Geomorfologicoes, e Uso da Terra	1:120.000
Rede Viaria da Sul - 67 Localizacao de Quadra de Exploracao	1: 40.000
Mapa do Solos	1: 40.000

Satellite Images

Landsat satellites 1,2, and 3 had Multispectral Scanner (MSS) sensors. Landsat satellites 4 and 5 have both MSS and Thematic Mapper (TM) sensors. MSS's pixels are 60 x 80 meters. TM pixels are 30 x 30 meters. Landsat satellite scenes are 185 x 185 km.

Spot 1 and 2 satellites have Panchromatic and Multispectral sensors. Spot Panchromatic pixels are 10 x 10 meters. Spot Multispectral pixels are 20 x 20 meters. Spot scenes are 60 x 60 km. The actual location of the center of the scene may vary by 10 km east or west of the nominal center.

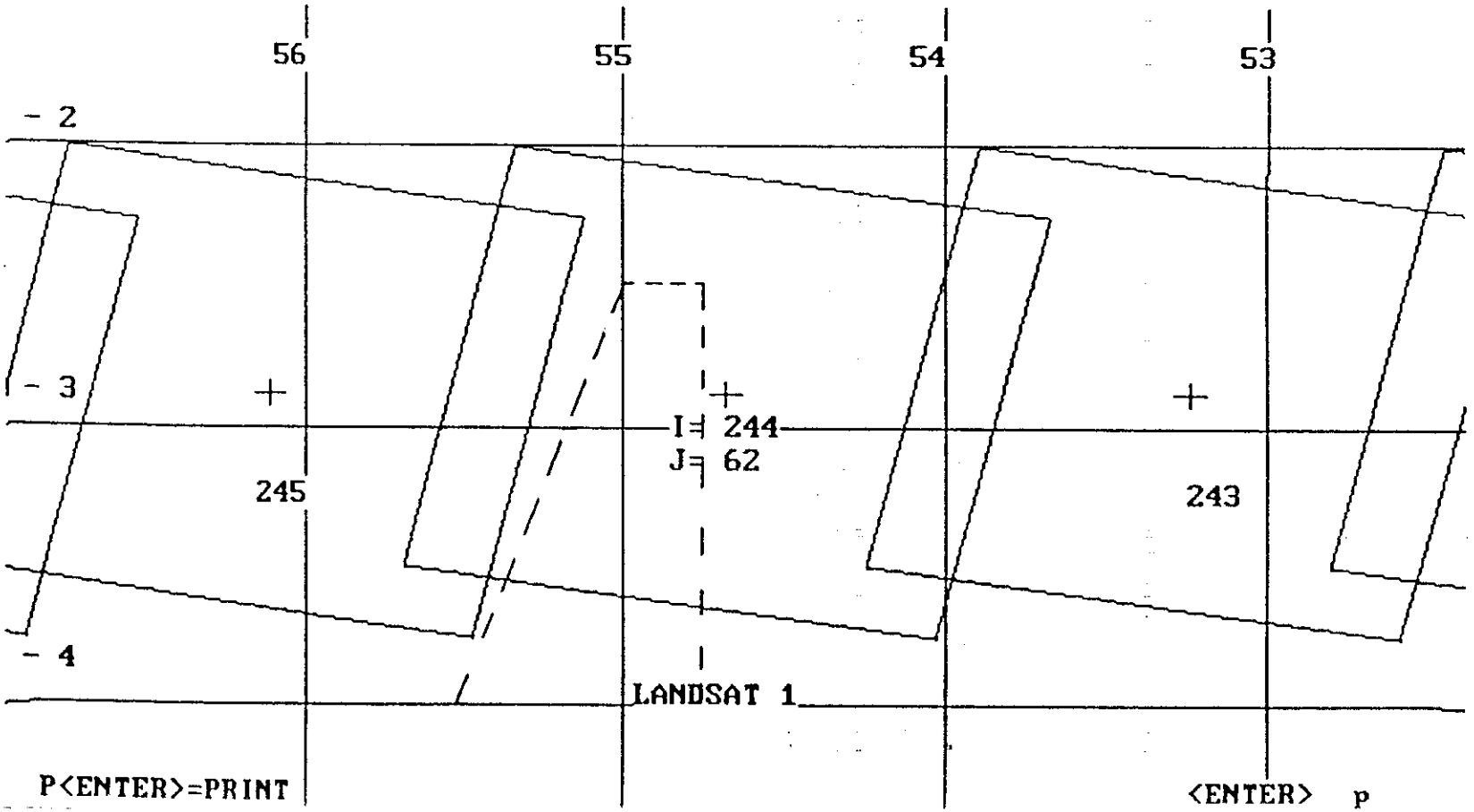
Satellite	Path	Row
Landsat 1,2, and 3	244	62 63
Landsat 4 and 5	227	62 63
	228	62 63
Spot 1 and 2	689	355 356 357 358
	690	355 356 357 358

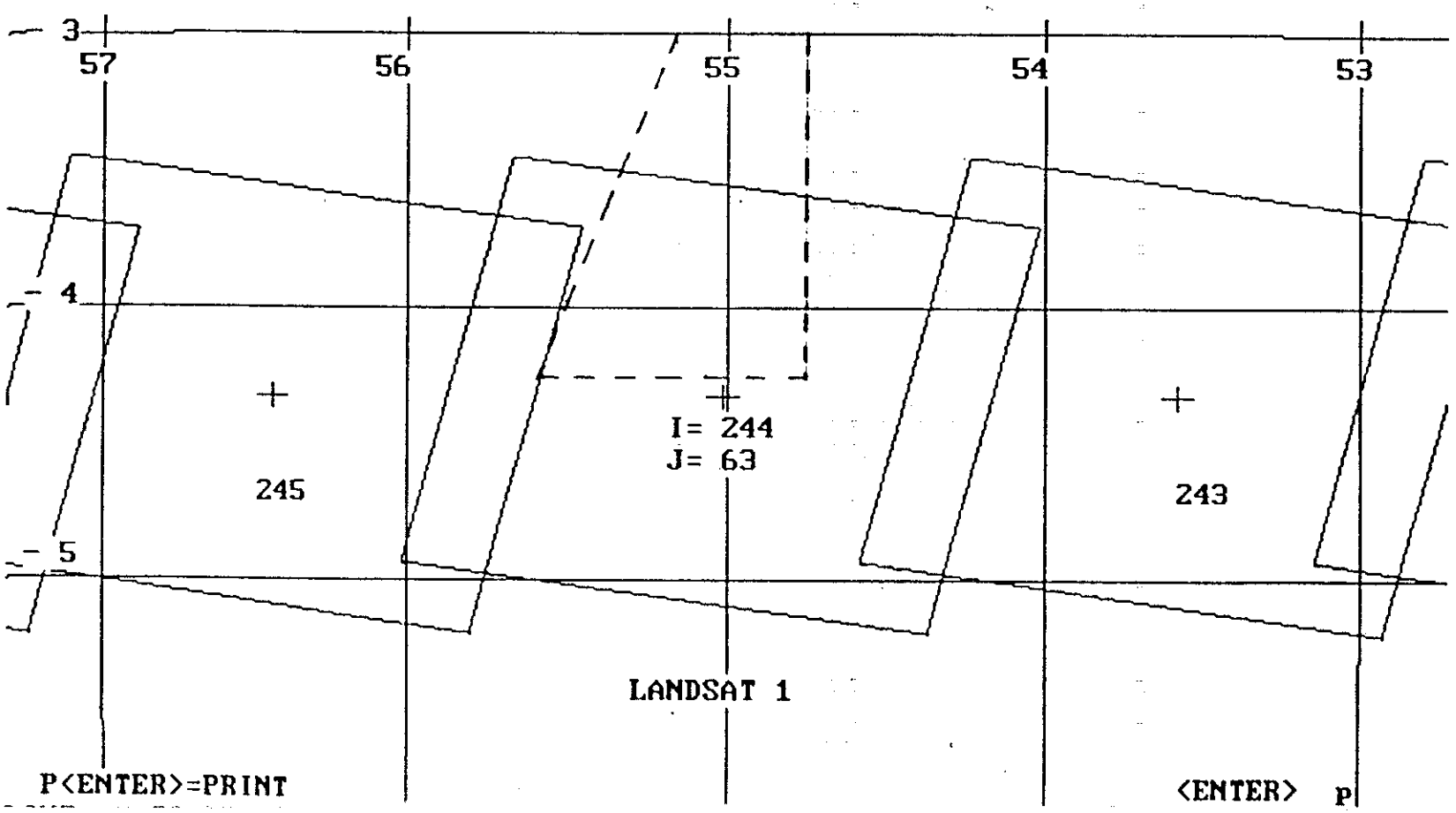
Figures 1 - 8 show the location of Satellite Scenes in relation to each other and to the Tapajos National Forest. The dotted line indicates the approximate location of the Tapajos National Forest.

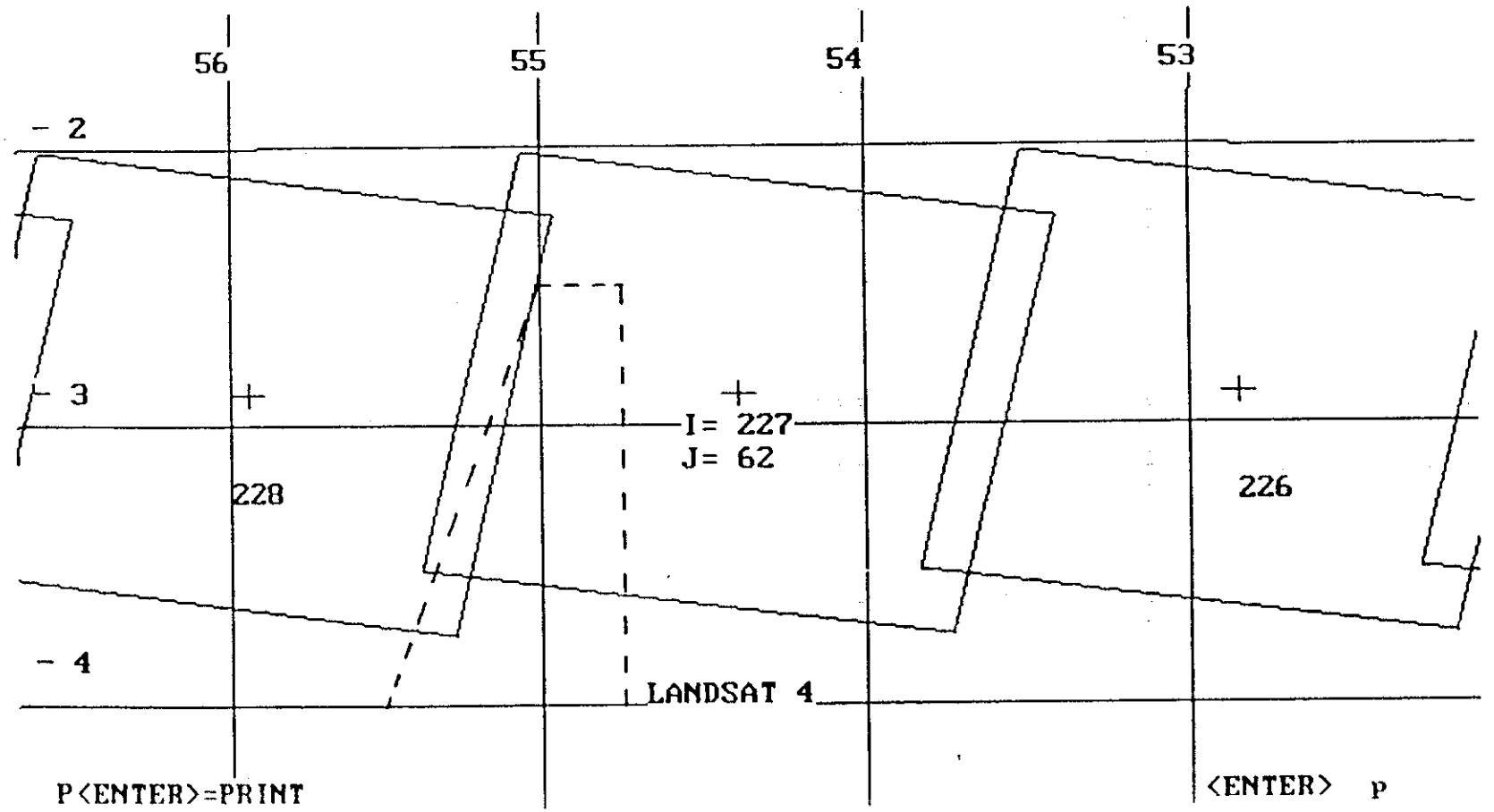
Figures 1 and 2 are for Landstat 1, 2, and 3 satellites.

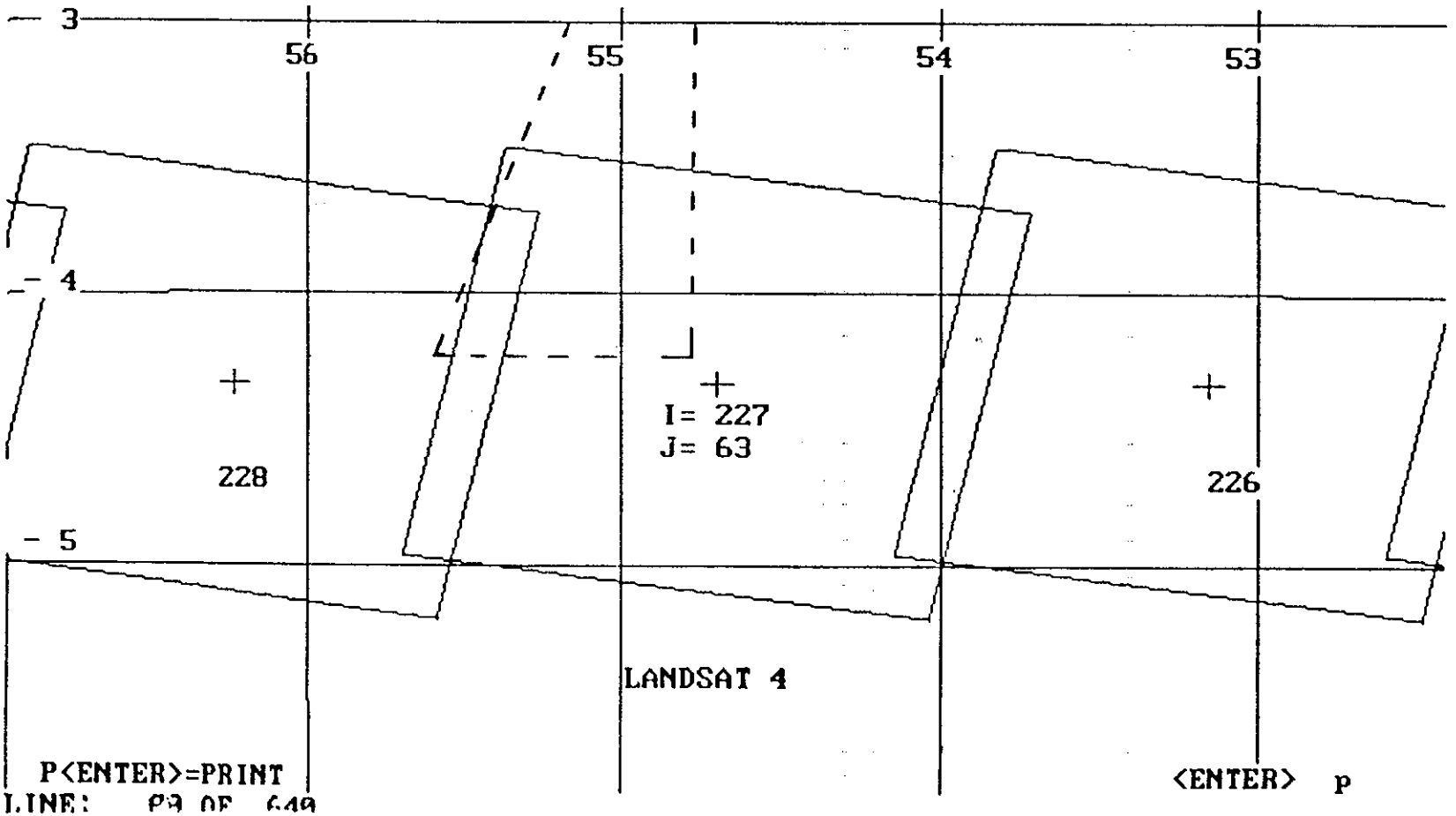
Figures 3 and 4 are for Landsat 4 and 5 satellites.

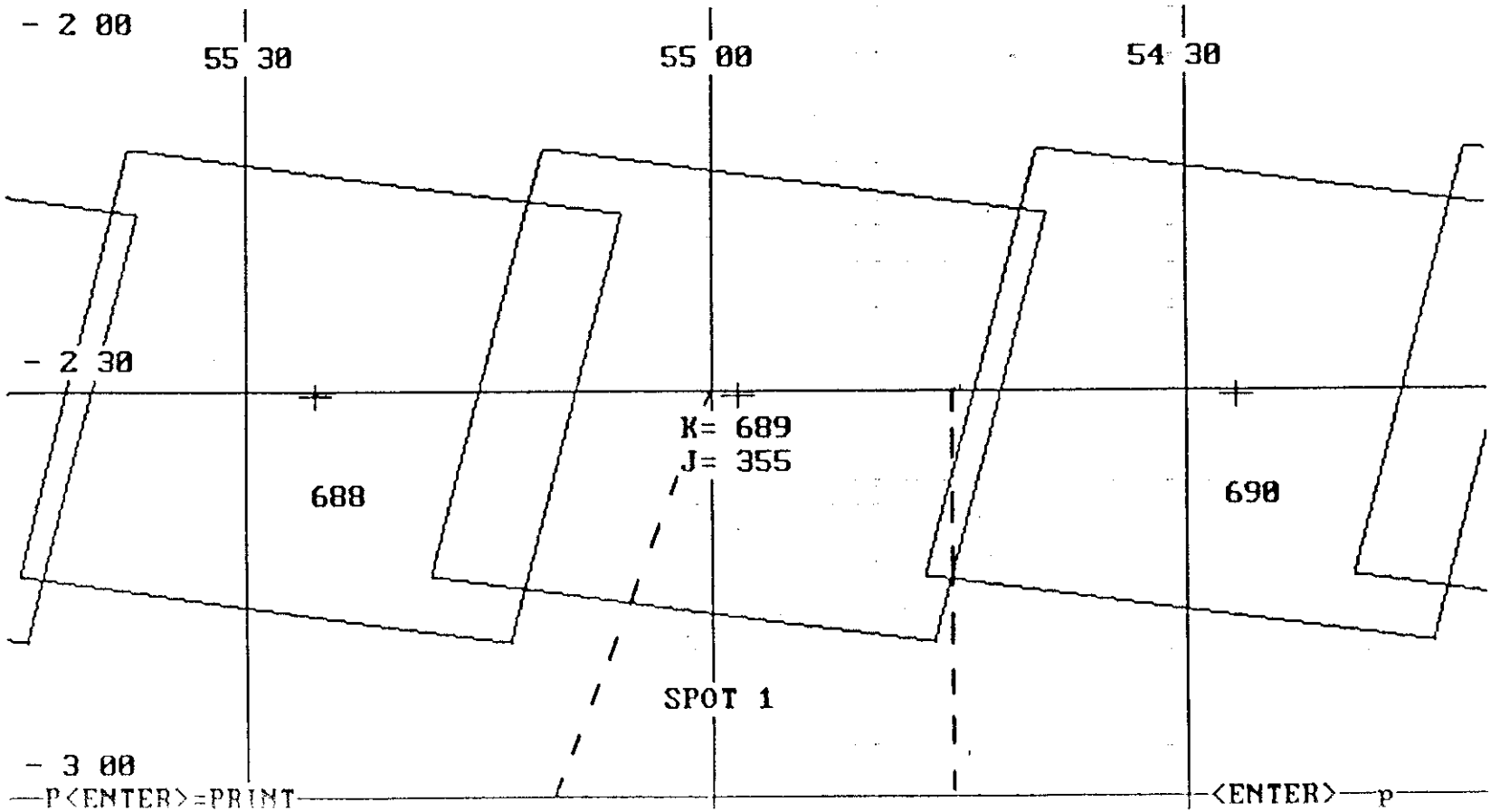
Figures 5 through 8 are for Spot 1 and 2 satellites.

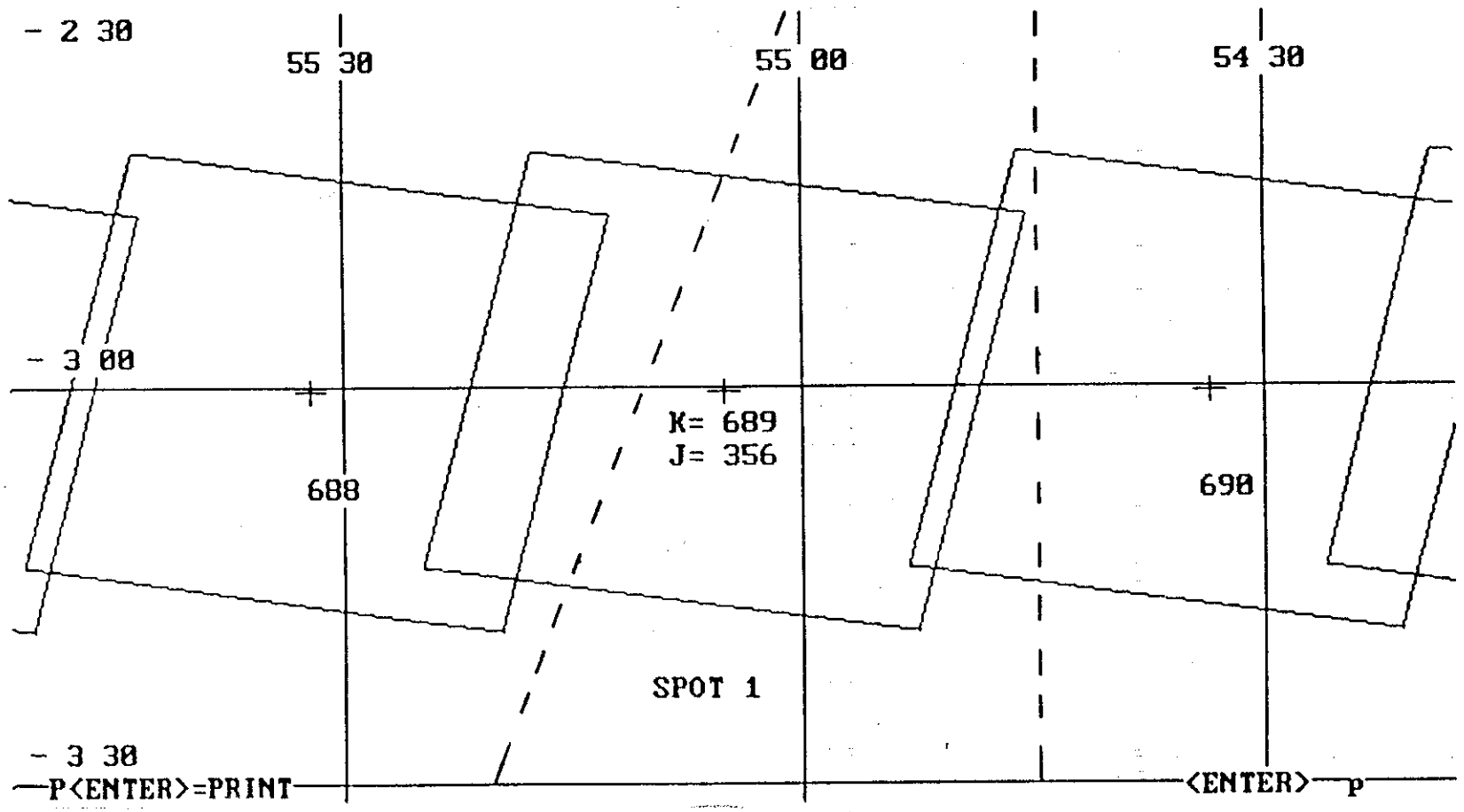


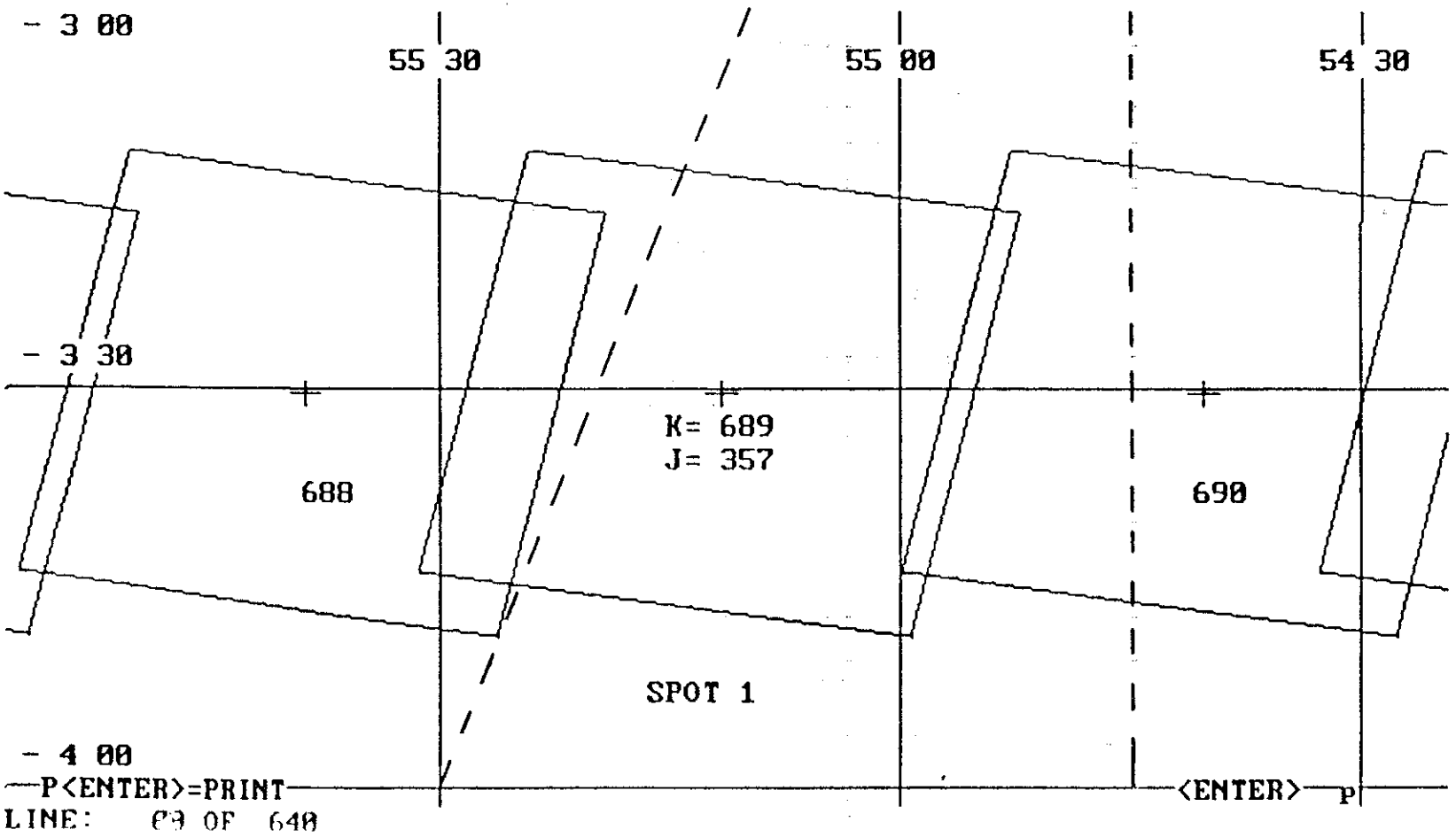

3
57
56
55
54
53
4
I= 244
J= 63
245
243
5
LANDSAT 1
P<ENTER>=PRINT
<ENTER> P

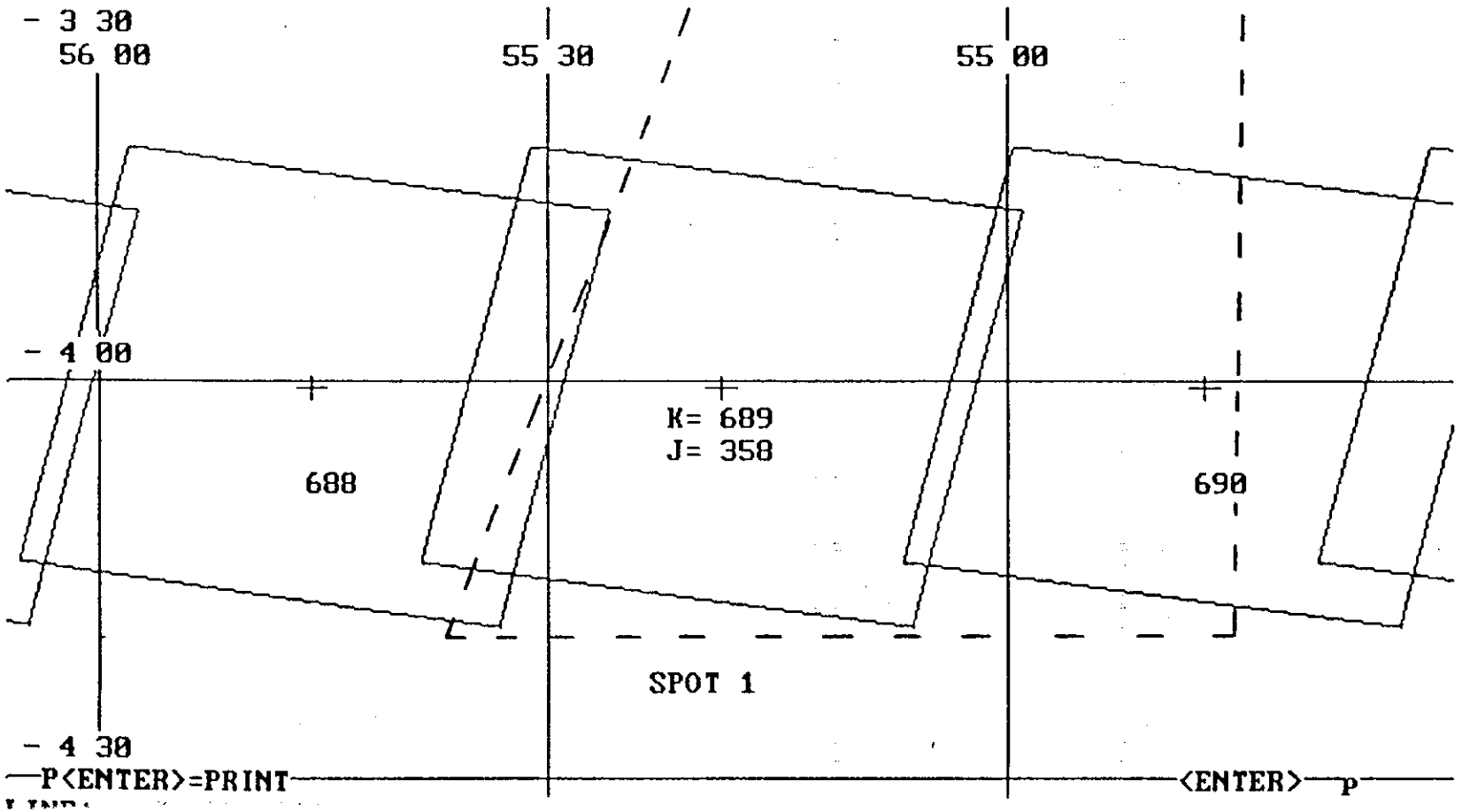

56
55
54
53
- 2
- 3
- 4
I= 227
J= 62
228
226
LANDSAT 4
P<ENTER>=PRINT
<ENTER> P


3
56
55
54
53
4
228
I= 227
J= 63
226
5
LANDSAT 4
P<ENTER>=PRINT
LINE: 83 OF 649
<ENTER> p


- 2 00
55 30
55 00
54 30
- 2 30
K= 689
J= 355
688
690
SPOT 1
- 3 00
P<ENTER>=PRINT
<ENTER> p


- 2 30
55 30
55 00
54 30
- 3 00
K= 689
J= 356
688
690
SPOT 1
- 3 30
P<ENTER>=PRINT
<ENTER> p


- 3 00
55 30
55 00
54 30
- 3 30
K= 689
J= 357
688
690
SPOT 1
- 4 00
P<ENTER>=PRINT
<ENTER>
P
LINE: 89 OF 640


- 3 30
56 00
55 30
55 00
- 4 00
K= 689
J= 358
688
690
SPOT 1
- 4 30
P<ENTER>=PRINT
<ENTER> P

SPOT CATALOG FILE FORMAT

Each line contains, from left to right:

- row number in GRS
- acquisition mode (X= multispectral, P=panchromatic)
- acquisition date (day-month-year)
- visibility (9=best, 0=worst)
- average cloud cover (0 for 0%, 1 for 10% ... 9 for 90% and T for 100%)
- coordinates of scene center (latitude/longitude)
- difference from nominal scene center to real scene center, in kilometres.
  W means a shift to west. E means a shift to East.
- incidence angle (in degrees)
- sun elevation and azimuth at scene center (in degrees)
- INPE scene identification:

    Ssti-rrrrr.ppp

where "s" is satellite number
      "t" is acquisition mode (X=multispectral, P=panchromatic)
      "i" is instrument number
      "rrrrr" is revolution number
      "ppp" is row number

1988

K689

```
355 X 06-07-88 T578 7 8 S02:30/W55:01 W05 +18.4 54/044 S1X1-12335.355
356 X 06-07-88 3835 8 5 S03:00/W55:08 W05 +18.4 54/044 S1X1-12335.356
357 X 06-07-88 2111 8 1 S03:30/W55:15 W05 +18.4 53/044 S1X1-12335.357
358 X 06-07-88 1002 8 1 S04:00/W55:21 W05 +18.4 53/042 S1X1-12335.358
```

K690

```
355 X 06-07-88 4477 8 6 S02:30/W54:27 E01 +14.3 54/044 S1X2-12335.355
356 X 06-07-88 7798 8 8 S03:00/W54:34 E01 +14.3 54/042 S1X2-12335.356
357 X 06-07-88 7612 8 4 S03:30/W54:41 E01 +14.3 53/042 S1X2-12335.357
358 X 06-07-88 1113 8 2 S04:00/W54:48 E01 +14.3 53/042 S1X2-12335.358
```

1989

K689

```
355  X 19-06-89 7 9 S02:30/W54:57 E02  +2.0 55/040 S1X1-17274.355
356  X 19-06-89 7 7 S03:00/W55:04 E02  +2.0 55/040 S1X1-17274.356
357  X 19-06-89 7 7 S03:30/W55:11 E02  +2.0 54/040 S1X1-17274.357
```

358 X 19-06-89 7 3 S04:00/W55:18 E02 +2.0 54/039 S1X1-17274.358

K690

355 X 19-06-89 0 T S02:30/W54:26 E02 -2.0 56/040 S1X2-17274.355
356 X 19-06-89 7 T S03:00/W54:33 E02 -2.0 55/039 S1X2-17274.356
357 X 19-06-89 7 7 S03:30/W54:40 E02 -2.0 55/039 S1X2-17274.357
358 X 19-06-89 7 4 S04:00/W54:46 E02 -2.0 54/039 S1X2-17274.358

TM CATALOG FILE FORMAT

Each line contains, from left to right:

- row number in WRS
- acquisition date (day-month-year)
- average cloud cover (from 0% to 100%)
- cloud cover per quarter (0 for 0%, 1 for 10% ... 9 for 90% and T for 100%)
    - first quarter (A) is top left
    - second quarter (B) is top right
    - third quarter (C) is bottom left
    - fourth quarter (D) is bottom right
- scene average visibility (0=no visibility, 9=maximum visibility)
- coordinates of scene center (latitude/longitude)
- sun elevation angle (in degrees)
- three digits (d:d:d) that represents grades of:
    - general scene quality (9= best quality, 0=worst quality)
    - problem code
    - cause code

1984

227

```
062 18-04-84 100% TTTT 2 S02:53/W054:23 52 2:4:0
062 04-05-84 100% TTTT 2 S02:53/W054:19 50 2:3:0
062 20-05-84 100% 9TTT 8 S02:53/W054:23 49 8:5:0
062 05-06-84  50% 6643 8 S02:53/W054:25 47 8:5:0
062 21-06-84  90% 9989 8 S02:53/W054:25 46 8:5:0
062 07-07-84  70% 7T27 8 S02:53/W054:24 46 8:5:0
062 23-07-84  20% 2221 9 S02:53/W054:26 47 9:5:0
062 08-08-84  60% 5926 8 S02:53/W054:31 49 8:5:0
062 24-08-84  70% 4632 4 S02:53/W054:35 51 4:5:0
062 09-09-84  80% 389T 8 S02:53/W054:33 54 8:5:0
062 11-10-84  90% 7T9T 8 S02:53/W054:27 58 8:5:0
062 28-11-84 100% 9TTT 7 S02:53/W054:19 53 7:5:0
062 14-12-84  90% 7TTT 8 S02:53/W054:20 51 8:5:0
062 30-12-84 100% TTTT 6 S02:53/W054:21 50 6:5:0

063 18-04-84 100% TTTT 0 S04:20/W054:41 51 0:4:0
063 04-05-84 100% TTTT 1 S04:20/W054:38 49 1:3:0
063 20-05-84  90% 799T 7 S04:20/W054:42 48 7:5:0
063 05-06-84  20% 1101 7 S04:20/W054:43 46 7:5:0
063 21-06-84  70% 9675 8 S04:20/W054:43 45 8:4:0
063 07-07-84  10% 0200 8 S04:20/W054:42 45 8:5:0
```

063 23-07-84 30% 2270 8 S04:20/W054:45 46 8:5:0
063 08-08-84 40% 4283 8 S04:20/W054:50 48 8:5:0
063 24-08-84 70% 2149 4 S04:20/W054:54 51 4:5:0
063 09-09-84 100% TTTT 7 S04:20/W054:51 54 7:5:0
063 11-10-84 90% 8T7T 4 S04:20/W054:46 58 4:5:0
063 28-11-84 100% TTTT 7 S04:20/W054:37 54 7:5:0
063 14-12-84 100% TT9T 7 S04:20/W054:38 52 7:5:0
063 30-12-84 100% TTTT 5 S04:20/W054:40 50 5:5:0

228

062 09-04-84 90% T998 7 S02:53/W055:58 52 7:5:0
062 25-04-84 100% TTTT 7 S02:53/W055:53 51 7:2:0
062 11-05-84 100% TTTT 1 S02:53/W055:54 50 1:4:0
062 27-05-84 100% TTTT 6 S02:53/W055:57 48 6:4:0
062 12-06-84 100% TTTT 7 S02:53/W055:58 46 7:5:0
062 28-06-84 10% 2000 8 S02:53/W055:57 46 8:5:0
062 14-07-84 90% 89TT 7 S02:53/W055:56 46 7:5:0
062 30-07-84 20% 1501 8 S02:53/W056:01 48 8:5:0
062 15-08-84 90% 49TT 4 S02:53/W056:06 50 4:5:0
062 31-08-84 100% TTTT 1 S02:53/W056:07 53 1:4:0
062 16-09-84 90% 98TT 7 S02:53/W056:05 55 7:4:0
062 02-10-84 50% 3527 7 S02:53/W056:02 57 7:5:0
062 18-10-84 100% TTTT 3 S02:53/W055:59 58 3:4:0
062 19-11-84 90% 879T 7 S02:53/W055:52 55 7:5:0
062 05-12-84 100% TT8T 8 S02:53/W055:52 52 8:5:0
062 21-12-84 100% TTTT 5 S02:53/W055:53 50 5:5:0

063 09-04-84 80% 94T8 8 S04:20/W056:16 51 8:5:0
063 25-04-84 90% T999 7 S04:20/W056:12 50 7:3:0
063 11-05-84 100% TTTT 0 S04:20/W056:12 49 0:4:0
063 27-05-84 100% TTTT 7 S04:20/W056:15 47 7:4:0
063 12-06-84 100% TTT9 5 S04:20/W056:16 45 5:4:0
063 28-06-84 0% 0000 8 S04:20/W056:16 45 8:5:0
063 14-07-84 50% 8742 8 S04:20/W056:15 45 8:5:0
063 30-07-84 0% 0000 8 S04:20/W056:20 47 8:5:0
063 15-08-84 100% TTT9 2 S04:20/W056:24 49 2:4:0
063 31-08-84 80% T883 6 S04:20/W056:25 52 6:4:0
063 16-09-84 70% 9T53 7 S04:20/W056:23 55 7:4:0
063 02-10-84 40% 2822 7 S04:20/W056:20 57 7:5:0
063 18-10-84 100% TTTT 4 S04:20/W056:17 58 4:4:0
063 19-11-84 90% 9T78 8 S04:20/W056:10 55 8:5:0
063 05-12-84 80% 7689 6 S04:20/W056:10 53 6:5:0
063 21-12-84 100% TTTT 5 S04:20/W056:12 51 5:5:0

1985

227

062 31-01-85 100% TTTT 7 S02:53/W054:22 49 7:5:0

```
062 16-02-85 100% TTTT 5 S02:53/W054:22 50 5:5:0
062 20-03-85 100% TTTT 7 S02:53/W054:22 53 7:5:0
062 05-04-85 100% TTTT 7 S02:53/W054:22 53 7:5:0
062 21-04-85 100% 9TTT 5 S02:53/W054:21 52 5:5:0
062 07-05-85 100% TTTT 4 S02:53/W054:20 51 4:5:0
062 23-05-85 100% TTTT 7 S02:53/W054:21 49 7:5:0
062 08-06-85 100% 9TTT 7 S02:53/W054:23 47 7:5:0
062 24-06-85 100% TT99 8 S02:53/W054:24 46 8:5:0
062 10-07-85  40% 5243 8 S02:53/W054:24 46 8:5:0
062 26-07-85  90% TT89 8 S02:53/W054:24 47 8:5:0
062 11-08-85  80% T885 8 S02:53/W054:24 49 8:5:0
062 27-08-85 100% TTTT 2 S02:53/W054:23 52 2:4:0
062 12-09-85 100% TTTT 2 S02:53/W054:23 55 2:5:0
062 14-10-85  50% 3368 9 S02:53/W054:23 58 9:5:0
062 30-10-85 100% TTTT 0 S02:53/W054:24 57 0:5:0
062 15-11-85 100% 9T9T 7 S02:53/W054:24 55 7:2:0
062 01-12-85  90% 6TTT 7 S02:53/W054:23 53 7:5:0

063 31-01-85 100% 9TTT 8 S04:20/W054:40 50 8:5:0
063 16-02-85 100% TTTT 3 S04:20/W054:40 51 3:5:0
063 20-03-85 100% TTTT 7 S04:20/W054:40 52 7:5:0
063 05-04-85 100% TT9T 7 S04:20/W054:40 52 7:5:0
063 21-04-85 100% T7TT 5 S04:20/W054:40 51 5:5:0
063 07-05-85 100% TTTT 3 S04:20/W054:39 50 3:5:0
063 23-05-85 100% TTTT 8 S04:20/W054:40 48 8:5:0
063 08-06-85  80% 9T76 8 S04:20/W054:41 46 8:5:0
063 24-06-85  60% 5837 8 S04:20/W054:42 45 8:5:0
063 10-07-85  80% 7697 7 S04:20/W054:42 45 7:5:0
063 26-07-85  90% 899T 8 S04:20/W054:42 46 8:5:0
063 11-08-85  40% 1605 7 S04:20/W054:42 48 7:5:0
063 27-08-85 100% TTTT 2 S04:20/W054:42 51 2:4:0
063 12-09-85 100% TTTT 2 S04:20/W054:41 54 2:5:0
063 14-10-85  70% 6928 7 S04:20/W054:42 58 7:5:0
063 30-10-85 100% TTTT 0 S04:20/W054:42 57 0:5:0
063 15-11-85  70% 7948 8 S04:20/W054:42 55 8:2:0
063 01-12-85 100% TTTT 1 S04:20/W054:42 53 1:5:0

228

062 07-02-85 100% TTTT 4 S02:53/W055:55 50 4:5:0
062 23-02-85 100% TTTT 4 S02:53/W055:55 51 4:5:0
062 27-03-85 100% T9TT 8 S02:53/W055:54 53 8:5:0
062 14-05-85  90% 9TT7 7 S02:53/W055:53 50 7:5:0
062 30-05-85 100% TTTT 7 S02:53/W055:55 48 7:5:0
062 15-06-85 100% TTTT 7 S02:53/W055:56 47 7:5:0
062 01-07-85  70% 6866 7 S02:53/W055:57 46 7:5:0
062 17-07-85  60% 9762 8 S02:53/W055:57 47 8:5:0
062 02-08-85  30% 3401 7 S02:53/W055:57 48 7:5:0
062 18-08-85  50% 2T13 7 S02:53/W055:56 50 7:5:0
062 03-09-85  70% 7966 8 S02:53/W055:56 53 8:5:0
062 05-10-85  40% 1515 7 S02:53/W055:56 57 7:4:0
062 21-10-85  80% 64TT 8 S02:53/W055:56 57 8:4:0
```

062 06-11-85 70% 8398 8 S02:53/W055:56 56 8:5:0
062 08-12-85 100% TTTT 1 S02:53/W055:56 52 1:5:0

063 07-02-85 100% TTTT 6 S04:20/W056:13 50 6:4:0
063 23-02-85 100% TTTT 2 S04:20/W056:13 51 2:5:0
063 27-03-85 100% TTTT 3 S04:20/W056:13 53 3:4:0
063 14-05-85 100% TTTT 5 S04:20/W056:12 49 5:4:0
063 30-05-85 80% TT48 8 S04:20/W056:13 47 8:5:0
063 15-06-85 100% TTT9 8 S04:20/W056:14 45 8:5:0
063 01-07-85 30% 3100 6 S04:20/W056:15 45 6:5:0
063 17-07-85 10% 1111 8 S04:20/W056:15 46 8:5:0
063 02-08-85 10% 0000] S04:20/W056:15 47 7:5:0
063 18-08-85 30% 1231 7 S04:20/W056:15 50 7:5:0
063 03-09-85 90% 979T 8 S04:20/W056:14 53 8:5:0
063 05-10-85 70% 4766 6 S04:20/W056:14 57 6:4:0
063 21-10-85 100% TTTT 3 S04:20/W056:15 58 3:4:0
063 06-11-85 100% 99TT 8 S04:20/W056:15 57 8:5:0
063 08-12-85 100% TTT9 8 S04:20/W056:14 52 8:5:0

1986

227

062 18-01-86 100% TTTT 7 S02:53/W054:23 48 7:2:0
062 03-02-86 100% TTTT 2 S02:53/W054:23 49 2:5:0
062 19-02-86 100% TTTT 0 S02:53/W054:22 50 0:4:0
062 07-03-86 100% TTTT 0 S02:53/W054:22 51 0:5:0
062 23-03-86 100% 9T9T 7 S02:53/W054:24 52 7:5:0
062 08-04-86 100% TTTT 2 S02:53/W054:25 52 2:5:0
062 24-04-86 100% 8TTT 6 S02:53/W054:26 51 6:5:0
062 10-05-86 100% TTTT 5 S02:53/W054:27 49 5:5:0
062 26-05-86 100% TT9T 7 S02:53/W054:27 47 7:5:0
062 11-06-86 90% T988 8 S02:53/W054:27 46 8:5:0
062 27-06-86 60% 9583 8 S02:53/W054:26 45 8:4:0
062 13-07-86 40% 3911 8 S02:53/W054:26 45 8:4:0
062 29-07-86 30% 2524 8 S02:53/W054:25 46 8:4:0
062 14-08-86 10% 1301 8 S02:53/W054:23 48 8:4:0
062 30-08-86 60% 4414 5 S02:53/W054:22 50 5:5:0
062 15-09-86 80% 4T9T 8 S02:53/W054:23 53 8:4:0
062 01-10-86 90% T999 7 S02:53/W054:24 55 7:4:0
062 17-10-86 30% 1227 8 S02:53/W054:25 55 8:5:0
062 02-11-86 50% 3476 8 S02:53/W054:25 54 8:5:0
062 18-11-86 100% TTTT 7 S02:53/W054:25 52 7:5:0
062 04-12-86 100% TTTT 6 S02:53/W054:28 50 6:5:0
062 20-12-86 90% 8T99 7 S02:53/W054:26 48 7:5:0

063 18-01-86 100% TTTT 5 S04:20/W054:41 49 5:2:0
063 03-02-86 90% T8T9 7 S04:20/W054:41 49 7:5:0
063 19-02-86 100% TTTT 2 S04:20/W054:41 50 2:4:0

```
063 07-03-86 100% TTTT 0 S04:20/W054:41 51 0:5:0
063 23-03-86 100% TTTT 7 S04:20/W054:42 51 7:5:0
063 08-04-86 100% TTTT 2 S04:20/W054:43 51 2:5:0
063 24-04-86 100% TTTT 3 S04:20/W054:44 50 3:5:0
063 10-05-86  80% T976 8 S04:20/W054:45 48 8:4:0
063 26-05-86 100% 9TT9 7 S04:20/W054:45 46 7:4:0
063 11-06-86  10% 3110 8 S04:20/W054:45 45 8:4:0
063 27-06-86  40% 7151 8 S04:20/W054:45 44 8:4:0
063 13-07-86   0% 0100 8 S04:20/W054:44 44 8:4:0
063 29-07-86  50% 7921 8 S04:20/W054:43 45 8:4:0
063 14-08-86   0% 0000 8 S04:20/W054:42 47 8:4:0
063 30-08-86  70% 0274 3 S04:20/W054:41 50 3:5:0
063 15-09-86  80% 9T34 5 S04:20/W054:41 53 5:4:0
063 01-10-86  80% 7979 8 S04:20/W054:42 55 8:4:0
063 17-10-86  40% 1735 8 S04:20/W054:43 55 8:5:0
063 02-11-86  70% 3889 8 S04:20/W054:44 55 8:5:0
063 18-11-86 100% TTTT 7 S04:20/W054:44 53 7:5:0
063 04-12-86 100% TTTT 2 S04:20/W054:46 51 2:5:0
063 20-12-86 100% TTTT 7 S04:20/W054:45 49 7:5:0

228

062 25-01-86 100% TTTT 7 S02:53/W055:55 48 7:5:0
062 10-02-86 100% TTTT 2 S02:53/W055:55 49 2:5:0
062 26-02-86 100% TTTT 3 S02:53/W055:55 50 3:3:0
062 14-03-86 100% T9T9 6 S02:53/W055:56 51 6:5:0
062 15-04-86 100% 99TT 7 S02:53/W055:58 51 7:5:0
062 01-05-86 100% TTTT 4 S02:53/W055:59 50 4:4:0
062 17-05-86  90% 99T8 8 S02:53/W056:00 48 8:5:0
062 02-06-86 100% TTTT 1 S02:53/W056:00 46 1:5:0
062 18-06-86  20% 1411 8 S02:53/W055:59 45 8:4:0
062 04-07-86  70% 8T38 8 S02:53/W055:59 45 8:4:0
062 20-07-86  50% 3735 7 S02:53/W055:58 45 7:5:0
062 05-08-86  30% 3601 7 S02:53/W055:57 47 7:5:0
062 21-08-86  90% 88T9 8 S02:53/W055:56 49 8:4:0
062 06-09-86  70% 8948 8 S02:53/W055:55 52 8:4:0
062 08-10-86  80% 869T 7 S02:53/W055:57 55 7:5:0
062 24-10-86  90% 9T99 6 S02:53/W055:58 55 6:5:0
062 09-11-86  90% 97TT 8 S02:53/W055:58 54 8:5:0
062 11-12-86  70% 7849 8 S02:53/W056:00 49 8:5:0
062 27-12-86 100% T9TT 7 S02:53/W055:58 48 7:5:0

063 25-01-86 100% TTTT 3 S04:20/W056:14 49 3:5:0
063 10-02-86 100% TTTT 0 S04:20/W056:13 49 0:5:0
063 26-02-86  80% T975 8 S04:20/W056:13 50 8:3:0
063 14-03-86 100% TTTT 0 S04:20/W056:14 51 0:5:0
063 15-04-86 100% TTTT 7 S04:20/W056:17 51 7:4:0
063 01-05-86 100% T9T9 8 S04:20/W056:17 49 8:4:0
063 17-05-86  70% 8587 8 S04:20/W056:18 47 8:5:0
063 02-06-86 100% TTTT 5 S04:20/W056:18 45 5:4:0
063 18-06-86  40% 6143 7 S04:20/W056:18 44 7:4:0
063 04-07-86  60% 44T7 8 S04:20/W056:17 44 8:4:0
```

063 20-07-86 20% 2201 7 S04:20/W056:16 44 7:5:0
063 05-08-86 0% 0000 8 S04:20/W056:15 46 8:4:0
063 21-08-86 90% T9T8 8 S04:20/W056:14 48 8:4:0
063 06-09-86 90% 6T9T 7 S04:20/W056:13 51 7:4:0
063 08-10-86 90% 8T9T 6 S04:20/W056:15 55 6:5:0
063 24-10-86 100% 9TTT 7 S04:20/W056:16 55 7:5:0
063 09-11-86 100% TTTT 5 S04:20/W056:16 54 5:5:0
063 11-12-86 70% 5935 6 S04:20/W056:19 50 6:5:0
063 27-12-86 90% 0000 1 S04:20/W056:17 48 1:5:0

1987

227

062 05-01-87 100% TTTT 5 S02:53/W054:24 47 5:5:0
062 21-01-87 100% T9T9 5 S02:53/W054:22 47 5:5:0
062 06-02-87 100% TT9T 7 S02:53/W054:21 47 7:5:0
062 10-03-87 90% 7T9T 5 S02:53/W054:23 50 5:5:0
062 26-03-87 100% T9TT 7 S02:53/W054:24 51 7:5:0
062 11-04-87 100% 9TTT 8 S02:53/W054:25 51 8:5:0
062 27-04-87 100% T9TT 7 S02:53/W054:25 50 7:5:0
062 13-05-87 80% T489 8 S02:53/W054:25 49 8:5:0
062 29-05-87 90% 9T99 8 S02:53/W054:24 47 8:5:0
062 14-06-87 100% 9TTT 7 S02:53/W054:23 46 7:5:0
062 30-06-87 60% 8T23 8 S02:53/W054:22 45 8:5:0
062 16-07-87 70% 288T 8 S02:53/W054:19 46 8:5:0
062 01-08-87 90% 9999 7 S02:53/W054:20 47 7:5:0
062 17-08-87 90% 7T8T 8 S02:53/W054:21 49 8:5:0
062 18-09-87 70% 3869 8 S02:53/W054:22 55 8:5:0
062 20-10-87 70% 5913 4 S02:53/W054:21 57 4:5:0
062 05-11-87 100% 9TTT 5 S02:53/W054:21 56 5:5:0
062 21-11-87 100% 99TT 6 S02:53/W054:21 54 6:5:0
062 07-12-87 70% 1618 4 S02:53/W054:21 52 4:5:0
062 23-12-87 100% TTTT 3 S02:53/W054:20 50 3:5:0

063 05-01-87 90% 89TT 7 S04:20/W054:43 48 7:5:0
063 21-01-87 100% TTTT 3 S04:20/W054:40 47 3:5:0
063 06-02-87 100% TTTT 5 S04:20/W054:40 48 5:5:0
063 10-03-87 80% 9T39 7 S04:20/W054:42 50 7:5:0
063 26-03-87 100% TTTT 5 S04:20/W054:43 50 5:5:0
063 11-04-87 100% 99TT 8 S04:20/W054:43 50 8:5:0
063 27-04-87 100% TTTT 4 S04:20/W054:44 49 4:5:0
063 13-05-87 20% 2311 8 S04:20/W054:44 48 8:5:0
063 29-05-87 60% 5883 8 S04:20/W054:43 46 8:5:0
063 14-06-87 100% TTTT 5 S04:20/W054:42 44 5:5:0
063 30-06-87 10% 1121 8 S04:20/W054:40 44 8:5:0
063 16-07-87 90% 8T79 8 S04:20/W054:38 44 8:5:0
063 01-08-87 70% 8947 8 S04:20/W054:38 46 8:5:0

063 17-08-87 80% T965 5 S04:20/W054:39 49 5:5:0
063 18-09-87 70% 4T48 7 S04:20/W054:40 55 7:5:0
063 20-10-87 60% 1351 4 S04:20/W054:39 57 4:5:0
063 05-11-87 90% TT79 5 S04:20/W054:39 57 5:5:0
063 21-11-87 90% 8T9T 7 S04:20/W054:40 55 7:5:0
063 07-12-87 80% 3919 4 S04:20/W054:39 52 4:5:0
063 23-12-87 100% TTTT 0 S04:20/W054:39 51 0:5:0

228

062 12-01-87 90% 8899 8 S02:53/W055:56 47 8:5:0
062 13-02-87 100% 99TT 5 S02:53/W055:55 48 5:5:0
062 01-03-87 90% 999T 6 S02:53/W055:56 49 6:5:0
062 17-03-87 100% TTTT 3 S02:53/W055:56 50 3:5:0
062 02-04-87 80% 669T 8 S02:53/W055:57 51 8:5:0
062 18-04-87 100% TTTT 5 S02:53/W055:58 51 5:5:0
062 04-05-87 90% 99T9 7 S02:53/W055:58 50 7:5:0
062 20-05-87 50% 2458 7 S02:53/W055:57 48 7:5:0
062 05-06-87 90% 9T89 7 S02:53/W055:57 46 7:5:0
062 21-06-87 90% T999 7 S02:53/W055:55 45 7:5:0
062 07-07-87 90% 999T 7 S02:53/W055:53 45 7:5:0
062 23-07-87 50% 6714 8 S02:53/W055:52 46 8:5:0
062 08-08-87 80% 7899 7 S02:53/W055:53 48 7:5:0
062 24-08-87 40% 4325 8 S02:53/W055:54 51 8:5:0
062 09-09-87 30% 4322 8 S02:53/W055:54 54 8:5:0
062 25-09-87 90% TT77 4 S02:53/W055:54 56 4:5:0
062 11-10-87 50% 2342 6 S02:53/W055:54 57 6:5:0
062 12-11-87 70% 4318 4 S02:53/W055:54 55 4:5:0
062 28-11-87 90% T879 4 S02:53/W055:54 53 4:5:5
062 14-12-87 90% T9T4 3 S02:53/W055:53 51 3:5:0
062 30-12-87 90% 9T99 7 S02:53/W055:53 49 7:5:0

063 12-01-87 90% 99T9 8 S04:20/W056:14 47 8:5:0
063 13-02-87 100% TTTT 3 S04:20/W056:13 48 3:5:0
063 01-03-87 100% TTTT 7 S04:20/W056:14 49 7:5:0
063 17-03-87 100% TTT8 7 S04:20/W056:15 50 7:5:0
063 02-04-87 100% TTTT 5 S04:20/W056:16 51 5:5:0
063 18-04-87 90% T897 8 S04:20/W056:16 50 8:5:0
063 04-05-87 100% TTT8 8 S04:20/W056:16 49 8:5:0
063 20-05-87 60% 5865 8 S04:20/W056:16 47 8:5:0
063 05-06-87 40% 7324 8 S04:20/W056:15 45 8:5:0
063 21-06-87 100% TTT8 8 S04:20/W056:14 44 8:5:0
063 07-07-87 100% TTT8 8 S04:20/W056:12 44 8:5:0
063 23-07-87 10% 0110 8 S04:20/W056:10 45 8:5:0
063 08-08-87 100% 99TT 8 S04:20/W056:11 47 8:5:0
063 24-08-87 20% 2212 8 S04:20/W056:12 50 8:5:0
063 09-09-87 40% 0201 5 S04:20/W056:13 53 5:5:0
063 25-09-87 90% 8878 4 S04:20/W056:13 56 4:5:0
063 11-10-87 80% T396 6 S04:20/W056:12 57 6:5:0
063 12-11-87 80% 4998 5 S04:20/W056:12 56 5:5:0
063 28-11-87 90% 79T6 5 S04:20/W056:12 54 5:5:0
063 14-12-87 90% T366 3 S04:20/W056:12 52 3:5:0

228

062 15-01-88 100% TTT9 8 S02:53/W055:54 49 8:5:0
062 31-01-88 100% TTTT 2 S02:53/W055:55 49 2:5:0
062 16-02-88 100% T9T9 7 S02:53/W055:56 50 7:5:0
062 03-03-88 70% 5869 8 S02:53/W055:56 52 8:5:0
062 19-03-88 60% 7845 8 S02:53/W055:56 53 8:5:0
062 04-04-88 90% 6T9T 7 S02:53/W055:56 53 7:4:0
062 20-04-88 100% TTTT 0 S02:53/W055:55 52 0:4:0
062 22-13-88 90% T978 8 S02:53/W055:57 49 8:4:0
062 07-06-88 80% 9887 7 S02:53/W055:57 47 7:4:0
062 23-06-88 90% TT78 8 S02:53/W055:57 46 8:4:0
062 09-07-88 80% 8T39 8 S02:53/W055:57 46 8:4:0
062 25-07-88 30% 2021 6 S02:53/W055:57 47 6:4:0
062 10-08-88 70% 9932 6 S02:53/W055:56 49 6:4:0
062 26-08-88 80% 4605 3 S02:53/W055:57 52 3:4:0
062 11-09-88 60% 4847 7 S02:53/W055:57 55 7:4:0
062 27-09-88 80% 88T7 7 S02:53/W055:55 57 7:4:0
062 13-10-88 *% **** * S02:53/W055:54 58 0:0:0
062 29-10-88 80% 7868 7 S02:53/W055:55 57 7:4:0
062 14-11-88 100% TTTT 5 S02:53/W055:57 56 5:4:0

063 15-01-88 100% TTT9 8 S04:20/W056:12 49 8:5:0
063 31-01-88 100% TTTT 3 S04:20/W056:13 50 3:5:0
063 16-02-88 100% TTTT 5 S04:20/W056:14 50 5:5:0
063 03-03-88 80% 8776 6 S04:20/W056:14 52 6:5:0
063 19-03-88 70% 5779 7 S04:20/W056:14 52 7:5:0
063 04-04-88 100% 9TTT 7 S04:20/W056:14 52 7:4:0
063 20-04-88 100% TTTT 4 S04:20/W056:14 51 4:4:0
063 22-13-88 100% TTTT 7 S04:20/W056:15 48 7:4:0
063 07-06-88 60% 7395 8 S04:20/W056:15 46 8:4:0
063 23-06-88 60% 7917 8 S04:20/W056:16 45 8:4:0
063 09-07-88 70% 4885 7 S04:20/W056:16 45 7:4:0
063 25-07-88 30% 1000 6 S04:20/W056:16 46 6:4:0
063 10-08-88 30% 0000 6 S04:20/W056:15 49 6:4:0
063 26-08-88 60% 3211 4 S04:20/W056:15 51 4:4:0
063 11-09-88 80% 6663 3 S04:20/W056:15 54 3:4:0
063 27-09-88 70% 8912 5 S04:20/W056:13 57 5:4:0
063 13-10-88 *% **** * S04:20/W056:13 58 0:0:0
063 29-10-88 80% 7768 6 S04:20/W056:14 58 6:4:0
063 14-11-88 100% 9TT9 6 S04:20/W056:15 56 6:4:0

1898

227

062 10-JAN-89 100% TTTT 1 S02:53/W054:24 49 1:4:0
062 26-JAN-89 90% T7T9 7 S02:53/W054:22 49 7:4:0
062 27-FEB-89 100% 9TTT 6 S02:53/W054:26 51 6:4:0
062 15-MAR-89 100% TTTT 1 S02:53/W054:21 52 1:4:0

062	31-MAR-89	100%	TT9T	7	S02:53/W054:20	53	7:4:0
062	16-APR-89	100%	8TTT	7	S02:53/W054:25	52	7:4:0
062	02-MAY-89	100%	9TTT	7	S02:53/W054:25	51	7:4:0
062	18-MAY-89	90%	9T8T	7	S02:53/W054:24	49	7:4:0
062	03-JUN-89	100%	TTTT	5	S02:53/W054:26	47	5:4:0
062	19-JUN-89	80%	9T65	6	S02:53/W054:24	46	6:4:0
062	05-JUL-89	100%	8TTT	7	S02:53/W054:25	46	7:3:0
062	21-JUL-89	100%	TTT8	8	S02:53/W054:25	46	8:4:0
062	06-AUG-89	60%	9943	8	S02:53/W054:25	48	8:4:0
062	22-AUG-89	30%	2302	7	S02:53/W054:25	50	7:4:0
062	07-SEP-89	40%	2415	7	S02:53/W054:25	53	7:4:0
062	23-SEP-89	100%	9TTT	7	S02:53/W054:24	55	7:4:0
062	09-OCT-89	100%	9TTT	7	S02:53/W054:26	57	7:4:0
062	25-OCT-89	90%	89TT	7	S02:53/W054:21	56	7:4:0
062	10-NOV-89	100%	9T9T	6	S02:53/W054:23	55	6:4:0
062	26-NOV-89	100%	9TTT	5	S02:53/W054:23	52	5:4:0
062	12-DEC-89	100%	9T9T	7	S02:53/W054:24	50	7:4:0
062	28-DEC-89	100%	TTTT	0	S02:53/W054:24	48	0:4:0
063	10-JAN-89	100%	TTTT	1	S04:20/W054:43	50	1:4:0
063	26-JAN-89	100%	T9TT	7	S04:20/W054:41	50	7:4:0
063	27-FEB-89	100%	TTTT	3	S04:20/W054:44	51	3:4:0
063	15-MAR-89	100%	TTTT	2	S04:20/W054:39	52	2:4:0
063	31-MAR-89	100%	9TT9	7	S04:20/W054:39	52	7:4:0
063	16-APR-89	100%	TTTT	7	S04:20/W054:43	51	7:4:0
063	02-MAY-89	100%	TTTT	7	S04:20/W054:43	50	7:4:0
063	18-MAY-89	80%	4989	7	S04:20/W054:42	48	7:4:0
063	03-JUN-89	100%	TTTT	7	S04:20/W054:44	46	7:4:0
063	19-JUN-89	30%	2501	7	S04:20/W054:42	45	7:4:0
063	05-JUL-89	70%	9T52	7	S04:20/W054:43	44	7:2:0
063	21-JUL-89	40%	8521	8	S04:20/W054:43	45	8:4:0
063	06-AUG-89	10%	0100	7	S04:20/W054:43	47	7:4:0
063	06-AUG-89	0%	0100	8	S04:21/W054:43	47	8:6:4
063	22-AUG-89	30%	1210	6	S04:20/W054:43	50	6:4:0
063A	22-AUG-89	10%	1111	8	S03:52/W055:03	50	8:6:6 8:0:6
063A	22-AUG-89	20%	0111	7	S03:52/W055:03	50	7:6:4
063	07-SEP-89	70%	3979	7	S04:20/W054:43	53	7:4:0
063	23-SEP-89	100%	TTTT	6	S04:20/W054:42	55	6:4:0
063	09-OCT-89	100%	9T9T	7	S04:20/W054:44	57	7:4:0
063	25-OCT-89	100%	9T9T	5	S04:20/W054:40	57	5:4:0
063	10-NOV-89	100%	TTTT	5	S04:20/W054:42	55	5:4:0
063	26-NOV-89	100%	TTTT	3	S04:20/W054:41	53	3:4:0
063	12-DEC-89	100%	TTTT	5	S04:20/W054:43	51	5:4:0
063	28-DEC-89	100%	TTTT	1	S04:20/W054:43	49	1:4:0
228							
062	01-JAN-89	100%	T9TT	7	S02:53/W055:57	50	7:4:0
062	17-JAN-89	90%	9999	8	S02:53/W055:56	49	8:4:0
062	02-FEB-89	100%	TTTT	0	S02:53/W055:57	49	0:4:0
062	22-MAR-89	100%	TTT9	5	S02:53/W055:50	53	5:4:0
062	07-APR-89	80%	8T5T	7	S02:53/W055:57	53	7:4:0

062	23-APR-89	100%	TTTT	2	S02:53/W055:57	52	2:4:0
062	09-MAY-89	100%	TTTT	0	S02:53/W055:58	50	0:4:0
062	25-MAY-89	100%	TTT9	5	S02:53/W055:58	48	5:4:0
062	10-JUN-89	70%	9T32	7	S02:53/W055:58	46	7:4:0
062	26-JUN-89	60%	6626	7	S02:53/W055:58	46	7:4:0
062	28-JUL-89	10%	0100	7	S02:53/W055:58	47	7:4:0
062	28-JUL-89	10%	0101	8	S02:54/W055:58	47	8:6:4
062	13-AUG-89	70%	6837	7	S02:53/W055:57	49	7:4:0
062	29-AUG-89	90%	98TT	7	S02:53/W055:58	52	7:4:0
062	14-SEP-89	20%	1301	7	S02:53/W055:54	54	7:4:0
062	30-SEP-89	100%	TTTT	4	S02:53/W055:58	56	4:4:0
062	16-OCT-89	90%	8827	3	S02:53/W055:56	57	3:4:0
062	01-NOV-89	100%	TTTT	2	S02:53/W055:56	56	2:4:0
062	17-NOV-89	100%	T9TT	5	S02:53/W055:54	54	5:5:0
062	03-DEC-89	80%	378T	6	S02:53/W055:57	51	6:4:0
062	19-DEC-89	100%	TTTT	3	S02:53/W055:57	49	3:4:0
063	01-JAN-89	100%	TTTT	7	S04:20/W056:16	50	7:4:0
063	17-JAN-89	90%	9T99	7	S04:20/W056:14	49	7:4:0
063	02-FEB-89	100%	TTTT	1	S04:20/W056:16	50	1:4:0
063	22-MAR-89	100%	T9TT	5	S04:20/W056:09	52	5:4:0
063	07-APR-89	100%	9T9T	7	S04:20/W056:15	52	7:4:0
063	23-APR-89	100%	TTTT	3	S04:20/W056:15	51	3:4:0
063	09-MAY-89	100%	TTTT	4	S04:20/W056:16	49	4:4:0
063	25-MAY-89	90%	T999	6	S04:20/W056:16	47	6:4:0
063	10-JUN-89	50%	2166	7	S04:20/W056:16	45	7:4:0
063	26-JUN-89	40%	0218	7	S04:20/W056:16	45	7:4:0
063	28-JUL-89	10%	0000	7	S04:20/W056:16	46	7:4:0
063	13-AUG-89	70%	23T9	7	S04:20/W056:16	48	7:4:0
063	29-AUG-89	80%	9T57	7	S04:20/W056:16	51	7:4:0
063	14-SEP-89	40%	0001	5	S04:20/W056:13	54	5:3:0
063	30-SEP-89	100%	TTTT	5	S04:20/W056:17	56	5:4:0
063	16-OCT-89	80%	T323	3	S04:20/W056:14	57	3:4:0
063	01-NOV-89	100%	TT9T	5	S04:20/W056:15	56	5:4:0
063	17-NOV-89	100%	TTTT	0	S04:20/W056:12	54	0:5:0
063	03-DEC-89	100%	TTTT	5	S04:20/W056:15	52	5:4:0
063	19-DEC-89	100%	TTTT	3	S04:20/W056:16	50	3:4:0

1990

227

062	13-JAN-90	80%	3989	6	S02:53/W054:24	47	6:4:0
062	29-JAN-90	100%	TTTT	4	S02:53/W054:25	47	4:4:0
062	14-FEB-90	100%	9T9T	4	S02:53/W054:25	48	4:4:0
062	18-MAR-90	90%	7T9T	7	S02:53/W054:27	50	7:4:0
062	03-APR-90	100%	TTTT	5	S02:53/W054:22	50	5:4:0
062	19-APR-90	100%	9TTT	5	S02:53/W054:25	50	5:5:0
062	05-MAY-90	100%	89TT	5	S02:53/W054:24	49	5:5:0
062	21-MAY-90	100%	TT9T	7	S02:53/W054:25	47	7:5:0

062	06-JUN-90	90%	7TTT	7	S02:53/W054:25	45	7:5:0	
062	08-JUL-90	100%	TTTT	7	S02:53/W054:25	44	7:5:0	
062	24-JUL-90	100%	TTT9	5	S02:53/W054:24	45	5:5:0	
062	09-AUG-90	70%	4752	5	S02:53/W054:24	47	5:5:0	
062	25-AUG-90	100%	9TT9	7	S02:53/W054:24	49	7:5:0	
062	10-SEP-90	60%	2447	6	S02:53/W054:25	52	6:5:0	
062	10-SEP-90	40%	2336	8	S02:54/W054:25	52	8:7:4	8:7:4
062	26-SEP-90	80%	8499	8	S02:53/W054:25	54	8:5:0	
062	12-OCT-90	80%	5T8T	7	S02:53/W054:25	55	7:5:0	
062	28-OCT-90	100%	TTTT	6	S02:53/W054:25	55	6:5:0	
062	13-NOV-90	100%	TTT9	7	S02:53/W054:28	53	7:4:0	
062	29-NOV-90	100%	TTTT	5	S02:53/W054:28	51	5:5:0	
062	15-DEC-90	100%	TTTT	6	S02:53/W054:24	49	6:5:0	
062	31-DEC-90	90%	8T9T	6	S02:53/W054:25	47	6:5:0	
063	13-JAN-90	80%	9986	7	S04:20/W054:42	48	7:4:0	
063	29-JAN-90	100%	TTTT	2	S04:20/W054:43	48	2:4:0	
063	14-FEB-90	100%	TTTT	3	S04:20/W054:44	48	3:4:0	
063	18-MAR-90	100%	T99T	7	S04:20/W054:45	50	7:4:0	
063	03-APR-90	100%	TTTT	3	S04:20/W054:40	50	3:4:0	
063	19-APR-90	100%	TTTT	6	S04:20/W054:43	49	6:5:0	
063	05-MAY-90	100%	99TT	5	S04:20/W054:42	48	5:5:0	
063	21-MAY-90	80%	9T83	7	S04:20/W054:44	46	7:5:0	
063	06-JUN-90	100%	TT99	7	S04:20/W054:43	44	7:5:0	
063	08-JUL-90	70%	9946	7	S04:20/W054:43	43	7:5:0	
063	24-JUL-90	80%	9958	6	S04:20/W054:43	44	6:5:0	
063	09-AUG-90	90%	T6T6	6	S04:20/W054:43	46	6:5:0	
063	25-AUG-90	100%	99TT	5	S04:20/W054:42	49	5:5:0	
063	10-SEP-90	70%	6828	6	S04:20/W054:43	52	6:5:0	
063	26-SEP-90	100%	TTT9	7	S04:20/W054:43	54	7:5:0	
063	12-OCT-90	100%	9T9T	7	S04:20/W054:43	55	7:5:0	
063	28-OCT-90	100%	TT9T	7	S04:20/W054:44	55	7:5:0	
063	13-NOV-90	100%	T9TT	7	S04:20/W054:47	54	7:5:0	
063	29-NOV-90	100%	TTTT	7	S04:20/W054:46	52	7:5:0	
063	15-DEC-90	100%	TTTT	6	S04:20/W054:43	49	6:5:0	
063	31-DEC-90	100%	TT99	6	S04:20/W054:43	48	6:4:0	
228								
062	04-JAN-90	90%	89TT	7	S02:53/W055:56	48	7:4:0	
062	20-JAN-90	90%	T8T9	6	S02:53/W055:57	47	6:4:0	
062	21-FEB-90	100%	TT9T	6	S02:53/W055:59	49	6:5:0	
062	09-MAR-90	90%	989T	7	S02:53/W055:59	50	7:4:0	
062	25-MAR-90	100%	TTTT	1	S02:53/W055:58	50	1:4:0	
062	10-APR-90	90%	99T9	6	S02:53/W055:56	50	6:4:0	
062	26-APR-90	100%	TTTT	0	S02:53/W055:57	49	0:5:0	
062	12-MAY-90	90%	79TT	7	S02:53/W055:58	48	7:5:0	
062	28-MAY-90	90%	9998	6	S02:53/W055:57	46	6:5:0	
062	13-JUN-90	100%	TTTT	3	S02:53/W055:57	45	3:5:0	
062	29-JUN-90	30%	3500	7	S02:53/W055:57	44	7:5:0	
062	31-JUL-90	100%	T8TT	5	S02:53/W055:57	46	5:5:0	
062	16-AUG-90	50%	4812	6	S02:53/W055:57	48	6:5:0	

062	01-SEP-90	60%	9925	8	S02:53/W055:56	51	8:5:0
062	17-SEP-90	70%	T782	7	S02:53/W055:58	53	7:5:0
062	19-OCT-90	80%	389T	5	S02:53/W055:57	55	5:5:0
062	04-NOV-90	50%	1217	6	S02:53/W055:59	54	6:5:0
062	06-DEC-90	100%	TTT9	5	S02:53/W055:58	50	5:4:0
062	22-DEC-90	90%	5TTT	6	S02:53/W055:57	48	6:5:0
063	04-JAN-90	80%	9T56	7	S04:20/W056:14	48	7:4:0
063	20-JAN-90	100%	TTTT	6	S04:20/W056:16	48	6:4:0
063	21-FEB-90	100%	T9TT	6	S04:20/W056:17	49	6:5:0
063	09-MAR-90	90%	T998	7	S04:20/W056:17	50	7:4:0
063	25-MAR-90	100%	TTTT	3	S04:20/W056:16	50	3:4:0
063	10-APR-90	90%	T798	6	S04:20/W056:15	50	6:4:0
063	26-APR-90	100%	TTTT	0	S04:20/W056:15	49	0:5:0
063	12-MAY-90	90%	TTT6	7	S04:20/W056:16	47	7:5:0
063	28-MAY-90	90%	97T9	7	S04:20/W056:15	45	7:5:0
063	13-JUN-90	90%	9T97	6	S04:20/W056:16	44	6:5:0
063	29-JUN-90	30%	1242	7	S04:20/W056:16	43	7:5:0
063	31-JUL-90	100%	TTTT	3	S04:20/W056:15	45	3:5:0
063	16-AUG-90	40%	1213	6	S04:20/W056:15	47	6:5:0
063	01-SEP-90	20%	3131	8	S04:20/W056:15	50	8:5:0
063	17-SEP-90	30%	2332	7	S04:20/W056:16	53	7:5:0
063	19-OCT-90	70%	8T35	6	S04:20/W056:16	55	6:5:0
063	04-NOV-90	50%	1802	6	S04:20/W056:17	55	6:5:0
063	06-DEC-90	100%	T9TT	5	S04:20/W056:17	51	5:4:0
063	22-DEC-90	90%	9T8T	6	S04:20/W056:16	49	6:5:0

Anexo 4. Available Digital Data.

SUDAM has digitized or in the process of digitizing into SGI software the following map layers for the Tapajos National Forest at a scale of 1:100.000:

Soils	compteted
Vegetation	completed
Deforestation	
Geomorphology	
Hydrology	completed
Climate	
Roads	completed
Administrative Boundaries	completed.

Other locations with these layers digitzed are:

Floresta Nacional do Tapirape
Area de Protecao Ambiental do Tapirape
Reserva Biologica do Tapirape
Reserva Biologica do Trombetas.

SUDAM has also digitized into SGI the information for the Plano de Desenvolvimento da Amazonia at 1:1.200.000.

The United States Geological Survey's EROS Data Center in Souix Falls, SD has the following information digitzed in ARC/INFO format:

Mapa do Vegetacao do Brasil at 1:5.000.000 (also available from the World Conservation Monitoring Centre)

FAO Soil map of the World at 1:5.000.000.

(see attached documentation from Dr. Norman Bliss from the EROS Data Center).

The World Conservation Monitoring Centre, Cambridge, England, has information in ARC/INFO format for South America, including Brazil (see telefax from Clare Billington).

IBGE in Salvador has digitized into their Intergraph System some of the maps derived from Project RADAM and other special projects like PMACI1. These maps are a valuable asset. Map scales are between 1:250.000 and 1:1.000.000.

The army cartographic section in Brasilia, CCAuEx, prepares topographic maps using their Intergraph System. Perhaps, digitial maps may be obtained from them.

HUGHES STX CORPORATION
Contractor for the USGS EROS Data Center
HUGHES

RE: OAB7-64

July 16, 1992

Mr. Robert W. Klaver
GIS Consultant
Forest Management Planning
TCP/BRA/0154
Brazil

Dear Mr. Klaver:

Thank you for your fax message of June 5, 1992. I am sorry for the delay in replying.

The EROS Data Center (EDC) has digitized vegetation and soil maps for Brazil at the 1:5,000,000 scale. We also have a digital copy of the 1:5,000,000-scale Food and Agriculture Organization (FAO) Soil Map of the World. One sheet of a more detailed soil map was also digitized. As part of a SOTER pilot study, a portion of southern Brazil, Argentina, and Uruguay was mapped and digitized at 1:1,000,000-scale. We also digitized some maps of deforested areas as delineated from Landsat interpretations.

I am enclosing a copy of the documentation for the vegetation data set. I will be ready to distribute the Brazil soil data set as soon as I complete similar documentation. The FAO Soil Map of the World data was received from Environmental Systems Research Institute (ESRI), and was reprojected at EDC. A sheet describing the available attributes is enclosed. The other data sets that we have digitized have not been prepared for distribution, but could be made available if a high priority need is identified.

To request copies of the data, please give me a complete mailing address, and a request on letterhead specifying the data sets. I will be able to provide them to you at no cost as Arc/Info export files on diskette or tape. Please specify the type of media that you require.

At the present time, I have not made contact with the authors of these maps, and I have only distributed the digital data on an informal basis to other scientists. If it is appropriate, I would like to advertise the availability of these data more widely, perhaps through the United Nations Environment Program Global Resource Information Database (UNEP/GRID). An office of UNEP/GRID has been established at the EDC, which would make this easy to do. I would like your assistance in arranging for permission to distribute these data.

You may want to contact Dr. Jan van Roessel, ESRI. He was formerly an employee of the EDC. He has authored several papers that may be of interest to you. I only have copies of the review drafts, so you should contact him for the published citations or reprints. ESRI's address is 380 New York Street, Redlands, California 92373. The papers are "Statistical Overlay: An

South Dakota Operations
EROS Data Center Sioux Falls SD 57198
605 594-6572
FAX (605) 594-6589

experiment with AVHRR and IBAMA TM interpretations" and "First experiment for pilot test definition of large area forest monitoring methodology through sampling and use of Landsat and AVHRR imagery with application in Brazil."

I have cooperated with Dr. Philip Fearnside, working at INPA, to produce overlays and extract areas from the vegetation map, and maps of protected areas, indigenous areas, and state boundaries developed in conjunction with the Conservation International conference in Manaus in 1990. He is preparing a paper on this for publication, entitled "Identifying areas of biological importance in Brazilian Amazonia." His address is Department of Ecology, Instituto Nacional de Pesquisas da Amazonia, C.P. 478, 69.011 Manaus-Amazonas, Brazil (Fax: 55-92-236-3822).

My primary area of research at the present time is on methods to construct a global soil map of the world at 1:1,000,000 scale. As part of this effort, I am developing methods to generalize maps in the United States that are at 1:250,000 scale (the State Soil Geographic data base--STATSGO) to the 1:1,000,000 scale (to form the National Soil Geographic data base--NATSGO). When we are done with these procedures for North America, my next priority will be to work on South America. I am very interested in strengthening my contacts in Brazil for this purpose. It would be helpful if you could provide me with information on the primary agencies dealing with natural resource data in Brazil, and their areas of responsibility. Who would be most able to contribute to this type of effort? I will reverse the question that you are asking me! What paper maps are available, and which have been converted to digital form? In other words, I would like to know the results of your inquiries, and be prepared with a plan if we are able to find additional resources to devote to this project.

Sincerely,

Norman B. Bliss

Norman B. Bliss
Principal Scientist
Land Sciences Section

Enclosure

Copy to: T. Loveland

Date: June 18, 1992

To: Recipient of Data for Vegetation Map of Brazil

From: Dr. Norman B. Bliss
Principal Scientist
Land Sciences Section
EROS Data Center
Sioux Falls, South Dakota 57198

Tel: (605) 594-6034
Fax: (605) 594-6589
email: bliss@dgl.cr.usgs.gov

Subject: Documentation of Data for Vegetation Map of Brazil

This file is distributed with the data as BRVEGGEO11.README.

The MAPA DE VEGETACAO DO BRASIL was digitized at the U.S. Geological Survey's EROS Data Center, Sioux Falls, South Dakota. It was produced by:

Ministerio da Agricultura
Instituto Brasileiro de Desenvolvimento Florestal

Secretaria de Planejamento e Coordenacao
da Presidencia da Republica

Fundacao Instituto Brasileiro de Geografia
e Estatistica - IBGE

1988

Original scale 1:5,000,000

Original projection: Polyconic

The original map contains both vegetation codes and overprints. The Vegetation codes were digitized using the same one- or two-letter codes that are used on the legend of the published map. The overprint codes were sequentially assigned in the order that they were encountered in the map legend:

OP	Overprint code
1	CAMPOS
2	CAMPANHA GAUCHA
3	CAMPOS DE RORAIMA
4	CAMP. GAUCHA
5	FLORESTA ATLANTICA
6	ATIVIDADES AGRICOLAS

Where there was no overprinting, an overprint code of zero (0) was used. In the ANTROPICA column, the legend defines the codes S, E, T, D, A, M, F, C, and P to indicate human influences, and the map is shaded with fine dots. These are not considered overprints because the vegetation codes uniquely identify these conditions, and the overprint code is zero (0). In some cases, such as where the D code is combined with FLORESTA ATLANTICA, then a non-zero overprint code is used.

Some of the polygons on the original map were not labeled. The code NOLAB was entered for the vegetation code. This is discussed in more detail below.

Water was coded as WATER for the vegetation code. The polygons for the rivers and the Lagoa dos Patos were arbitrarily closed at the contact with the Atlantic Ocean. The polygons for the Amazon river were arbitrarily split so that the polygon shading in Arcplot would work properly. If these arbitrary lines are a problem in Arcplot, then the Arc BUILD command could be used to create an Arc Attribute Table (AAT), the arbitrary arcs could be labeled, and the RESELECT command in Arcplot could be used to suppress plotting the arcs.

Following digitizing, the map was reprojected into Geographic (latitude-longitude) coordinates. Since then, the following updates have been made:

a. Plots were made to compare the data with the original map. Some polygons were corrected, using the VEG2 and OP2 items. Thus, the items VEG2 and OP2 should be used if fidelity to the original map is a primary concern. (December 1991)

b. The polygons that were digitized as having no label (NOLAB) were identified, and Norman Bliss made a "best guess" as to the probable vegetation type of these data. These revisions were coded in VEG3 and OP3. Use of these codes is optional, or the user may wish to make his or her own interpretation based on the original map or other data sources. There is considerable confusion on the original map in the area of 49.5 degrees West, 7.5 degrees South. (December 1991)

c. Seven polygons with codes D or Dm were identified by Liane Guild (NASA Ames) that should have overprint code of 5 (indicating Atlantic forest rather than Amazon forest). Five of these were correctly shown on the map, and the OP2 item was corrected to reflect this. For two polygons (BRVEGGEO11-ID 1808, 1870) it appears that the printed map is missing the overprints. All seven polygons were corrected by calculating OP4 = 5. VEG4 and OP4 now reflect the best estimate of the vegetation and overprint codes. (June 18, 1992)

The data are distributed as an Arc/Info interchange file. Arc/Info is is a proprietary geographic information system software package developed by the Environmental Systems Research Institute, Inc., Redlands, California.

The interchange file was created using the Arc/Info EXPORT command:

```
EXPORT COVER BRVEGGEO11D BRVEGGEO11D
```

The data can be read using the Arc/Info command:

```
IMPORT COVER BRVEGGEO11D BRVEGGEO11D
```

This will result in a coverage BRVEGGEO11D. This name connotes:

BR	BRazil
VEG	VEGetation
GEO	GEOgraphic coordinates (latitude-longitude)
11	Version 11 of the file
D	Distribution format

A distribution format for the data has been created that removes the additional items that were added at the EROS Data Center for our own processing, analysis, and plotting. Those items could confuse a user, and perhaps lead to erroneous results.

1. The follwing files are present in the coverage, with the size in bytes indicated:

arc	1409948
arx	48644
bnd	16
cnt	51480
cnx	17228
lab	68580
log	1310
pal	211104
pat	59948
pax	17228
tic	72
tol	36

2. The following files are present in the INFO directory. The INFO internal names may be different following the IMPORT.

```
ENTER COMMAND >DIR
TYPE NAME                          INTERNAL NAME     NO. RECS LENGTH EXTERN
 DF  BRVEGGEO11D.TIC                 ARC000DAT            -     12     XX
 DF  BRVEGGEO11D.BND                 ARC001DAT            1     16     XX
 DF  BRVEGGEO11D.PAT                 ARC002DAT         2141     28     XX
 DF  BRVEGGEO11D.NAME                ARC007DAT           94    186
```

3. The Arc/Info DESCRIBE command gives:

```
Arc: describe brveggeo11d
               Description of SINGLE precision coverage brveggeo11d

          ARCS                                POLYGONS

Arcs              =       6068          Polygons     =       2141
Segments          =     145891          Polygon Topology is present.
0     bytes of Arc Attribute Data         28    bytes of Polygon Attribute Data

          POINTS                              SECONDARY FEATURES

Label Points  =       2140                Tics         =          6
                                          Annotations  =          0
                                          Links        =          0
          TOLERANCES                          STATUS

Fuzzy     =             0.000 V           The coverage has not been Edited
Dangle    =             0.010 V           since the last BUILD or CLEAN.

                    COVERAGE BOUNDARY

Xmin =                  -73.979           Ymin =                -33.779
Xmax =                  -34.811           Ymax =                  5.230
```

4. The items in BRVEGGEO11D.PAT are:

```
ENTER COMMAND >SEL BRVEGGEO11D.PAT
```

```
2141 RECORD(S) SELECTED

ENTER COMMAND >ITEMS
DATAFILE NAME: BRVEGGEO11D.PAT                                  6/18/1992
   8 ITEMS: STARTING IN POSITION    1
COL   ITEM NAME           WDTH OPUT TYP N.DEC  ALTERNATE NAME
   1  AREA                   4   20  F     8
   5  PERIMETER              4   20  F     8
   9  BRVEGGEO11D#           4   10  B     -
  13  BRVEGGEO11D-ID         4   10  B     -
  17  VEG2                   5    5  C     -    CORRECT.TO.MAP
  22  OP2                    1    1  I     -
  23  VEG4                   5    5  C     -    UPDATE.JUNE92
  28  OP4                    1    1  I     -
**  REDEFINED ITEMS   ** 17  VEGOP2              6    6  C     -
  23  VEGOP4                 6    6  C     -
```

The item VEG1 was deleted from the coverage before distribution. It represents the vegetation code as originally digitized, before corrections were made in December 1991. Similarly, the OP1 code is obsolete.

VEG2 is the vegetation code as contained on the published map.
OP2 is the overprint code as digitized from the published map.
VEG4 is the vegetation code including the "best guess" for polygons that are not labeled on the original map.
OP4 is the overprint code including the "best guess" for polygons that are not labeled on the original map.
VEGOP2 is an item created with the INFO REDEFINE command, that includes both the vegetation code VEG2 and the overprint code OP2 as a single item.
VEGOP4 is a redefined item that includes VEG4 and OP4 as a single item.

5. The INFO file BRVEGGEO11D.NAME contains text items that identify the coded legend categories. Because the vegetation codes and overprint codes are both necessary for an appropriate understanding of the legend, the redefined items VEGOP2 or VEGOP4 should be used for linking this file with the .PAT file. The items are:

```
ENTER COMMAND >SEL BRVEGGEO11D.NAME
    94 RECORD(S) SELECTED

ENTER COMMAND >ITEMS
DATAFILE NAME: BRVEGGEO11D.NAME                                 1/ 2/1992
   8 ITEMS: STARTING IN POSITION    1
COL   ITEM NAME           WDTH OPUT TYP N.DEC  ALTERNATE NAME
   1  NAME.ID                4    4  I     -
   5  VEG2                   5    5  C     -
  10  OP2                    1    1  I     -
  11  GROUP                  1    1  C     -
  12  GROUP.NAME            65   65  C     -
  97  SUBGROUP.NAME         20   20  C     -
 117  CLASS.NAME            40   40  C     -
 157  GROUP.SHORTNAME       30   30  C     -
     **  REDEFINED ITEMS  **
   5  VEG4                   5    5  C     -
  10  OP4                    1    1  I     -
   5  VEGOP2                 6    6  C     -
   5  VEGOP4                 6    6  C     -
```

NAME.ID is an identifier, used to sort the vegetation and overprint codes into the sequence used on the original map legend.
VEG2 is the vegetation code on the original published map.
OP2 is the overprint code on the original published map.
GROUP is a one character code that represents the major headings on the original published map.
GROUP.NAME is the full name of the major headings on the original map.
SUBGROUP.NAME is the name of the subgroups on the original map. These are often distinguished on the basis of the overprint code.
CLASS.NAME refers to the distinguishing type within the groups and subgroups. The class names by themselves do not uniquely define a legend category.
GROUP.SHORTNAME is an abbreviated version of the group name.
VEG4 is a redefined item that represents the vegetation code. It is designed to be related to the VEG4 item in BRVEGGEO14D.PAT (see below). The VEG4 item is implemented as a redefined item referencing the same data as VEG2.
OP4 is a redefined item for overprint codes to be used with VEG4.
VEGOP2 is a redefined item that combines VEG2 and OP2 into a single item. This is useful for relating the .NAME file to the .PAT file.
VEGOP4 is a redefined item that combines VEG4 and OP4 into a single item.

Records 92 and 93 of the file provide for the NOLAB vegetation code. They will be referenced if VEGOP2 is used, but will not be referenced if VEGOP4 is used as the relate item when relating to the .PAT (see below).

Record 94 of the file provides for the OFFMA vegetation code. This is a carryover from a previous analysis in which an OFFMAP category was defined after an overlay with another map, and may be ignored or purged.

3. The RELATE command in INFO may be used to relate the polygon attribute table BRVEGGEO11D.PAT to the names file BRVEGGEO11D.NAME in order to access the names associated with each polygon. For example, to use the codes referring to the original map (including NOLAB codes), the VEGOP2 item should be used as the relate item:

```
ENTER COMMAND >SELECT BRVEGGEO11D.PAT
  2141 RECORD(S) SELECTED

ENTER COMMAND >RELATE BRVEGGEO11D.NAME 1 BY VEGOP2

ENTER COMMAND >LIST VEGOP2,$1GROUP.NAME,$1SUBGROUP.NAME,$1CLASS.NAME
              1
VEGOP2          =     0
NO MATCH IN RELATED DATAFILE 1 FOR RECORD       1
GROUP.NAME      =
SUBGROUP.NAME   =
CLASS.NAME      =
              2
VEGOP2          =Dm   0
GROUP.NAME      =FLORESTA OMBROFILA DENSA
SUBGROUP.NAME   =FLORESTA AMAZONICA
CLASS.NAME      =Montana
              3
VEGOP2          =Tp   3
GROUP.NAME      =SAVANA ESTEPICA
SUBGROUP.NAME   =CAMPOS DE RORAIMA
```

```
CLASS.NAME       =Parque
                4
VEGOP2           =Ds    0
GROUP.NAME       =FLORESTA OMBROFILA DENSA
SUBGROUP.NAME    =FLORESTA AMAZONICA
CLASS.NAME       =Submontana
                5
VEGOP2           =Pf    0
GROUP.NAME       =AREAS DAS FORMACCES PIONERIAS
MORE?N

ENTER COMMAND >
```

The message:

```
   NO MATCH IN RELATED DATAFILE 1 FOR RECORD        1
```

is expected, and represents the "universe polygon" in the Arc/Info coverage.

To use the "best guess" values that do not contain the NOLAB code, use VEGOP4 as the relate item.

It is possible to use both items as relate items by doing two relates. This example illustrates some of the polygons that were recoded between VEG2 and VEG4.

```
ENTER COMMAND >SELECT BRVEGGEO11D.PAT
  2141 RECORD(S) SELECTED

ENTER COMMAND >RELATE BRVEGGEO11D.NAME 1 BY VEGOP2 RO

ENTER COMMAND >RELATE BRVEGGEO11D.NAME 2 BY VEGOP4 RO

ENTER COMMAND >RESELECT VEG2 = 'NOLAB'
    58 RECORD(S) SELECTED

ENTER COMMAND >LIST VEGOP2,VEGOP4,$1GROUP.SHORTNAME,$2GROUP.SHORTNAME
               96
VEGOP2           =NOLAB0
VEGOP4           =Da    0
GROUP.SHORTNAME =NO LABEL.
GROUP.SHORTNAME =FLORESTA OMBROFILA DENSA
              132
VEGOP2           =NOLAB0
VEGOP4           =D     0
GROUP.SHORTNAME =NO LABEL.
GROUP.SHORTNAME =FLORESTA OMBROFILA DENSA
              133
VEGOP2           =NOLAB0
VEGOP4           =LO    0
GROUP.SHORTNAME =NO LABEL.
GROUP.SHORTNAME =AREAS DE TENSAO ECOLOGICA
              137
VEGOP2           =NOLAB0
VEGOP4           =D     0
GROUP.SHORTNAME =NO LABEL.
GROUP.SHORTNAME =FLORESTA OMBROFILA DENSA
              145
VEGOP2           =NOLAB0
```

VEGOP4 =LO 0
MORE?N

ENTER COMMAND >

Suggestions on ways to improve this data base would be appreciated.

UNEP/FAO World and Africa Data Base
File Names, Locations, and Contents
FAO Soils of the World
(World except Africa 1:5,000,000)

POLYGON COVERAGES:	INCH	TRANSFORM
ESRI Tape(s)	Tape 1 and Tape AMERIC	Tape 2 and Tape AMERIC
FAO Disk Pack(s)	GIS2	GIS2
UFD(s)	SOIL.INCH	SOIL.TRANSFORM
ARC/INFO File(s)	SOILØ1.PAT SOIL19.PAT	SOILØ1.PAT SOIL19.PAT
ASCII Code File(s)	FAOSOIL.CODEØ1-FAOSOIL.CODE19	

Classification Variable Name	INFO Item Name	Entry Code Columns	INFO INCH Columns	INFO TRANSFORM Columns	INFO Item Definition
	AREA		1-4	1-4	4,12,F,3
	PERIMETER		5-8	5-8	4,12,F,3
	SOILnØ		9-12	9-12	4,5,B
Polygon Sequence Number	SOILn-ID	1-4	13-16	13-16	4,5,B
Soil Map Symbol	FAOSOIL	5-21	17-33	17-33	17,17,C
First Phase Type	PHASE1	22-23	34-35	34-35	2,2,C
Second Phase Type	PHASE2	24-25	36-37	36-37	2,2,C
First Miscellaneous Land Unit	MISCLU1	26	38	38	1,1,I
Second Miscellaneous Land Unit	MISCLU2	27	39	39	1,1,I
Permafrost Areas	PERMAFROST	28	40	40	1,1,I
World Model Rating: Texture Class	TEXTURE			41	1,1,I
World Model Rating: Slope Class	SLOPE			42	1,1,I
World Model Rating: Pedogenic Indicator and Severity Class	PFRATE			43-44	2,2,I
World Model Rating: Pedogenic Processes and Regimes	PEDOGENIC			45-46	2,3,C

EXPANDED ATTRIBUTES: FAO SOIL	
ESRI Tape(s)	Tape 6
FAO Disk Pack(s)	GIS1
UFD(s)	EXPFILES
INFO File(s)	SOILEXP.W.FIN (INFO User Name is EXP) EXPØØ7ITM EXPØØ7INF
ASCII Files	SOILEXP.WRLD.SAVE

File Names, Locations, and Contents: FAO Soils of the World, continued

Classification Variable Name	INFO Item Name	Entry Code Columns	INFO Code Columns	INFO Item Definition
Calculated Unique Soil Identifier Number	NUMBER	1-4	1-4	5,5,4,I
FAO Unique Soil Identifier Code	S.TYPE	5-28	5-28	24,24,C
Component Name	COMP.NAME	29-30	29-30	2,2,C
Component Dominance	DOM	31	31	1,1,I
First Phase Type	PHASE1	32-33	32-33	2,2,C
Second Phase Type	PHASE2	34-35	34-35	2,2,C
Permafrost Area	PERMAFRST	36	36	1,1,C
Texture 1/Slope a	TS1A	37	37	1,1,I
Texture 1/Slope b	TS1B	38	38	1,1,I
Texture 1/Slope c	TS1C	39	39	1,1,I
Texture 2/Slope a	TS2A	40	40	1,1,I
Texture 2/Slope b	TS2B	41	41	1,1,I
Texture 2/Slope c	TS2C	42	42	1,1,I
Texture 3/Slope a	TS3A	43	43	1,1,I
Texture 3/Slope b	TS3B	44	44	1,1,I
Texture 3/Slope c	TS3C	45	45	1,1,I
Total Percent Composition of Component	TOT.COMP	46-50	46-50	5,5,N,1
Calculated Total of Texture/Slope Indicators	PHASETOT	51	51	1,1,I
Calculated Percent of Texture/Slope Indicators	PERCENT	52-56	52-56	5,5,N,1
Calculated Percent of Texture 1/Slope a	PC1A	57-61	57-61	5,5,N,1
Calculated Percent of Texture 1/Slope b	PC1B	62-66	62-66	5,5,N,1
Calculated Percent of Texture 1/Slope c	PC1C	67-71	67-71	5,5,N,1
Calculated Percent of Texture 2/Slope a	PC2A	72-76	72-76	5,5,N,1
Calculated Percent of Texture 2/Slope b	PC2B	77-81	77-81	5,5,N,1
Calculated Percent of Texture 2/Slope c	PC2C	82-86	82-86	5,5,N,1
Calculated Percent of Texture 3/Slope a	PC3A	87-91	87-91	5,5,N,1
Calculated Percent of Texture 3/Slope b	PC3B	92-96	92-96	5,5,N,1
Calculated Percent of Texture 3/Slope c	PC3C	97-101	97-101	5,5,N,1
Calculated Percent Composition of Texture 1	T1	102-106	102-106	5,5,N,1

File Names, Locations, and Contents: FAO Soils of the World, continued

Classification Variable Name	INFO Item Name	Entry Code Columns	INFO Code Columns	INFO Item Definition
Calculated Percent Composition of Texture 2	T2	107-111	107-111	5,5,N,1
Calculated Percent Composition of Texture 3	T3	112-116	112-116	5,5,N,1
Calculated Percent of Slope Phase a	TA	117-121	117-121	5,5,N,1
Calculated Percent of Slope Phase b	TB	122-126	122-126	5,5,N,1
Calculated Percent of Slope Phase c	TC	127-131	127-131	5,5,N,1
World Model Rating: Slope Class	SLOPE	132	132	1,1,C
World Model Rating: Texture Class	TEXTURE	133	133	1,1,C
World Model Rating: Pedogenic Indicator and Severity Class	PF	134-135	134-135	2,2,C

n = Map Module Number for INFO Item Name

UNEP/FAO World and Africa Data Base
Data Classification and Codes
FAO Soils of the World
(World except Africa 1:5,000,000)

POLYGON DATA

Polygon Sequence Number (Columns 1-4)

1-N = User ID

Soil Map Symbol or Independent Miscellaneous Land Unit Symbol (Columns 5-21)*

o Soil Map Alpha/Numeric Symbol - (Variable Length - Left Justified)
A1-Zn = Actual Alpha/Numeric Code

o Independent Miscellaneous Land Unit Map Pattern Symbol - (Left Justified)
D/SS = Dune or Shifting Sands
SALT = Salt Flats
ROCK = Rock Debris or Desert Detritus

Other Phases by Type (Columns 22-25)*
First Phase Type (Columns 22-23)
Second Phase Type (Column 24-25)

o Type
-- = Not an Other Phase
01 = Stony
02 = Lithic
03 = Petric
04 = Petrocalcic
05 = Petrogypsic
06 = Petroferric
07 = Phreatic
08 = With Fragipan
09 = With Duripan
10 = Saline
11 = Sodic
12 = Cerrado

Dependent Miscellaneous Land Unit by Type (Columns 26-27)*
First Miscellaneous Land Unit Type (Column 26)
Second Miscellaneous Land Unit Type (Column 27)

o Type
-- = No Miscellaneous Land Units
1 = Dune or Shifting Sands
3 = Salt Flats
4 = Rock Debris or Desert Detritus
9 = Waterbody

Permafrost Areas by Type (Column 28)

- = Not a Permafrost Area
1 = Permafrost
2 = Intermittent Permafrost

POLYGON DATA (MODELED)

(Model Values from EXP Restructured and
Associated with Mapped Polygons in Final File Processing)

World Model Rating: Texture Class (Column 41)

1 = Texture Class 1
2 = Texture Class 2
3 = Texture Class 3
4 = Texture Class 4
5 = Texture Class 5
6 = Texture Class 6
7 = Texture Class 7

World Model Rating: Slope Class (Column 42)

1 = Slope Class a
2 = Slope Class b
3 = Slope Class c

World Model Rating: Pedogenic Indicator and Severity Class (Columns 43-44)

01 = Salinization Severity Rating: High
02 = Gypsic Cementation Severity Rating: High
03 = Calcic Cementation Severity Rating: High

* Codes in Columns Constituted an ID for Referencing an Expansion File of Attribute Information.

04 = Silica Cementation Severity Rating: High
05 = Ferric Cementation Severity Rating: High
06 = Salinization Severity Rating: Low
07 = Wind Ablation and Accumulation Severity Rating: High
08 = Water Erosion Severity Rating: High
09 = Water Erosion Severity Rating: Low
10 = Gypsic Cementation Severity Rating: Low
11 = Calcic Cementation Severity Rating: Low
12 = Silica Cementation Severity Rating: Low
13 = Wind Ablation and Accumulation Severity Rating: Low
14 = Water Erosion Severity Rating: Low
15 = Aridic Conditions Severity Rating: High
16 = Ferric Cementation Severity Rating: Low
17 = Low Temperature Regime Severity Rating: High
18 = Low Temperature Regime Severity Rating: Low
19 = Aridic Conditions Severity Rating: Low

World Model: Pedogenic Processes and Regimes (Columns 45-46)
Indicator (Column 45)
Severity Class (Column 46)

o Indicator
A = Aridic Conditions
C = Gypsic Cementation
D = Silica Cementation
E = Wind Ablation and Accumulation
F = Ferric Cementation
G = Gypsic Cementation
P = Low Temperature Regime
W = Water Erosion
Z = Salinization

o Severity Class
1 = Low
2 = High

UNEP/FAO World and Africa Data Base
Expansion Code Outline
FAO Soils
(World except Africa)

Calculated Unique Soil Identifier Number (Columns 1-4) #

0001-3723 = Calculated Unique Soil Identifier Number in world. (excluding Africa). Some Numbers in Sequence Omitted Total Number of Unique Codes is 3562.

FAO Unique Soil Identifier Code (Columns 5-28) #
- Soil Map Symbol or Independent Miscellaneous Land Unit Symbol (Columns 5-21)
- Other Phases by Type (Columns 22-25)
  - First Phase Type (Columns 22-23)
  - Second Phase Type (Columns 24-25)
- Dependent Miscellaneous Land Unit by Type (Columns 26-27)
  - First Miscellaneous Land Unit Type (Column 26)
  - Second Miscellaneous Land Unit Type (Column 27)
  - Permafrost Areas by Type (Column 28)

o Soil Map Symbol or Independent Miscellaneous Land Unit Symbol

Soil Map Alpha/Numeric Symbol - (Variable length - Left Justified)
Al-Zn = Actual Alpha/Numeric Code

Independent Miscellaneous Land Unit Map Pattern Symbol - (Left Justified)
D/SS = Dune or Shifting Sands
SALT = Salt Flats
ROCK = Rock Debris or Desert Detritus

o Other Phase by Type
-- = Not an Other Phase
01 = Stony
02 = Lithic
03 = Petric
04 = Petrocalcic
05 = Petrogypsic
06 = Petroferric
07 = Phreatic
08 = With Fragipan
09 = With Duripan
10 = Saline

11 = Sodic
12 = Cerrado

o Dependent Miscellaneous Land Unit by Type
-- = No Miscellaneous Land Units
1 = Dune of Shifting Sands
3 = Salt Flats
4 = Rock Debris or Desert Detritus

o Permafrost Areas by Type
- = Not a Permafrost Area
1 = Permafrost
2 = Intermittent Permafrost

Component Name (Columns 29-30) #

Soil Associations
AF-Zt = Soil Association

Miscellaneous Land Units

DS = Dune or Shifting Sands
SF = Salt Flats
RK = Rock Debris or Desert Detritus

Component Dominance (Column 31) #

1 = Dominant
2 = Co-Dominant
3 = Association
4 = Inclusion
5 = Miscellaneous Land Unit
9 = Sum for Map Unit

Other Phases by Type (Columns 32-35) #
First Phase Type (Columns 32-33)
Second Phase Type (Columns 34-35)

o Type
-- = Not an Other Phase
01 = Stony
02 = Lithic
03 = Petric
04 = Petrocalcic
05 = Petrogypsic
06 = Petroferric
07 = Phreatic

08 = With Fragipan
09 = With Duripan
10 = Saline
11 = Sodic
12 = Carrado

Permafrost Area (Column 36) #

- = Not a Permafrost Area
1 = Permafrost
2 = Intermittent Permafrost

Texture/Slope Phase Indicators (Column 37-45)
Texture 1/Slope a (Column 37)
Texture 1/Slope b (Column 38)
Texture 1/Slope c (Column 39)
Texture 2/Slope a (Column 40)
Texture 2/Slope b (Column 41)
Texture 2/Slope c (Column 42)
Texture 3/Slope a (Column 43)
Texture 3/Slope b (Column 44)
Texture 3/Slope c (Column 45)

o Indicator
- = Not Indicated
1 = Indicated

Total Percent Composition of Component (Column 46-50) #

.1-100.0 = Total Percent Composition

Calculated Total of Texture/Slope Indicators (Column 51)

0-9 = Total Number of Texture/Slope Indicators

Calculated Percent Composition of Each Texture/Slope Indicators (Column 52-56)

o Calculation
0-100.0 = Percent Composition of each Texture/Slope Indicator

Calculated Percent Composition of Each Texture Slope Phase (Columns 57-101) #
Texture 1/Slope a (Columns 57-61)
Texture 1/Slope b (Columns 62-66)
Texture 1/Slope c (Columns 67-71)

Texture 2/Slope a (Columns 72-76)
Texture 2/Slope b (Columns 77-81)
Texture 2/Slope c (Columns 82-86)
Texture 3/Slope a (Columns 87-91)
Texture 3/Slope b (Columns 92-96)
Texture 3/Slope c (Columns 97-101)

o Calculated Percent
0-100.0 = Percent Composition of each Texture/Slope Phase

Calculated Percent Composition of Each Texture Phase #
(Columns 102-116)
Texture 1 (Columns 102-106)
Texture 2 (Columns 107-111)
Texture 3 (Columns 112-116)

o Calculated Percent
0-100.0 = Percent Composition of each Texture Phase

Calculated Percent Composition of Each Slope Phase #
(Columns 117-131)
Slope a (Columns 117-121)
Slope b (Columns 122-126)
Slope c (Columns 127-131)

o Calculated Percent
0-100.1 = Percent Composition of each Slope Phase

World Model Rating: Slope Class (Column 132) #

a = Slope Class a
b = Slope Class b
c = Slope Class c

World Model Rating: Texture Class (Column 133) #

1 = Texture Class 1
2 = Texture Class 2
3 = Texture Class 3
4 = Texture Class 4
5 = Texture Class 5
6 = Texture Class 6
7 = Texture Class 7

World Model Rating: Pedogenic Processes and Regimes (Columns 134-135) #
Indicator (Column 134)
Severity Class (Column 135)

o Indicator
A = Aridic Conditions
C = Gypsic Cementation
D = Silica Cementation
E = Wind Ablation and Accumulation
F = Ferric Cementation
G = Gypsic Cementation
P = Low Temperature Regime
W = Water Erosion
Z = Salinization

o Severity Class
1 = Low
2 = High

Items in Columns are included on the Expansion Code Listing in the Accompanying Documents.

87

WORLD CONSERVATION
MONITORING CENTRE

219, Huntingdon Road, Cambridge CB3 0DL, U.K.
Tel: (0223) 277314 Telex 817036 SCMUG Fax (0223) 277136

FAX

To: Robert Klaver, Forest Management Planning

From: Clare Billington, GIS/Habitats

Date: 8 June 1992

Subject: GIS mapping

Dear Robert,

Thank you for your fax of 5 June. We would certainly be in a position to help you with the provision of GIS datasets. Presumably you are just looking for Neotropical datasets - this is the area that we are working on at the moment and is therefore less comprehensive than the other tropical regions.

We are also extensively mapping conservation areas and forest reserves (protection and production) for all tropical countries - this is a contribution to the FAO *Tropical Forest Resources - 1990*. The TMAA (*Tropical Managed Areas Assessment*) is now nearing completion - final datasets will be available at the end of June. WCMC data holdings for forest reserves are complete for an increasing number of countries but coverage for all countries is incomplete.

Neotropical forest data are less extensive at present than the other regions. We are continually working in this region towards the 3rd volume of *The Conservation Atlas of Tropical Forests*, due to be completed by the end of this year. Closed moist forest mapping is complete for Colombia, Ecuador, Venezuela, Suriname, French Guiana, Bolivia, Peru, Nicaragua, Costa Rica, Panama, Mexico, Cuba, Trinidad and Tobago and St Lucia. We are working on Brazil (IBGE *Mapa de Vegetacao do Brasil* (1988) and satellite imagery to be provided by the Brazilian space agency, INPE) and will slowly plod on with the Caribbean. (We have found it difficult to obtain good sources for the Caribbean.) Conservation area coverage for the Neotropics will be complete by end June and we expect the Brazil vegetation data to be available by the end of July. We have obtained a digital copy of the Unesco Vegetation Map of South America which you may be interested in. I'm sorry to disappoint you, but at present we can't really send anything useful for Brazil. We will be able to soon - Syracuse University are nearing completion of the IBGE map and we have had test datasets from INPE regarding data transfer. I can't tell for sure when the Brazilian data will be up and running, hopefully by the end of July. I will endeavour to pass these datasets on to you as soon as we can.

I hope this information is useful to you.

Kind regards,

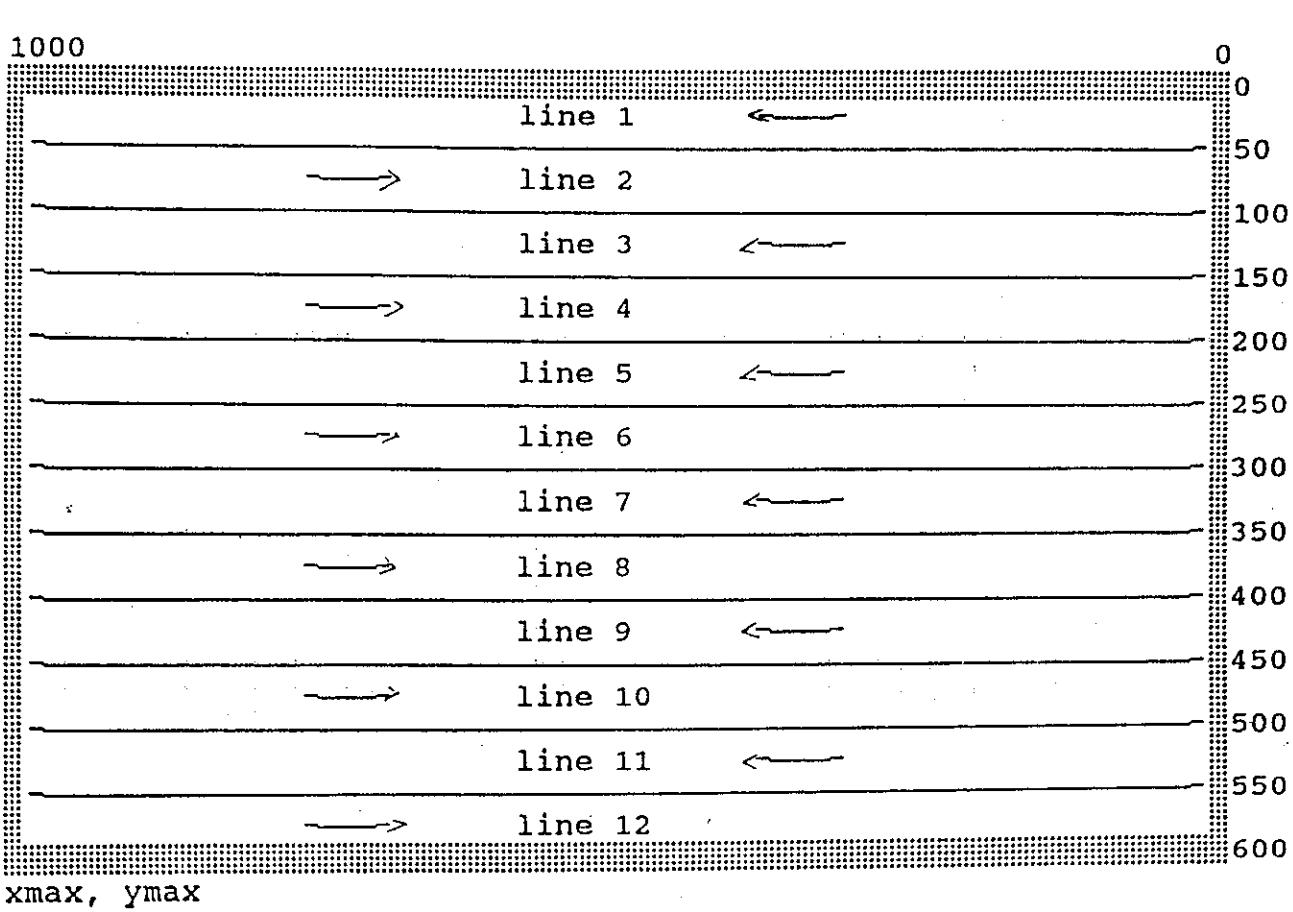
Clare Billington

Anexo 5. Size of one-side of different size squares, in centimeters, when plotted at various maps scales. For example, a 250 ha square is 1.58 cm on a side when plotted at 1:100.000; that same area is 0.32 centimeters when plotted at 1:500.000.

	Area (Ha)										
Map Scale	10000	1000	500	250	100	50	25	10	5	2	1
5,000,000	0.20	0.06	0.04	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.00
1,000,000	1.00	0.32	0.22	0.16	0.10	0.07	0.05	0.03	0.02	0.01	0.01
500,000	2.00	0.63	0.45	0.32	0.20	0.14	0.10	0.06	0.04	0.03	0.02
250,000	4.00	1.26	0.89	0.63	0.40	0.28	0.20	0.13	0.09	0.06	0.04
100,000	10.00	3.16	2.24	1.58	1.00	0.71	0.50	0.32	0.22	0.14	0.10
50,000	20.00	6.32	4.47	3.16	2.00	1.41	1.00	0.63	0.45	0.28	0.20
25,000	40.00	12.65	8.94	6.32	4.00	2.83	2.00	1.26	0.89	0.57	0.40

Anexo 6. Method of converting orginal data for locating trees in the commercial inventory into a coordinate system usable in a GIS.

For Quadra 3, Bloco 1 the survey lines are located as follows:



Trees are described as being so many meters along a survey line and so many meters perpendicular to that line. The direction of the survey line changes direction every other line (even numbered lines start from the west and go to the east; odd numbered lines start from the east and go to the west).

The dBase commands to convert these data, xorg and yorg, to the coordinate sytem, x and y, whose orgin is in the lower left corner (southwest corner) are:

```
replace all x with xorg for mod(line,2) eq 0   (for the even lines)
replace all x with 1000 - xorg for mod(line,2) neq 0 (odd lines)

replace all y with 550 - 50 * (line - 1) + yorg.
```

In more general form:

```
replace all x with xorg for mod(line,2) eq 0 (even lines)
replace all x with (xmax -xorg) for mod(line,2) neq 0 (odd lines)

replace all y with (ymax - 50) - 50 * (line - 1) + yorg.
```

This method will work for all blocks orientated like block 1. For blocks rotated 90 degrees from bloc 1, the equations for x and y are reversed. In other words:

```
replace all y with yorg for mod(line,2) eq 0
replace all y with (ymax - yorg) for mod(line,2) neq 0
replace all x with (xmax - 50) - 50 * (line -1 ) + yorg.
```