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Foxberg Field Book

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Fosberg Field Book
No 51

Collection and Field Note Book

No. 51

(March 22, 1958 - April 14, 1958)

(39317 ----- 39419)

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B & W Photo (a this book)
58-1 to 58-6

Don't copy parts
bracketed [in red]

part taken in ()
a.m. (7:15)

1958 Florida

1

March 22 - Flight from
Miami to Managua
Left Miami 7:25

Everglades are gray-
brown plains with low
vegetation (sawgrass?) and
vivid green patches of
woods (hammocks). Much
of the area seen is wet
or even submerged.

Near Miami the plain
is cut by roads and
several large ^{industrial} plants
(marl pits? cement plants?)
mar its surface. The
roads and areas around
the plants are white. This
area also has drainage
ditches.

After this peripheral
area roads and canals
are scarce. The hammocks
are mostly small and
in places extremely
numerous, in other
places scarce.

7:55? Some patches of sparse
pine forest under plane
and close to course. Several
miles out, beyond a curved
road, is a curious parallel
arrangement of elongate
patches of vegetation in the
direction of the course, looks

like drainage

7:52

This changes into spotty vegetation and a great series of lagoons and some flooded swamp-land, some of it mangrove, some a brownish-green lower vegetation. The lagoons are muddy to varying degrees.

7:56

crossed coastline, ^{Capo Hable} a scalloped or cusped peninsula with a very narrow sand beach just to right of course, the ~~keys~~ ^{keys} visible in distance to right, course following ^{rather} parallel to their direction but gradually coming closer. The water is greenish-muddy color north of keys.

8:03

Some isolated small wooded keys north of main chain and highway have curious spits like tadpole tails.

8:05

Large wooded keys with real estate projects almost under plane.

8:06

Keys on both sides of course, mostly wooded, but many areas grassy or

sandy. Amount of street development seemingly out of proportion to number of houses.

8:09

Islands exceedingly irregular in outline, separated by shallow water, many small lagoons.

8:13

Key West

8:35

~~Harvest~~ Havana

Land around city almost entirely under cultivation, soil a bright hematite red. West along coast a rather wide coastal strip of savanna, some patches of woods ~~far~~ toward inland edge of it. Inland is cultivated area some wooded patches, also.

8:40

off shore several miles a curved strip of island or bar cut by transverse channels - perhaps a barrier reef exposed by fall of sea level.

8:43

Inside this some islands with dark purplish red soil, partly wooded, very flat.

The "barrier reef" may be the landward edge of a large atoll-like structure with most islet development

4

Cuba - Isle of Pines

on south^{west} side

8:48

West end of Cuba to south
in distance

8:58

Isle of Pines - southeast
side very irregular,
broad mangrove belt
with some higher
~~sandy~~ areas, apparently
of raised reef limestone,
judging by pits.Inland is dry savanna-
like area, very flat.Westward entire south
part of island is
apparently a coral
plain (possibly sandy
but pits suggest rock)
covered by dense low
scrub or scrub-forest,
very even, drab green.Along coast some
small irregular
lagoons. To westward
or coastal area of
sand that is either
rather young or is
unfavorable to scrub
vegetation, as it is
very thinly vegetated,
appears sandy.In the south part of
the island are no roads,
not even trails, apparently.

Swan I. Nicaragua or Honduras 5

10:09

Swan Island - visibility
poor - building on west or
northwest end, rest
apparently wooded (or in
coconut plantation). Has
station for some sort of
air navigation system.

10:37

Continuous clouds
Breaks in clouds
show continuous luxuriant
forest on somewhat
rough terrain

10:40

Dull green canopy with
lighter green emergents,
a very few bright yellow
emergents in flower - looks
like typical primary rain forest.

10:46

Continuous clouds
small breaks in clouds,
dense forest.

10:48

-51

small breaks - dense forest
as described above. A small
river crosses course, dark
water, not muddy.
Light green emergent trees
conspicuous, numerous.

10:52

clouds.

10:54

-55

Breaks in clouds - dense forest
stream at acute angle to course,
not muddy

10:56

clouds

10:57

breaks - dense forest

10:58

clouds.

- 11:00 Break in clouds - densely forested
- 11:06 low mountains. Dull green mottled with light green, occasional reddish flowering trees.
- 11:06 First clearing seen in forest. In this area pinkish flowering trees are common.
- 11:07 Large area visible - mostly in shifting agriculture and secondary forest, hilly, some hills covered with dense ~~scrub~~ forest, mostly deciduous at this season. Large winding river crosses course ^{wide} sandy bed dark water, low at this season. Some slopes burned off.
- 11:10 Cloudy with some breaks country similar to last.
- 11:12 Proportion of clearing becomes greater, much pasture with scrub, small patches of forest, mostly secondary. Many roads. Some patches of sugar cane.
- 11:17 Country, still hilly, suddenly takes on a much drier aspect. Some sparse pine forest on higher ~~scrub~~ hills, hills mostly in brown or drab savanna, patches of gray-brown scrub or scrub forest.
- 11:17 Scrub becomes quite extensive,

- relief becomes less. Lago de Managua visible ahead. Land about $\frac{1}{3}$ or $\frac{1}{2}$ in scrub or scrub forest, the rest in cleared patches, dry grain fields and pastures, ^{new} gallery woodland, very narrow along streams and ravines.
- 11:20 Cross railroad, pass small ^{town} Trinidad? Very few clouds.
- 11:22 Approaching Lake Managua the ground is almost completely covered by ^{gray-brown} scrub, with conspicuous green gallery forest scattered yellow clearings, cattle trails abundant. relief lower. North of Tipitapa is a mosaic of scrub ^{with} and savanna, very dry looking. Along lake some ^{large} cultivated fields, brown, some very dark burnt under burn. Narrow strip of herbaceous vegetation along shore of ^{lake} lake. Volcano on peninsula in lake has two crater lakes, slopes are covered by deciduous forest with scattered green trees. Crater lakes blue, Lake Managua muddy khaki color. Plain between volcano and Matas mostly

cultivated also strip bet. crater lake and lake, on peninsula.

11:30

Small volcano south of Managua erupting lots of steam and some ash.

Plain around Managua mostly cultivated, many fields plowed, some freshly burned. some in dry grass. Large cotton gin near airport.

Trees partly deciduous at this season.

11:35

landed at Managua airport.

Plants observed at terminal:

Lawsonia inermis

Acalypha amentosa v. *wilkesiana*

Pseuderanthemum caruthersii

var. *atropurpureum*

Citrus sp.
Araucaria excelsa

Melia azadirachta

Merium oleander

Cynodon dactylon

Ficus retusa

Breynia nana

Terminalia catappa

Hibiscus schuyopetalus

Caesalpinia pulcherrima

Codiaeum variegatum

Zizania tenuifolia

Bougainvillea spectabilis

Dolyceris fruticosa

Mangifera indica

Cocos nucifera

omit

This is obviously dry season on this slope. Some completely bare trees of Ceiba type, very large, thick conical trunks, other smaller bare species.

12:09

Took off for San Jose, C. Rica

On low hills about 95% of trees are bare, 5% bright fresh green. Soil is a light sandy ~~to~~ color.

12:14

One conspicuous area of contour farming.

The country here looks generally rather depleted - erosion not of gully type, however.

rima

Two crater lakes, caldera type ^{rima} scarcely elevated above surrounding hilly plain.

12:16

Several sink-holes or blow-out holes at base of volcano south of Granada. Slopes of this volcano wooded with mixed evergreen-deciduous forest, which becomes more deciduous as it runs out onto flatter low ground.

12:20

Isla Zapatera covered by deciduous, locally partly evergreen forest. Some evidence of recent fire.

Isthmus bet. Lake ^{Nicaragua} and Pacific a mosaic of savanna and ~~patches~~

of deciduous woods. Lagoons along lake have areas of bright green marsh or *ubampo* along shores.

Ground Belen, etc. ^{mostly} cultivated some sugarcane, some may be pineapples - visibility very poor. Fields separated by hedges (?)

12:37 Ometepe Island - flat part near Moyogalpa mostly cultivated

Slopes of two volcanoes wooded, Ometepe volcano erupting some steam and ash. Forest here mostly evergreen.

South of this, on the south west ~~side~~ side of lake the hills are wooded with mostly evergreen forest but large areas of savanna probably secondary, as some burning actually going on now.

12:30 Mostly cloudy, some breaks show mosaic of savanna and semi-deciduous forest.

12:34 Break in clouds - solid evergreen forest. Cloudiness complete.

12:38 Tempique Valley in distance clear, mosaic of cultivation and wood. Mountain mass covered by clouds.

12:40 Clear. Hills partly green and partly wooded, evergreen forest. Little cultivation, mostly pasture. Southward mostly dry pasture, much burning, some patches of wood left.

12:44 Mountains again covered by clouds, valley in distance clear, rather dry aspect, especially around head of Gulf of Nicoya.

12:47 Mts. east of Gulf clear mostly cleared and in dry pasture but perhaps 10% in ravines and on steepest slopes in secondary forest.

South, toward Gulf ^{thru} ~~thru~~ out to low savanna-covered hills with gallery forest.

12:50 Considerable ^{green, probably} sugar cane (?) near Gulf. There has a broad belt of mangrove.

12:52 Punta Arenas - Punta Arenas Hills s.e. of here covered by savanna and ~~open~~ sparse deciduous woodland.

12:54 Inland hills with palm savanna. Some this wooded. Ravines wooded, semi-deciduous. Much burning going on. Grass generally dry.

Mts. n. w. of San Jose brown with green wooded ravines almost to top, ~~some~~

on upper slopes and tops.
semi-deciduous to evergreen.

Plateau around San Jose
greener, but still dry
looking. Considerable
bright green bananas,
sugar etc. Maize fields
brown. Deciduous trees
here partly leafed out,
Lecantheaceae conspicuous.
From ground the country
looks rather wooded, but
only because of fence rows,
trees around dwellings,
shade trees, etc. Some
coffee with shade trees.

1:40
1:240

7:02 off from San Jose for Panama.

Bananas planted under
and between ^{rows} in coffee
plantations.

Stream ravines ~~are~~ ^{valley}
deep and straight. Walked
here in volcanic material.

East from San Jose the
country appears dry
except for trees, but
south in middle distance
is considerable sugar cane.

Hills to east are dry with
green ravines. Higher
slopes of Volcan Turrialba
are green, but largely cleared.
Hills are heavily grazed.

grazing pattern visible
even from air.

1:50 Turned back? circled to gain
altitude, as clouds are
thick around mountains.

1:55 Country very rough,
almost completely cleared
except for ravines.

1:57 Country becomes somewhat
greener, generally more
woods left, sugar cane in
flat valleys.

2:00 Large city surrounded by
coffee plantations and woods.
Probably Cartago (Turrialba?)
then clouds over everything.

2:23 Clouds thinned and we
seemed to be over the ocean,
then closed in again.

5 distinct layers of cloud.
Then a long period of dense
cloud, and rough weather.

3:07 Large opening in clouds -
dense forest with some
clearings. Visibility poor.

3:09 same.
Clouds thin out. Continuous
forest with evidences of
shifting cultivation.

3:10 layer of low clouds.

3:11 No clouds but a thin haze
appears to be over ocean.

3:22 ~~See~~ a small steep dry island.

- 3:14 another very similar island, or the same one, perhaps as we are circling. Mainly grassy, small and very grass-stained on bluffs over sea.
- 3:16 Two larger islands, steep, rocky, partly wooded; partly grass. a landing and roads on larger one. soil light sandy red.
- 3:18 Then still another, a little larger and thinly wooded. These must be Taboga Islands.
- 7:20 Approaching Panama coast at an angle. Visibility very dull. Losing altitude for landing at Tocuman. Beach muddy and very shallow here, 5' line of breakers. Well developed strip of mangrove along shore then a low cleared sand ridge, then forest largely *Cecropia*. Then a scrubby bright green forest with patches of a low even gray scrub. Then cultivation and pasture, much burned grass.
- 7:25 Landed. Grass dry.

Relief map of Darien shows in airport shows inundated land along lower Rio Chiriqui, entire lower atrate, and narrow strip on

well shown mangrove

Rio San Juan to opposite Navla. Lower Rio Chiriqui and coastal strip from Cabo Corrientes south.

Cult. at airport:

Ruellia longifolia?
Cocos nucifera
Codaseum variegatum
Catharanthus roseus
Alpinia purpurata
Fibicus hybrid

4:15 Took off from Tocuman for Panamayuela.

Low hills covered with savanna at end of airport and for some distance, ravines with scattered trees, and then flat grassland cut with wooded ravines and then the coastal wooded belt with meandering tidal channels, then a large area of marsh before coming to a large drowned river, probably Rio Mamoi.

Following up this, there is wooded land with some clearings or patches of grass. Visibility gradually obscured by haze. When there are holes much clearing is seen near river.

4:20

10:20 Solid forest through opening in clouds.

4:27 Reached gulf of ~~Paraná~~ ^{Paraná} - shores wooded a mangrove visibility poor.

5:30 Hole in clouds - rather dry country mostly geometrically cut up.

March 28 - Air trip, Barranquilla to Medellin via Cartagena

Sept 6:50 Around Barranquilla is a sparse deciduous thorn woodland, most of which, in the vicinity of the city, has been cleared at one time or another, ~~and~~ the fields being separated by thin hedge-rows. Most is in pasture rather than cultivation. The general pattern west toward Cartagena is a patchwork of fields in various stages of succession, mostly rather bare, but some presenting a savanna appearance, others a scrub woodland. Along ravines it tends to be green. Many fields have been burned over very recently. Most fields are brown, but

7:05

occasional ones are green. Some patches of well-developed thorn woodland, also a derelict pond, the central part very gray. Then some rough hilly land, cut by ravines, ~~then a~~ half surrounding a small lake with no outlet. Then an area of green cultivated fields. This is only a mile or two back from the coast. Then more pastures, not quite so dry looking and with tiny ponds or water-holes, very frequent, constructed by damming small dry watercourses. Then an area of very low hills, ~~so~~ heavily grazed, with gallery forests that are green along ravines and dry watercourses, many of these dammed to form small reservoirs. Some cultivation, mostly pasture. Then some savanna-like pasture with large flat-topped trees. Then much sparse deciduous woodland, especially close to coastal lagoons. Just east of Cartagena around lagoons

is some slight develop-
ment of mangrove.

Some small mangrove
patches in harbor and
around airfield.

7:15

Landed at Cartagena

8:53

Took off for Medellin.

Small hills near airport
covered by dry scrub.

Considerable mangrove
swamps around lagoon
west of Cartagena

Thick brush with patches
of taller deciduous forest
back of mangrove.

South along coast a
mosaic of patches of
cleared dry pasture and
scrub in various
stages of ~~reg~~ development
Some patches of taller
deciduous forest. A large
canal follows course
crossing it to eastward.

8:03

It intersected by smaller
curving channels, these
possibly natural.

Large ponds of black
water with light green
floating vegetation, perhaps
Hydrocharitaceae along
margins. Some taller forest.

8:05

landscape obscured by haze

8:17

Large savannas, obviously
cleared because of some
angular patches of
vegetation. Visibility very poor.
Country looks eroded.

8:19

crossed a ~~to~~ conspicuous road.
(San Marcos ??) (on pipe line ~~road~~)
somewhat denser vegetation
south of it.

No visibility.

8:41

Green forest but with many
dry looking clearings, locally
over 50% of area, but seems to
be a typical shifting cultivation
pattern, with various stages
of secondary forest. Much recent
burning

8:45

crossed a large very muddy ^{river}
probably the Cauca. Caucasia
Forest here probably 75% cleared,
much recent burning.

8:47

Course parallel to meandering
river.

8:48

Some forest. Clearings
green except where recently burned.
Forest green but with many
bare emergents.

8:50

Preponderantly forest, with
some clearing, especially
along meandering ~~to~~ stream
channels. Country flat.

8:51

Country begins to be dissected
and is now entirely forested,
no clearings at all.

8:52 A few tiny clearings along small streams, otherwise forest - no obvious trails or roads to them.

Forest here has rather rough canopy, few bare trees, few obvious emergents above general canopy though with such irregular canopy this is hard to see.

8:54 Small dark water streams with local rather large clearings near a main intersection of streams.

In distance to west the escarpment down to the Cauca is visible. This forest is montane and the land has reached a rather considerable altitude.

8:58 Relief very strong, with large ridges and deep canyons, all entirely forested. The forest on the ridge tops of a much finer texture than on slopes.

9:00 Much cleared land in middle distance, on steep slopes, mostly pasture, perhaps 40-50% of area. Some roads there. Very little clearing along course. Landslides frequent.

9:02 Suddenly almost all is cleared perhaps 80%. Roads and

dwellings rather common in this large river valley leading west down to the Cauca.

9:04 Much relief, perhaps half cleared. Much recent burning. Trail along ridge tops. Large ridges leading up, parallel to course now mostly cleared and in pasture.

9:07 Almost entirely cleared, in pasture. Many bright orange-pink erosion scars. Grass very thin, soil showing through.

9:08 Villages and roads now perhaps 20% forest but rather poor, mostly.

9:09 Grass looks somewhat better, but erosion scars conspicuous. Soil dull pinkish orange.

9:10 Small city on small river.

Perhaps Yanamal. Yanamal

9:11 About 90% cleared - patches of forest on some hill-tops and in some ravine heads.

Grass in better condition.

9:12 Large valley of Rio Jorge, large

9:13 Mts. perhaps 85% cleared, ravine generally wooded here slopes ~~are~~ and ridges with exposed rocks some cultivated land

- 9:15 Very little forest left, some degraded wood with scattered trees. Gentler slopes a patchwork of cultivated patches, especially bananas, and pasture.
- 9:16 Steep slopes mostly in pasture, much of it very thin, some woods in ravines, much rock.
- 9:17 Mostly poor pasture with abundant scattered bushes in valley, some patches of thin brushy woods. Grass bluish, prob. Melinis.
- 9:19 Much conspicuous erosion, high range of soil approaching Medellin. Hills around city almost all cleared and recently burned some poor scrub.

Mar 22 - Medellin - Quibdo

- 10:15 Left Medellin airport. Grazing patterns very noticeable on some of foothills west of Medellin. Some hills rather brushy. Ravines generally with trees, these mostly shade for coffee. Perhaps 10-15% of land in coffee, rest in pasture, some bananas. Many

- houses, some small citrus groves, geometrically arranged. Many roads and houses on top of ridges. Percentage of pasture less as we descend hill to west. Some woods, mostly tangled secondary, more coffee. Hard to tell shaded coffee from secondary forest. Gleichenia noticeable on some slopes and ridges. General landscape grassy with wooded patches covering perhaps 20% or 25%. More and more clouds higher up.
- 10:25 Perhaps 50% wooded, locally much less, especially low in larger valleys, which are mostly deforested. Higher peaks have forest or scrub.
- 10:28 Large valley almost completely cleared, broad muddy gravelly river entering Rio Cauca, which here is very muddy. Cauca Valley 90-95% cleared and in thin grass. Some reddish erosion scars. Some small heads of ravines still wooded, only steepest ones.
- 10:30 Proportion of wooded patches increases on higher steep

slopes. Relief here is very great. Few roads. Trails on tops of most ridges.

10:37

Much coffee here. Patches of woods with conspicuous white leopards.

Perhaps 75% pasture, of wooded part half may be coffee. part of rest secondary woods, some good montane forest. Some ~~coffee~~ ^{plantations} planted without shade. Pasture here greener than ~~rest~~ in Cauca gorge.

10:40

More patches of good forest, much less coffee at higher altitudes. Greater part still cleared.

10:42

10:43

Some large peaks entirely wooded except lower slope. Clearing now mainly in valleys. Perhaps only about 70% cleared, becoming rapidly less westward.

Mountains very rugged much good montane forest. Valley cleared, bright green, especially along road.

10:46

Very little clearing, relief much lower now. Forest mostly undisturbed canopy rather uneven. Rather little clearing here even along road.

10:50

Many clouds, visibility between

them good. Relief lower.

10:52

Rivers here with dark water. Light sand-bars. Some scattered clearings, in various stages of regrowth.

10:53

Village of large clear river running northwest some clearing around village. Road goes through village and to west.

10:55

another village on road at smaller less clear stream. No visibility.

10:56

10:58

Rio Atrato - enormous meandering muddy river. Quibdo. Dense forest on flood plain, some clearings along road running north from city, some along river and bayous. Many palms in this forest. Forest very mixed in composition, with a loose canopy, a few bare trees, but very few.

11:00

landed at Quibdo air strip, - a sort of dirt strip.

Cultivated plants seen at Quibdo:

Alocasia macrorrhiza? "*macrorrhiza*"

Dieffenbachia maculata

Carludovica palmata

Colocasia esculenta "Achim" "namon"

Axonopus compressus

Begonia spp.

Artocarpus altilis B.

Stapelia sp.
 Malvaceae
Clerodendrum thomsonae
Coleus scutellarioides
Porjia patinoides
Passiflora quadrangularis var.
 with narrow buds, light
 yellowish green, dull white
 within.
Persea americana
Mangifera indica
Ananas comosus
Euphorbia corollifolia
Cassia alata
Saccharum officinarum
Guilfordia
Hibiscus (hybrid)
Allamanda cathartica
 v. *hendersonii*
Musa paradisiaca
Canna sp.
Pagerstroemia indica
Eugenia jambos
Lathyrus roseus
Antigonon leptopus
Caladium bicolor
Euphorbia antiquorum?
Rosa sp.
Asparagus plumosus
Polypodium fruticosum
Hippobroma longiflora
Zabernia montana coronaria
Inga sp.

Mar. 23 - Rio ^{Atrato} ~~fracts~~ about
Quibdó -

Much erosion along
banks. River evidently
falling, large sand bars
exposed, slumping on steep
banks, present level
2-3 m. below level of flood
plain.

On flood plain along
river are many swellings
and clearings. *Antocarpus*
altalis very common.

Gustavia, *Castilloa*,
Guilielma, *Musa*, and
other ~~catt~~ planted ~~spec~~
genera. Soil is sandy
and ~~is~~ brownish gray.

Along the banks *Gynerium*
is common. On older
sand bars a large low
grass forms tangled mounds.
Musa planted back of
this. Scattered large
trees left from forest on
flood plain. Flood
plain on east bank
extends several miles,
then narrows out and
the bank is cut into
a higher terrace about
10-15 m. On west side
is a broad flood plain.
The higher terrace is

of a red soil. Bluffs
covered by a luxuriant
macrophyllous forest
of several species of *Leucopis*,
Shrubs, several palms,
Heliconia, *Carludovica*, and
a number of smaller leafed
trees. Bar slump faces
with talus at base covered
by grasses. Then river
swings west and again
there is a large flood plain
with small farms.
~~Para~~ *Musa* seems by far
the most important food
plant. *Musa sapientum*,
M. paradisiaca and *M. nana*
all present.

The river is much
closer to the east side
of the flood plain than the
west, and much of the
east bank is of cliffs.
Lower part of cliffs is ~~is~~
~~is~~ gray gravel, upper
part a deep red or flesh
colored clay. The surface
of this upper terrace is
locally much dissected.

A large *Ficus* and *Apeiba*
very common on flood plain.

Mar. 27, Boca Tananda, Rio Abato, above Quibdo

Top of beach or flood plain near dwelling.

39317

(grass)

first pioneer on beaches and sand bars.

19 Solanum

edges of thickets

From ^{Boca Tananda upstream} here ~~there~~ there is flood plain on both sides, no bluffs.

Quadrus is very scarce here. A large Heliconia is common along the shores at top of beaches and low edges of flood plain.

Gravel bars ^{pebbles} much more common than sand bars.

Samurindi

At a fork in the river is a village ~~San Miquel~~ in the middle of the flat on a remnant of high ground.

Above here the flood plain is composed of a layer of gray-brown sand about 2 m. thick, underlain by gray gravel.

In places the sand layer is much thinner.

forming tangles

shrub 2.5 m. tall, fruits whitish, immature "sauce amargo".

Guillemo very common on flood plain. Some Mauritia and a slender caespitose areoid palm.

Above the flood plain becomes somewhat higher, 3 m. or more, the gravel beds much thicker, the color of the sand red-brown. This is said to be typical of the areas where gold and platinum are mined, and some small holes were seen where gravel had been dug for washing.

(25 km. above Quibdo but 26 km in str. line)

At ~~the~~ ^{Bellego} ~~Quibdo~~ ^{Magato Yuto} (A) on the east bank is higher ground, but perhaps 5 m. of gravel and yellowish sand or clay. Gradually becomes higher and redder. Above town are bluffs 10 m. high. At town an exposure just above

water level of a yellowish gray fine bedded sandstone.

Above here for the first time the bluffs appear on the west bank, broad flood plain on east. Then the river swings across, and they are on the east. Between here and Tocolloro - there is high ground at frequent intervals on either side. ~~These~~ The cliffs are covered by a macrophyllous vegetation of aroids, zingiberoid, and a large gleichenia.

The bedded sandstone or shale shows up frequently at bases of the cliffs. In the irregularities of its surface lies a gravel.

(Basis of agriculture is plantains, maize and rice.)

Above Tocolloro the bluffs become higher, the vegetation more luxuriant.

Below Iloro on west side of Rio Atrato, above quilbo Wet cliffs, inundated in high water

59319 (creep)
1 20 (scrub)

These bluffs and ravine cut in them are covered by luxuriant tall forest, with abundant lianas and large-leaved aroids. Palms scarce or ^{almost} lacking.

Boranda - a high bluff on the east bank, largely cleared, with several species of palms left. These may be generally present but concealed by trees.

Quadua is more common on the ~~low~~ flood plains above Yuto than below, but only very locally.

Just below ^{Iloro} Iloro is a large farm, some sugarcane. Here the flood plain is about 2 1/2 m above the level of the river, about 1-1.5 m of brown sand lying directly on the black bedded shale or sandstone, locally on gravel.

40 m.



flowers pale lavender,

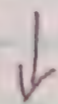
Mar. 23 Llora, east bank of Rio

in flood plain

- 35321 *Gustavia superba*
 1 common understory tree
 in abandoned clearings and
 around dwellings, planted.
- 1 21a *Theobroma cacao*
 planted. small tree, cauliflorous.
- 3 22 *Lamia*
 same - on dissected terrace of gravelly
 rare in secondary forest
- 3 23 (rubr.)
 rare in secondary forest
- 3 24a *Trichomanes* / *dendrocephala* (Boyd) Mett. &
 1535 occasional locally in deep
 shade at base of tree in secondary
- 4 25 *Cephaelis tomentosa*
 common in undergrowth,
 in secondary forest.
- 3 26 (rubr.)
 occasional in undergrowth
 in secondary forest
- 1 27 *Adrefflera*
 in undergrowth in secondary forest
- 3 28 *Trichomanes elegans* L.C. Rich. det. Sells 1978
 occasional, terrestrial in
 secondary forest

atrato, above Quilbo

55 m.



tree 6 m. tall, flowers
 in axillary corymbs,
 petals rose-purple dotted
 with white, staminal
 mass yellow individual
 filaments yellow at base,
 four-lobed maroon distally
 anthers yellow, ^{side yellow (photos)}

clay
 65 m.



leaves 4, erect, reclining
 in age, from a rhizome
 6 cm. thick, 30 cm. long,
 curved upward, sterile.
 slender understory tree
 4 m. tall; fruit immature,

Sadet.

forest

dark green, fertile
 fronds erect, sterile
 fronds rooting at tips.
 shrub 1-2 m. tall, bracts
 scarlet, corollas pale yellow,
 fruit bright blue, fleshy.
 weak shrub, stems green,
 leaves with silky sheen,
 juvenile leaves with purple
 under surface, upper
 surface dark green with bright
 pink raised veins. fruit
 immature

weak shrub 1 m. tall.

rhizome erect; fronds
 somewhat iridescent,
 ascending.

Mar 23 Panaja de Flores

Small very new experiment station occupying the site of an old farm, on the flood plain. The soil is brownish gray silt. The plain about 200 m. wide. Of this the half closest to the river is slightly higher, forming a natural levee. Back of this is marsh to the foot of the slope up to the upper terrace. All of this is cleared, as is the slope, but mostly recently cleared. Some trunks are still lying on the ground, covered by creepers and weeds.

On the dissected surface of the terrace is thick secondary forest, with scattered old trees, many young ones, perhaps 1-3 m. apart, with thick undergrowth of shrubs and small palms, and vines.

The soil is a ~~gray~~ yellow to reddish gravelly clay, with up to several inches of decomposing ~~tree~~ organic matter filled with live roots.

The vegetation is covered by epiphytes - ferns, Cyclanthus, Araceae, Bromeliads, etc. One species of Cecropia has conspicuous arched prop roots. A fair sized palm has stilt roots.

Several species of Trichomanes, Asplenium, Costus, Cyclanthus, Cephaelis, Melastomaceae.

Quibodo - cultivated tree of Borojoa patinoi with immature fruit.

Placentation gasteroid fruit subtended by a thin disk-like involucre, this by a pair of stipular bracts.

The endocarp is completely fleshy.

Stipules ovate-lanceolate, carinate.

Birds were scarcely seen along the river. One white heron, one that may have been an anhinga, one large sandpiper and three unidentified medium small birds were seen in a whole day on the river.

Mar. 28 - outskirts of Quibdó
cut-over land, undoubtedly
burned over, also, has
scattered large trees
probably persisting from
original cover. Many
small trees and shrubs
distributed ~~at~~ with spacing
of 1-5 m. in a tangled mass
of *Gleichenia* sp. *Scleria*
sp. etc.

Among the trees & shrubs
are *Casahuate* sp.
Cecropia sp. *Cespedesia* sp.
Vismia sp.
Liparuna sp.
Veronica sp.
Bauhinia sp. (vine)
~~*Salvia*~~ *Hanetta* sp.? (vine)
Psychotria sp.
many *Melastomaceae*
Isertia
Annona?
Borreria sp. (herb)
& small palm.

- 3 39329 *Dicranopteris pectinata* (Willd.) Underhill
1 abundant between scattered trees
2 30 *Atellanis*
common
3 31 *Borreria*
common in openings
1 32 *Cespedesia*
common

40 m.

The thickets vary
in height up to 4-5 m.
The *Gleichenia* from 1-3
m. Small open spaces
have a small species
of *Dichromena*, ferns
of several sorts, etc.

forming dense tangles;
pinnules glaucous beneath.

weakly ascending

stump sprouts only, sterile.

Mar. 28 - Quebrada Platina

3 km. e. of Guibdo

in second growth scrubby forest along small stream

34333 *Cephaelis*
very common

5 34 *Sabicea*
very common

3 35 *Faranera*
rare

3 36 *Psychotria macrophylla* R. & P.
occasional in undergrowth
in dense shade

Cut-over land, with many scattered tall trees remaining from original forest. The quebradas filled with thickets, the ridges and elevated lands more frequently with *Gleichenia* tangles with scattered bushes and small trees, especially *Cespedesia*.

50 m.

↓

shrub 2 m. tall (others seen up to 8 m.), flowers white, fruit immature, green with white longitudinal lines. Bracts white, caducous. Twiner, flowers white, fruit purplish red, fleshy. slender understory tree 5 m. tall, buds with limb greenish, tube blue, open corolla sky-blue; fruit immature. erect, unbranched, base dark green, bracts dark green, leaves bitter, fleshy, fruit white, crisply fleshy.

Mar. 29 - flight from Quibdó to Condoto, to the east at Pangui north to Ardita, east to

Rio Duero

Rio Duero south of Quibdó.

Rather complete deforestation immediately along rivers, scattered clearings for 1-2 km. from rivers.

The primary forest is dull green mottled with light green and reddish or brownish green.

Occasional small streams with clear water, reddish gravel, occasional small primitive mine workings.

Palms common in forest, left when clearings are made, at least some. These with planted Guiliching give to cleared areas the appearance of palm swannas.

Well south of Quibdó - near Certequí there is considerable dissection with entrenched meandering of small clear streams.

South of Certequí are occasional clearings in the forest; some new, some with secondary scrub.

North of Isthmia west of

Rio San Juan The country is almost entirely in secondary forest and shifting agriculture. The range of mountains called Cerros de las Mojanas is very steep and of a gray bedded sedimentary formation.

At Condoto is a large area of dredge tailings not a partially vegetated (photos).

Here to n.w. of Isthmia is almost entirely in shifting cultivation and small mines.

Northwest of this a small very much meandering river with vast white sand bars. Scattered shifting cultivation and large areas of good forest.

Another meandering river with some ox-bows, much secondary forest in vicinity, and some on to west.

Country becomes more dissected and heavily forested, except for clearings along small streams.

Some palms here but less than near Rio Atrato.

Becomes quite rough to the west. Still a varying amount of shifting agriculture and secondary forest. Palms locally abundant in north-south valleys. No clearing after first sharp ridge. ~~forms~~ until after third then numerous ~~of~~ clearing then high ridges - Serranía de Baudó - with tall forest.

Rio Baudó ^{Baudó} very strongly meandering, reddish yellow with mud. Flood plain definitely not swampy but perhaps flooded at high water. Some cultivation but not much. More rather high mountains west of river. Cultivation only along river.

Here most of emergent trees are bare. Some bright yellow.

These mountains are much higher than the map suggests.

Densely forested, palms common, no cultivation.

Approaching coast north of ^{El Valle} Niqui. Much cultivation.

then mangrove swamps around a large branching estuary.

Small wooded islets in bay. On beach ridge is a very peculiar forest appearing from air like the *Schrovia* forest of Marshall.

North of this the coast is very abrupt and mountainous, with gray crescent-shaped beaches. Mountains wooded down to high tide mark. Deep water up to rocky shores. Deep gorges, a few small rivers.

Puerto Utría - deep inlet, rocky islets, very steep shores on north west side of inlet narrow wastal shelf on south side.

Then the coast continues steep and very crooked, densely wooded.

Ridges roughly paralleling coast. Then long straight dark gray beach with little ^{and} flat area behind it. Then steep slopes. Much of coast in valleys parallel to it is much cultivation.

Then El Valle with a

conspicuous estuary and cultivated valleys are running north, but they were inland.

North of this a very rocky shore wooded from top of beach up the steep slope.

Landslides show bright red soil.

Country back of coast on peninsula west of Mutis very mountainous and densely wooded. with somewhat open canopy.

Flat valley cultivated. Beaches of red-brown sand at base of bluffs.

Wet cleared land with grass east of Mutis in valley.

Back of this untouched forest. Valleys running down to coast cleared.

Most of coast to north steep and wooded. A few gently sloping areas are cultivated.

Where there are no long beaches, along shores of gulf of Cupira. The beaches alternate with steep bluffs.

Inland from north part of gulf is dense forest with no cleared land.

Mountains to north of gulf mostly obscured by clouds.

Inland from Nabugá is a rather dissected upland with rivers meandering but deeply entrenched. Densely forested.

Below Tagachi and ^{Arquia} are several large lakes, surrounded by swamp forest.

7 level plain of Atrato largely forested with palms - ^{Ecupira} ~~interpl~~ ^{Mauritiella}, Mauritiella, ^{Mona}, etc in swamp forest.

^{Orbignya} ^{acuticarpa} ^{costaricensis} In places almost pure stands of Mauritiella.

In places much open water, numerous lagoons. Atrato is very muddy, the lagoons without openings have inky black water.

Some are somewhat muddy. Mauritiella has leaves white beneath, some show conspicuously.

Some clearing on natural levees. Back of this - swamp.

Euterpe very abundant
in swamps by river,
reaching almost to
Quibdó. More clearing
or natural levees to
Quibdó is approached.

The swamp forests
have an understory
principally of *Cubiyoga*
cuatrecasana with
very large leaves scarcely
divided, ~~short~~ acaulescent.

~~Acc. cuatrecasana~~
~~Samoa~~ *Jamia*
clingua grows in slightly
wet situations, trunk
about 1 m.

Cuatrecasana says the
Mauritiella has pneumato-
phones.

Mar. 30 - Quibdó
cultivated

39377 *Borojoa patinoi*

70 m.

small tree; fruit immature,
eaten mixed with milk
and sugar when ripe, odor
unpleasant.

with
flammariaMar. 30 Tatumando, on
road above quilbo toward Medellin
cut-over land

39338

(homel)

terrestrial in river ravine

39

(fungus)

attacks scale insects.

Mar. 30 El Pinar de Atrato

Mar. 30 Bolivar Antioquia

The mountains here are
completely denuded except
for ravines where trees
remain to shade the coffee.Bananas are planted on
steep slopes, but most
slopes are covered by a
thin growth of melinis,
with abundant erosion
scars. The soil is a pink
to orange latosol.In the valley above this
several miles are plantations
of *Tournefortia* on steep slopes.In the valley below
Bolivar a few miles above
its junction with the
Cauca is a rather dry
forest along the river
with *Bursera*, etc.

The slopes above are

extremely eroded.
The same is true of the
gorge of the Cauca, but
with less forest.
The rivers are very muddy.Between Bolombolo and
Medellin are coffee planta-
tions alternating with bare
slopes. The plantations
are shaded by *Inga* trees
from 2-5 or more m. apart,
varying in height from
3 to 12 m., flat topped, forming
a medium shade. The
coffee is in flower at present
and is all trimmed down
to bushes 1-2 m. tall, mostly
about 1 m., spaced variously
from 1 m. to 2 m. or more.Large areas are completely
cleared, bare hills with
perhaps a few patches of
tangled secondary vegetation
on the steepest slopes and
in heads of ravines. Very
little second growth seen,
mostly pasture, this of
Melinis, very thin, badly
eroded, very dry at this time.
Some plantations of figue ^{figue}
and bananae that look rather
poor.bracts
scarlet
flowers
grayish,
white
in bud.2100'
(photo)

(photos)

thicket
and
scattered
hills)

4100'

1958 Colombia

Mar. 30 ^{near} Carmen de Atrato

Mar. 31 - Santa Helena, near
summit of highway bet.
Medellin and Rio Negro
Brushy over-grazed
slopes and low thickets

- 39340 Epidendrum
terrestrial
- 2 41 Nertera granadensis
on moist banks at foot
of cliffs, shaded
- 2 42
on moist banks in sun
- 3 43 Borreria
common in low brush
- 2 44 Coccocypselum
occasional on low cliff
- 3 45 Vaccinium
occasional
- 1 46 (Melastom?)
occasional
- 1 47 Viola
occasional
- 1 48 Epidendrum
occasional
- 1 49 Viola
rare

(Antioquia)

5300'

(photos)

- 2650m. (9600') in a small ravine in an
exposure of what appears to
be a lateritic crust. The general
soil appears to be a lithosolic
yellow laterol, much eroded.
Dr. Weyrauch found a paucity
of insects and a
leaves fleshy distichous,
flowers flesh-pink.
prostrate, leaves somewhat
crispate, flowers yellow-green,
fruit vermilion, fleshy.
- witches broom on
Nertera granadensis (39391)
flowers white
- prostrate, fruit
bright blue, fleshy.
- ~~stands~~ sparsely branched
erect shrub 3.5m tall
bracts pinkish red
corolla pale shell pink,
fruits reddish (immature)
shrub, petals rose purple.
- flowers ~~with~~ pale lavender
with dark purple lines on
lower petals.
- flowers pink to purplish.
- fls. pale lavender with
dark lines on lower petals.

1958 Colombia

A. El Guad

- 39950 *Borreria*
occasional
- 2 51 *Bejaria*
occasional
- 2 52 *Galium hypocarpium*
occasional
- 3 53 *Vaccinium*
occasional
- 1 54 *Epidendrum*
occasional, terrestrial

March 30 - El Piñon de
Atrato, upper Rio Atrato
Choco

on steep brushy cut
banks above road

- 1 55 (lit)
occasional
- 2 56 *Rondeletia*
abundant

March 31 - El Poblado,
suburb of Medellin

- 1 57 *Fatoupha*
cultivated as ornamental

flowers white, leaves
plicate.
shrub 2 m. tall, leaves
flo glaucous beneath,
flowers rose pink.
climbing in bushes,
fruit orange, fleshy.
diffuse shrub 2 m. tall,
bracts rose red, collar
red with white tips.
flowers orange.

800 m.

stem unbranched, 1.3 m.
long; flowers white.
shrub 1-2 m. tall.
flowers white.

(5000') A. El Guad
1540 m.

rounded shrub 1.5 m.
tall, flowers crimson,
latex somewhat watery.

April 1 - flight from Medellín to Bogotá -

Tops of hills around Medellín still have occasional patches of forest, but very little that some are undisturbed is suggested by presence of white leucopis. Mostly the summits and higher slopes have a thin brush or locally thickets. The slopes are in grass except the uppermost ones and where there are coffee plantations. East of the city are extensive brushy slopes, the ridges badly eroded. Some ravine wooded. In lower valleys patches of sugar cane.

Mountains east of Medellín brush-covered then mostly wooded.

April 3 - Bogotá - ^{Zipaguá} Zipaguá by road.

The sabana is mostly in grass, small plots, with cows. The hills around it are largely covered by a scrub vegetation, with occasional slopes cleared and grassy. The hills are

all or mostly of a light yellowish bedded sandstone. At Zipaguá is a large salt dome, with pure salt in great masses and also veins in a black shaly material.

April 4. Hills s.e. of Tenjo
scrub about 2-4 m. tall,
dense, tangled except where
penetrated by cattle.

The ground is very mossy,
the moss forming loose
cushions and hummocks
around bases of shrubs.
Low Pteridium. A great
mixture of shrubs and
small trees, trunks seldom
more than 3-5 cm. thick,
usually less, rather
rigid branches or many
Ericaceae, Melastomaceae
(Miconia), Myrsine, Xylocarpus,
Vallea, Piper, Cordia

- 79353 Piper
5 occasional in secondary scrub
59 Amilax
3 occasional in secondary scrub
60 Bidens
common in secondary scrub
7 61 Miconia
very common in secondary scrub
4 62 Myrsine ferruginea ♀
very common in secondary scrub
4 63 Myrsine ferruginea ♂
same
5 64 Palicourea
common in secondary scrub
6 65 Cavendishia
occasional in secondary scrub

(8800')
2700 m.

On the middle slopes
Chusquea is very abundant.
The soil is a fine black
layer up to 1 m thick, but
mostly eroded much
thinner, lying on a
pale sandstone.

At the top, on the main
ridges leading down to the
pass, the vegetation is
a sparse scrub, the bushes
mostly 1 m. or less tall. Some
Espeltia corymbosa. Much
Hedyotis nitida and Hypericum
punifolium. Badly overgrazed
by donkeys, eroded, rocky.
(photos of savanna and of brushy slopes)

tree-like shrub 3 m. tall,
aromatic.
extensive twines

climbing in shrubs
and small trees, rays
bright yellow, disk yellow
shrub 2 m. tall, fruit
immature
small tree, 3 m. tall.

semi scandent
shrub 3 m. tall, flowers
bright purple.
shrub 2 m. tall, bracts
flowers reddish greenish

- 39346 (orchid)
3 road cut at edge of scrub
- 3 67 Rubus
roadside in secondary scrub, very abundant
- 4 68 Cordia lanata H.B.K.
occasional in secondary scrub along road
- 4 69 Lepechinia salicifolia (H.B.K.) Epling
common in roadside scrub
- 4 70 Cestrum
common in roadside scrub
- 4 76 Muhlenbeckia
roadside

April 4 - top of pass between Tenjo
and ~~Chia~~ Chia
in thin overgrazed subparamo
scrub on steep rocky slopes

- 6 72 Palicourea
very common
- 4 73 Miconia
occasional
- 3 74 (umbel)
common
- 2 75 Miconia salicifolia K. & S. det Wurdack
rare

- sepals dull greenish,
slightly gibbous, petals
brassy yellow with maroon
lines, column ^{dark} maroon
leaves sub-fleshy, held
up on stilt roots above ground
arching shrub extensive,
flowers white flushed
with pinkish
- bushy shrub \pm 2.5 m.
tall, flowers white.
- aromatic shrub 3 m tall rather
weak, calyx dark
blue corolla light blue
shrub 1-1.5 m tall, flowers
pale green with black
tips.
- climbing, flowers
white, fruit turning
reddish, immature.
- soil black, badly eroded
- compact shrub 0.5 m tall,
trayes green, flowers white, ripe
fruit orange.
- shrub 1 m tall, flowers white.
- woody at base
- flowers indigo

39376

3

Hedyotis mitida

very common

1 77

Hedyotis mitida

very common

April 4 - mts. above Zipaquirá
toward Pacho Pacho

Partly cleared, partly
brushy, some areas
planted to Eucalyptus.
Chusquea abundant
locally, one colony at 10000'
flowering.

Summit of pass at
10750' has an area of
degraded montane rain
forest on the steep, northwest
slope, with open scrub
and grass, with some
Espeletia on flattish
summit.

The forest is a mixture,
with *Drimys* most
abundant, but many
other small trees, maximum
height about 7 m. Many 2.5 dm.
^{trunks} ~~trunks~~ and lichen-covered,
much moss on ground.
Some epiphytic orchids, many
ferns.

This forest, though penetrated
by paths and badly invaded
by *Chusquea*, probably
represents fairly well the

erect shrub, flowers white.

depressed shrub, flowers
white.

uppermost forested zone
in this region. The trees
are crooked, close together,
have rounded crowns

Apr. 4 - northern extension
of Sabana de Bogotá -
land very flat, mostly
in pasture, some cultivation,
small parcels. *Falis* very
common along streams, and
ditches and fence-rows.
Eucalyptus also very common.
Around dwellings and in
fence-rows *Datura candida* (?)
'bonachero' is common. One of
the most abundant grasses seems
to be *Pennisetum clandestinum*.
Marshy areas and hummocky
areas that must be marshy
in wetter seasons are fairly
frequent.

Just now there is an abnormally
long and severe dry season. There
has been little rain in 6 months.

Apr. 5 - flight from Bogotá to Neiva.

Havana west of Techo has dark brown soil, some of it plowed, other parcels green, some marshy spots, some rows of *Eucalyptus*. South of here the Havana is covered by clouds. The mountains south and somewhat west are largely cleared but with ridges and steep slopes wooded, the woods with some white *Cecropia*.

Lower slopes green and with scattered trees, some rather poorly wooded. Toward Fusagasugá the dissected land about $\frac{1}{2}$ to $\frac{2}{3}$ cleared and green.

Below Fusagasugá a broad alluvial fan, truncated below, grassy but scarcely green, partly dissected, lower parts badly eroded & partly covered by ~~the~~ savanna. Steeper slopes here cleared and bright green some brushy, some patches of wood. Area east of course largely cleared but in distance higher mountain slopes largely wooded.

Area around first village mostly denuded, around second also.

Good forest on slopes of sharp ridges paralleling course. Valley below perhaps $\frac{1}{3}$ cleared, lower ^{parts} mostly cleared except ravines. Southward mostly pasture and varied secondary bush and woods. Typical shifting agriculture pattern. Some slopes bright yellow green, others dull some reddish from soil showing through. Streams muddy and patches of erosion very evident, especially on ridges. Steeper slopes and higher ridges in distance to east wooded. Some higher peaks below course of tilted bedded pinkish rock, bare on north slope, presenting a steep largely bare scarp along strike parallel with course, to the southward splitting into a number of scarps, very rough country, but mostly clear. Valley to east of it largely cleared.

Now over a very muddy river which cuts through the bedded ridges running southwestward. River margins and ravines wooded. Otherwise country is mostly

cleared and with a rather dry aspect, thinly grassy. Very little woods left even on ridges to east. Some patches in various stages of regrowth along course. Land along course mostly very dissected.

Then higher mountains, cleared, grassy, eroded, woods in some ravines but becoming scarcer southward.

Dissection more extreme southward. Slopes mostly yellow-green, bottoms of canyons mostly wooded.

Country extremely rough. Ridges tending to be eroded on tops. Southward bushy regrowth on ridges more abundant, also erosion much more apparent. Aspect then becomes somewhat ~~less~~ drier, less and less green. Stream beds here very rocky, water not muddy, little water.

Quite dry aspect except for green patches of spaul wood which moss and mud cover slopes and valley and ravine bottoms.

Then complicated dissection in low relief very dry area with wood in ravines. Higher

Rio
Cabrera
Cabrera

mountains to east largely bare and rather dry. Crossed a westward flowing river coming out of mts in broad valley, into ~~the~~ the flat but terrifically eroded Magdalena plain - intricately gullied and with almost no vegetation except scattered gray bushes and patches of thin semi-deciduous wood in low spots. Painted desert landscape. Then ~~the~~

~~the~~ savanna with green trees and very little grass between them, density quite variable. Then some rough land with bare ridges, patches of good wood, cacao and banana plantations along a rather large river flowing s.w. Then more badlands, gray and grotesquely dissected relief not high.

Then Rio Magdalena with flat bottom land cultivated, some terraces cultivated also. Some thorn forest, especially in ravines, some bamboo. Deciduous savanna on low relief dissected land.

7 lat terraces partly
pastures, partly cultivated
partly in scrub or scrubby
savanna

Green fields around Neiva,
in bottom land, some rice.

April 5 - by car Neiva - Palermo
return.

Valley floor - deep gray-brown
alluvial soil. pasture and
cultivation

Magdalena - muddy. lined
with trees - leguminosae,
mostly. ^{open brown savanna}

Terraces - savanna with
dry grass, mostly leguminous
trees & shrubs, some Cecropia.
Grass grazed off to roots
except a dry dark red kind.

Low gray brush common.
Green scrubby wood in
ravines and dry watercourses.

Randia. Jugosa Acacia.

In remnants of a somewhat
higher terrace more and larger
trees and taller grass.
Grass varies locally.

Closer to mts. trees are more
abundant, locally a
woodland, trees to 4-5 m.
On dissected land trees have

scrub between them.

Hills to west covered by
a scrub-forest or woodland
with eroded areas with
scattered small bushes,
red soil.

Quadrant and forest in
valley bottoms, also some
bananas very locally.

Steeper e. slopes grassy
and with sparse scrub.
Gentler slopes with scrub
woodland, a few baloa
trees. Woods thick in
ravines. Wood becomes
thicker and greener higher
up to top of first dissected
scarp.

Back of this, dissected
country with brushy
woodland and patches
of savanna. Trees taller
and closer together in
valley bottoms and ravine
up to 15 m.

Valley of Palermo flat
and cultivated and in pasture.
Scarps surrounding it
very rocky. Woodland
on n. facing slopes, savanna
in others. Scattered trees
on valley floor.

Small plantation of Teak
saplings below town.

photos of Palermos Valley
col. + b+w. 1, b+w. of woodlands.
Ridge bet Palermos & Mag
2 b+w. punchell b+w. roll 2
5 on roll 3.

On Magdalena side of
ridge 2 b+w, 4 b+w.

dissected terrace at foot of
scarpe 4 b+w. 5 b+w. of scrub
and disturbed woodland on
eroded alluvium.

Flat savanna on middle
terrace - 5 b+w 5 b+w.

more open ^{than} savanna on
middle terrace 5 b+w 8 b+w.

Magdalena R. from Neiva
bridge 3-4 b+w + b+w.

On the west side of the
Magdalena the alluvial
plain slopes gently up in
a series of ill defined terraces.
at least 3 in number, the
upper one, especially dissected
into rounded hills and
low mesas, the scarps
generally dissected into
rounded hills. The river
plain itself is very flat,
mostly cultivated or in
grass. Along the river on
each side is a fringe of
trees. The river has ample
water at this time and is
rather muddy, but the

tributaries entering it
in this area are in low
water and very clear.
The lower terraces are
sparsely vegetated except
in the shallow ravines
and watercourses, where
there is a "gallery scrub".
The general vegetation
is a sparse to dense thorn
savanna, with *Randia*
aculeata var. aff., *Prosopis* or
Acacia, *Cereus peruvianus*
var. aff. and a few broad-leafed
trees, these all small, not
over 4-5 m. at most, crooked.
Irregular patches of brush
are interspersed with
the badly over-grazed
dry grassland. Only a
specie of *Andropogon* (?)
occurring in patches and
drying dark dull red
has not been especially
grazed. As ~~the~~ higher
ground is reached
the grass seems to
have suffered much
less grazing and the
trees are much closer
together, generally flat-
topped, with a higher
proportion of larger-leafed
trees, but leaves rather coriaceous.

1958 Colombia (Huila)

Here the vegetation is not so spiny and cacti are rare or absent.

This gives way as the base of the hills is approached to a woodland of broader leaved trees, mostly, of small stature, much larger and denser in ravines and flat bottoms of small valleys, in places a well developed forest.

This becomes, generally, a scrub-forest, varying to woodland, or locally scrub or grass, on the rocky range of hills east of Palermo. This range is of ~~tilted~~ ^{tilted} beds of sandstone. The Palermo

Valley has sandstone(?) ~~with~~ bluffs on the west side and steep or medium dip slopes on the east side.

The bluffs are very bare and have grassy or savanna slopes up to their bases from the flat valley floor. The dip slopes are wooded with scrub forest or woodland.

Apr. 5 - flat alluvial terrace 5 km. w. of ~~Palermo~~

39378

Portulaca

on bare ground in overgrazed savanna

Colombia

On the edges of the terraces, especially there has been very serious erosion and the scarcely altered alluvium is generally exposed. The soils of the terraces vary from yellowish gray to pink and red. The alluvium is in general a gravel or gravelly clay with pebbles and locally boulders.

Neiva

prostrate, leaves fleshy
purplish brown.

Apr. 5 - by car Neiva to
Hells -

eastern slope of Cordillera
Central appears rather
bare from road east of
Rio Magdalena.

Glinuaria

Glinuaria and *Erythrina*
common in bottom-lands.

The lowest terrace
cultivated on higher
parts of it ^{dry} grass ^{some}
with some brush.

Elevation of next ^{higher}
terrace abrupt, of bedded
^{sandstone} sandstone, grass with
scattered trees.

Large trees abundant
along streams. Broad leafed
3 km. n. Neiva finished
h.w. roll 3 and took several
knots of dissected terrace
with erosion remnants.
low thorn ^{thorn} bush, nearly
leafless at this time.

some cacti, grass eaten to
rots. Beds of sandstone
gently dipping eastward.
A layer of ^{gray} gravelly
aluminum on top.

Cut by shallow clean
streams. Thorn scrub
and thorn savanna in
valley except gallery forest
along streams. ^{yellow} ^{leaf}

Columnar cacti ~~common~~
common.

Large river with
woodland in its
flat valley bottom.
Just north of h.w. - 4-5
h.w. of erosion remnants
etc.

North of here begins
"Painted Desert" terrain.
Some small streams
with green vegetation,
low trees. Otherwise
very overgrazed deciduous
thorn scrub savanna.

Many *Cereus*. Very rocky.
Along streams locally
are banana patches.

Low rounded hills and
small mesas. Tangled
woodland in deeper
valleys between hills.
Grass eaten to roots on
hills. Trees on hills ^{green}
partly deciduous. *Guajuvilla*
legumes, etc. common in
ravines.

Then out on a flat
treeless grassy plain,
cut by some brushy dry
ravines.

Aluminum here filled
with boulders, grass
a bunch grass, probably

andropogon sp. apparently
not eaten by stock.

The grass between
bunches of this eaten to
ground.

Thorn forest in ~~broader~~
broadest ravines.

Approaching Tello the
terrace is much more
dissected. a thorn scrub
is general vegetation
mostly green at this
time, locally nearly bare

Tello to Baraya.

Large trees and ^{banana} banana
patches in valley bed.
Hard thicket.

Broad grassy terrace
north of river valley.
Mostly andropogon.
Some cult. patches.

Few trees except in
small ravines.

Low hills to east
covered by scrub forest
& woodland.

Deep ravines mostly
wooded, dry, some slopes
bare, rocky, grassy,
overgrazed, wooded. These
ravines cut in deep
sand gravel.

Some fields of *Browna*

^{Panicum}
Panicum maximum.

Escorted hills with
savanna. Broad flat
valley largely cult.
Gallery forest along small
stream with bedrock
boulders. Thorn forest
in side ravines, semi-
deciduous.

Mts. to east mostly
bare. Steep scarps of
bedded rock. Wooded
& grassy slopes at base.

Some small ridges of
gray ^{much like} mudstone. Bedded
plate sandstone & shale.

These but hills mainly
scrub-covered, some grass
a flat green valley,
cult. and with
large trees. Bananas.

Rich pastures in bottom.
Quadrac *caiba* Epiphytes.

Baraya.
Largest trees seem to be
Anacardium.

Between Baraya and Tello, n. of
grassy plains. 2 broad ^{finishing}
well K3 of grazed slopes and
wooded ravine. about 3 ^{km} miles
of this area. scrub forest,
grazed slopes, etc.

This is area of deeply dissected

1957 Colombia

red or yellowish alluvium.

just south on grassy plain
 first several frames on
 Kod roll 4, about 10 ft + w.

Cacao
 Cacao near Tello, with
 bananas, shaded by
Erythrina. On flat
 alluvium along stream.
 Ceibas with bottle-shaped
 trunks.

Much Randia in thorn
 scrub s. of Tello. Scrub
 uneven, 1-2.5 m. tall, open
 to dense. Soils orange red,
 gravelly.

South of here very rocky.
 Grassy plain s. of Tello
 much less rocky than that
 north. Fine gray silty top
 soil with some cobbles and
 pebbles. Ravine with an
 abundance of large
 boulders, washed out of
 lower layers.

A number of brachiopods
 and b + w. of crati, etc. at
 s. edge of grassy plain.
 also of eroded land to south.

Bow. from moving car at
 Cucara - erosion remnants.

Colombia

The valley of the
 Magdalena northeast
 of Neiva is more complex
 than to the west. The
 flat along the river is

and made up of
 slightly different

This is mostly
 water in pastures
 there is some thorny
 and rocky
 areas.

next level is a
 sloping rocky
 apparently cut
 a main terrace
 beams, a number
 rich flow westward
 to the Magdalena.

main terrace
 about 2000' and
 med by a white
 sedimentary
 ation that dips
 gently eastward.
 scarp is rather
 at the different
 resist erosion

erently and a
 number of grotesque

erosion remnants
 occur, along with
 rounded hills formed by
 a thick deposit of gravelly

Defensa de los suelos

Los colombianos, como lo ha
 anotado el eminente botánico F.
 K. Fosberg, quien se propone es-
 tudiar la degradación de la flora
 espontánea en nuestro territorio,
 hemos disipado todas las posibi-
 lidades de desarrollo de los recur-
 sos naturales. No hemos tenido,
 hasta el momento, sentido alguno
 de su conservación y de su incre-
 mento, como si en nada nos pro-
 cuparan las necesidades futuras del
 crecimiento nacional. Y como si no
 nos interesaran, además, los per-
 juicios de todo orden derivados de
 la pérdida, cada vez más creciente,
 de los recursos actuales.

El índice más grave de esa dila-
 pidación es el abandono poco me-
 nos que absoluto en que se halla
 el suelo colombiano. La despobla-
 ción forestal practicada sin tasa
 ni medida, y desde luego sin suje-
 ción a ninguna norma técnica, no
 sólo ha hecho imposible la rehabi-
 litación indispensable de las reser-
 vas y de los recursos forestales,
 sino que ha dejado a los suelos
 expuestos a todos los factores de-
 terminantes de la erosión. Las tier-
 ras aptas para la agricultura, en
 estas condiciones, se han debilitado
 y empobrecido sistemáticamente.

Se trata, en verdad, de una bár-
 bara ofensa contra la agricultura,
 en particular, y contra la economía
 del país, en general, tanto más
 abrumadora si se considera que se
 la ha practicado tradicionalmente,
 sin que las planes científicos para
 defensa de los suelos ni los pro-
 gramas de instrucción a los amigos
 de las quejas y talas hayan surti-
 do efecto positivo alguno. En los
 términos científicos citados por el
 doctor Fosberg, ese ineluctable fe-
 nómeno es lo que ha ocasionado
 una degradación progresiva de la
 llamada flora espontánea, con la
 consiguiente destrucción de suelos
 aptos y su inhabilitación perman-
 ente para fines agrícolas.

red or yellowish alluvium,
just south on grassy plain
first several frames on
Kod roll 4

^{Carao}
Cacao
bananas,
Erythrina
alluvium
Ceibas
trunks.

Much R
seems s. of
uneven
to dense. S
gravelly.

South of
Grassy
much less
north. F
soil with
pebbles. R
abundant
boulders,
lower layer

A number
and to s. of
s. edge of
also of eroded land to south.

B+W. from moving car at
Cucera - erosion remnants.

Cruzada Tolima

Planadas", pide Soluzar Santos.
es de la región.

ber impresionado lo suficiente a los
gobiernos nacionales, quizás por
la subestimación de los factores so-
ciológicos que han influido en él.
En forma desarmada, un ropaje
literario de ninguna especie, el pro-
blema del Tolima en transición del
Estado manifestada a través de las
necesidades que el pueblo sime-
ta".

Añade el doctor Parra que para
valer a poner al hombre en con-
tacto con la tierra, para que el To-
lima produzca de nuevo todo quan-
to es capaz de producir, se requie-
re que el Estado intervenga y ayu-
de decididamente. "Y esto no será
un gasto público, ni una limosna
misericordiosa, sería la mejor de las
inversiones públicas, porque todos,
hombres y tierras le devolverían a
Colombia con dividendos altos el
dinero que a ellos se destina".

CRUZADA FERNANDE

La campaña de insubordinación pa-
ra que se atienda de inmediato a
su problema recibirá esta vez
con mayor decisión. El pueblo lo
ha recibido con muestras de ston-
ta entusiasmo y está brindando por
medio de cartas y de telegramas
un creciente respaldo a sus man-
datos. La campaña fue anunciada
por el periódico "Tribuna" después
de una serie de llamamientos al go-
bierno y a los hombres representa-
tivos del Tolima para que se abran

The valley of the
Magdalena northeast
of Neiva is more complex
than to the west. The
flat along the river is
wide and made up of
two & slightly different
levels. This is mostly
cultivated or in pastures
but there is some thorny
bush and rocky
savanna.

The next level is a
broad sloping rocky
plain apparently cut
in the main terrace
by streams, a number
of which flow westward
to enter the Magdalena.

The main terrace
is at about 2000' and
is formed by a white
bedded sedimentary
formation that dips
very gently eastward.
The scarp is rather
abrupt. The different
beds resist erosion
differently and a
large number of grotesque
erosion remnants
occur, along with
rounded hills formed by
a thick deposit of gravelly

red or yellowish alluvium.

just south on grassy plain
first several frames on
Kod roll 4, about 10 ft + w.

^{Cocoa}
Cocoa near Tello, with
bananas, shaded by
Erythrina. On flat
alluvium along stream.
Ceibas with bottle-shaped
trunks.

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north. Fine gray silty top
soil with some cobbles and
pebbles. Ravine with an
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differently and a
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erosion remnants
occur, along with
rounded hills formed by
a thick deposit of gravelly

alluvium on top of the bedded material.

This terrace, where intact is covered by grassland with locally some small trees, the grass being an *Andropogon* with a smaller grass. The latter is grazed, the former not. Locally there is a low pine scrub, dry at this time of the year. On rocky places there are tall *Cereus* of several kinds. Whenever there is any dissection a thorn scrub or thorn woodland appears. In the deeper ~~and~~ and wider valleys or ravines a more luxuriant green gallery forest is found with cultivation, such as bananas.

West of Tello the alluvium becomes very thick, the sandstone having dipped so that it no longer is exposed. Here, also, where the surface is preserved there is a similar grassland to that lower down. The surface is

~~so~~ very rocky. Where there is woody vegetation it is denser forming a woodland or scrub forest, becoming less thorny, in general, as higher levels are reached. Areas of grass and ~~scrub~~ savanna are common. Everything is very much overgrazed.

The larger river valleys are densely wooded with large trees, mostly cleared or planted to cacao under large *Erythrina* trees. Bananas and deep grass such as guinea grass, common. Northeastward toward Paraya these valleys are deeper, as the layer of alluvium is much thicker near the ~~to~~ base of the Cordillera. The foothills are mostly covered by a rather dense scrub forest, probably evergreen, at least very green at this time. Some areas here are grassy or with scattered bush and trees.

April 6 - outskirts of Neiva
in dry weedy alluvial flat

- 3 39379 *Commelina*
wet spot near irrigation ditch
- 4 80 *Guayuma ulmifolia*
common
- 4 81 sub.
common in fence rows
- 4 82 sub.
common in fence rows
- 2 83 *Tournefortia*
common along road.
- 4 84 *Cordia globosa* (Jacq.) H. B. K.
common along road
- 4 85 *Momordica charantia*
common along road in fence rows
- 2 86 (Arecif.)
occasional in fence row
- 4 87 (Comp.)
common in fence rows
- 4 88 *Casahuate*
common in fence rows
- 2 89 (Menisf.)
common in fence rows
- 3 90 *Passiflora foetida*
roadside weed

Apr. 6 Puerto Leguizamón, on
Río Putumayo
3 91 (Gram.)
common around air field

- prostrate; 2 large petals
blue, one small one white.
- small scraggly tree
4 m. tall, fls. dull yellowish.
- semi-scandent scrambling
shrub 2.5 m. tall, spinescent
branchlets; corolla white.
- scandent shrub, corolla white.
flowers greenish.
- semi-scandent shrub,
subfruticose herb.
0.7 m. tall, flowers greenish
white.
- vine, climbing on bushes,
flowers yellow, fruit orange.
- lactiferous vine, flowers
white.
- scandent shrub; ~~erect~~
flowers yellow.
- small tree 5 m. tall,
fruit red-brown.
- vine climbing in trees.
flowers greenish.
- vine, flowers white,
corolla purple within; fruit greenish.

Río Putumayo
culms ascending

April 6 - Flight from Neiva to Florencia

Some fair sized patches of forest left on high slopes of Cordillera Central visible from Neiva.

Some irrigated land near Neiva, but very little. Banana patches look dry.

Low eroded terrace west of river has very sparse bushy vegetation except in shallow ravines, where there is continuous scrub.

Some areas completely grassy and with no bushes. Dissected higher land south of Palermo very bare and dry except lower slopes which have low woodland or scrub and canyon bottoms which have woods.

East of Magdalena R. east of Retiro is a large area of parallel low strike ridges, badly eroded, with woody vegetation between them. This crosses river to west near Hob's and continues south westward. West of this a large area of grass hills south of Iguina are

grassy with wooded ravine

heads.

Some small wooded areas in meanders of Rio Magdalena. Valleys entering from east are wooded in their bottoms, as also their tributaries and ravines running up from these.

Mts. otherwise grassy. Entire upper valley seems to be grassy except for ravines and strips along streams.

North of Gigante large grassy plains. Around Gigante some fair patches of forest on flat land, esp. to north.

Very little wood visible on Cord. Central, perhaps 10% or less.

On Cord. Oriental under course some good patches on upper slopes. To east much forest.

Some dense woods along Magdalena river bottom below Garzon and on affluent below Paita.

East of Garzon many small patches of wood esp. palm in lower hills. Thick montane rain forest with scattered white

Cecropia over almost all of higher mountains east of Gigante.

Landslide scars occasional slopes & a few clearings on e. slope along course just after crossing, but very few.

Entire area visible s. and w. of course densely and evenly wooded. To east wooded also but some clearings.

Many palms in this forest. A few small clearings along stream perhaps ~~in~~ ^{near} ~~the~~ ^{the} ~~stream~~ ^{stream}.

Approaching Florencia lower slopes have many clearings, possibly 1/3 of area in valleys. Some grassy, some in various stages of regrowth.

photo. Lower down perhaps 2/3 cleared. Flat land at foot of mts. for several miles around Florencia mostly cleared.

Ortegaquay Riv ~~Ortegaquay~~ ^{Ortegaquay} extremely meandering below Florencia. Mauritia grove and Guadua conspicuous. Grass around Florencia very green - around airport

mostly Paspalum sp. aff. dilatata and Panicum maximum. Soil rather red. Some palms left in clearings.

10:27 begin roll bar. & bar with Guadua patch at distance. Left Florencia

Clearings extend down Rio Ortegaquay and for 1-2 km. on either side, in grass but some weedy or scrubby regrowth.

10:30 River muddy. Some ox-bow. Much clearing to about Potosi(?), scattered clearings from there on and a narrow strip along river, much active clearing and burning going on.

10:40 Large inundated area west of river, extends down somewhat.

Forest with fairly dense canopy, many palms in canopy, many emergents & some bare, many in young foliage.

11:15 (6 photos) Considerable cumulus cloud. Riv Caqueta visible in distance to west. A few clearings as we

approach Tres Esquinas
much swampy with dark
water east of Rio Ortega
just above Tres Esquinas.
Many palms.

11:17 Tres Esquinas. Situated
on slightly higher ground.

12:12 Left Tres Esquinas
Some clearing on slightly
elevated ground around
Tres Esquinas (2 photos)

Many palms in forest.
Some inundated land
very near Rio Caqueta on east
side, but not much.

Scattered clearings for a
short distance down river.
12:14 Rio Caqueta bends east to curve
again. Crossed it. Very muddy.

The forest here is low, in
places inundated, crossed
by channels or streams that
meander through it.

12:17 Crossed river again. A few
scattered small clearings
along it.

12:18 Swampy area west of river (lake
on map.)

12:16 Crossed river. Inundated area
east of it. Clearings on west bank
which is higher.

12:17 (photo of forest)
Forest away from river rather
uniform but apparently the compo-

sition varies. Occasional
pink flowered emergent trees,
a few ^{here} bare ones.

12:19 An elongate area of tangled
low vegetation that looks
like a wind-thrown strip,
partly regrown. Palms
still common but less
so than before.

12:21 Pink emergents more common.

12:22 Rio Caqueta far in distance
to east.

Bare emergents more common.
Some with white flowers,
narrow crowns.

12:23 These and light pink ones
now very common, probably
same thing. (3 photos)

12:25 ~~found~~ a lavender-flowered
emergent occasional
here to pure stands of

12:26 a palm. Clearings. ^{leguminous}
Appr. Puerto Leguizamo.
Matted strip, not long, ^{along} with
large cleared area around
town and air strip. Small village,
mostly military post (3 photos ^{from}
road, ~~to~~ from air strip.)

Rained most of time we were
on ground.

Tall forest in sight from
air strip in all directions.
Sky mostly cloudy. Temperature
high, humidity high, little breeze.

April 6 Flight Puerto Leguizamo
to Florencia to Bogota.

1:12
1:12

Left Pto. Leguizamo *mauritia*.

Groves of *Mauritia* along
air strip at south end.

Soil on higher ground red.

A road leads northeastward
some clearings along it.

Apparently goes to Rio Caqueta,
which can be seen in distance
to east.

1:16

1:16

Pink emergent trees common
in forest.

1:17

1:17

R. Putumayo visible in distance
to west, Caqueta to east.

1:20

Passed over what appears
to be some old clearings.

Otherwise uniform lowland
forest. Abundant big cumulus
clouds.

1:27

Rio Caqueta bends closer
on east side.

A few yellow flowering
emergent trees many light
green newly leaved out ones.

1:28

Course reaches bend in river
enclosing lagoon a swamp (cf 12:16)
small

1:35

Two Esquemas Esquemas

Much swamp on all sides.

1:39

Swamp with palms.

1:42

Clearing on higher ground, some
swamp close to river. Left river to
left side.

1:45

River well to left, some
slight relief here, maze
of ravine cut in terrace,
densely wooded, a light
green flat topped emergent
occasional.

1:50

1:55

2-are! area (photos)
arrived Florencia

Between Puerto Leguizamo
and beginning of cleared
area below Florencia took
remainder of 8:15 roll 5 and
a number of Kodachromes.
Light for some rather poor.

2:24

Left Florencia

Many palms in forest on
foothills above Florencia.

2:27

Scattered clearings well
up into hills. Some planted
to bananas. Then none or few.
Water in streams in canyons
here clear and dark, not a
trace of mud.

2:30

Some clearings in deeper
valleys, but few.

2:32

Palms here abundant but still
common.

2:33

Traces of old clearings, some
new ones, perhaps 25% cleared
in a broad valley.

2:34

Patches of very light green trees
on tops of certain peaks and ridges.

- 2:35 Still considerable clearing in wide valley.
- 2:36 Still some. Many pale yellow-green trees in forest, some white Cecropia.
- 2:37 Clearings strung along a mule trail up into mountains.
- 2:38 No more clearings. White Cecropia common in ravines. Vegetation on crests much lower and finer texture than on slopes.
- 2:39 Many clearings. White Cecropia very abundant.
- 2:40 Crossed a valley that is perhaps $2/3 - 3/4$ cleared, this on west slope. Lower west slope 75% cleared. Some steeper slopes and ravines left. Higher slopes and ridges mostly intact.
- 2:42 Road running up a ridge to a farm well up. Most of farms connected only by mule trails.
- 2:44 Crossed to east of ^{gully} gully. Here clearing is perhaps 80% on outer ridges of east oriented. Inner ones still forested. Trails mostly on ridges. Slopes show signs of over-grazing.
- 2:45 Mts. here almost entirely clear.

- grass rather thin and tending to be dry. Considerable erosion.
- 2:47 Dry low hills, grassy but very overgrazed, woods in ravines.
- 2:48 Broad valley of river from Algeciras, ~~some~~ ^{much} irrigated rice. much pasture above and below Cañoalegre. Terraces dry, gullied.
- 2:50 Mts cleared $2/3$ the way to tops in distance.
- 2:51 Extensive terraces with some cultivation, some savanna, rivers wooded some open grass fields.
- 2:52 Narrow gallery forest along Rio Magdalena.
- 2:54 Terraces to east mostly ^{than} savanna. Some rice along river.
- 2:55 Neiva. Many trees in city.
- Dry area in Magdalena Valley extends at least to above Gargon.
- 2:56 Left Neiva. Some rice along river, but savanna and eroded hills come practically to river on east side above Neiva. Tierrahueras.
- 2:57

Where old surface of tenebris is preserved there are no trees, only grass. Ravines have trees, slopes either savanna or woodland.

3:29 Opposite Baraya - some areas covered by thin forest, some eroded bar. Eroded ^{flat} areas extend north almost to Cabrera then bare dry eroded hills from there north, woody vegetation only in ravine bottoms.

Mts. west of Cabrera valley are almost completely denuded except for bushy vegetation in canyon and ravine bottoms. Ridges badly eroded.

3:39 Hills become slightly greener. Tops still badly eroded, woody vegetation only in ravine bottoms.

3:42 Some flat country, mostly thin grass, trees along streams that come out of mts. Some of it very badly eroded, esp. just south of Prado.

3:43 River n. of Prado meandering, dark chocolate color.

Valley rather green, very little woody vegetation.

3:44 Upper part of valley greener, grassy. Hills here thinly grassy.

3:45 Visibility low.

3:48 Country dissected, much greener, some woods, mostly in valleys and ravines.

3:50 Strike ridges parallel to course, about 1/3 or 1/2 thick, wooded.

Northward more

3:52 ^{Cunday} Cunday - Flat grassy valley with scattered trees. Sharp bare grassy ridge parallel with course, ~~flat grassy~~ gently sloping grassy country with scattered trees on both sides of it, patches of woods.

3:54 Head of valley above Cunday and of other valleys nearby considerably wooded but with many farms probably much coffee.

3:56 Lower slopes largely grassy. Sharp ridge curves westward and crosses course.

Icononzo. Icononzo

3:57 Pandi. Pandi
Grassy slopes, much scrub or ^{thin} forest

3:58 San Bernardo in distance. Much forest around it. Nearest slopes largely cleared or with thin second growth.

4:00

Hills in distance with thin broken woods, prob. coffee plantations, much pasture. Below Fusagasugá a large sloping grassy terrace. Many patches of woods n.w. of Fusagasugá. Some grassy slopes.

4:02

Coffee and pasture mosaic.

4:03

Grassy slopes with many scattered trees left from original forest.

Higher slopes in part still densely wooded, mostly cleared.

Many farms throughout this area.

4:04

A large patch of excellent forest on west slope of rim of Sabana.

4:05

Large lake or reservoir at lower end of Sabana & factories above it.

4:07

Green fields, some bare on town.

Hills badly burned over, little vegetation except thin scrub.

4:08

Plowed fields, white, around Teche. Rows of Eucalyptus fields n. of Teche very green. Many Eucalyptus rows.

April 9 - flight Bogotá to Barranca Bermeja

Plowed field to north in Sabana as much blacker than in the southern part.

Hills at north end to west of course have about 1/3 of forest left, in places less.

North, over these hills, in the drainage running down to the Magdalena the hills are cleared but have small patches of wood left in the ravines. The ridges tend to be eroded. The principal ones have trails, which tend to initiate erosion. Many farms - the density of houses here is very great and few of them are connected by roads, mostly by trails. The general aspect is green, with dark reddish erosion scars.

Northward the pattern is more or less the same,

but farms become fewer.

Visibility very poor. abundant cumulus clouds.

13:00

Valley of Rio Mined becomes more and more cleared northward. Some ridges seem to have remnants of original forest. Some ravines have woods. Most slopes grassy or recently burned.

The main escarpment descending to the Magdalena is still largely wooded, at least on its lower slopes and from here the woods become rather continuous. Visibility very poor.

Whenever a bit of the earth shows it has dense forest, few clearings, but some rather large ones, especially west of lower Rio Carare. Rio Carare very muddy. Road running east from Limitara. Much clearing. Below this a clearing along banks, but not many away from river.

Lower Rio Open areas of slightly elevated land are cleared. Low swampy area along river open also.

Low hills around lake and between Open and Barr. Berm. cleared or being cleared. already eroding in spots.

Mostly cleared land between R. Open lake and Barr. Berm. Whenever it is hilly it is badly eroded. Less so immediately south of B. B. Ridge tops are sites of unaltered erosion. Much secondary

vegetation here, especially in ravines.

This is a low dissected terrace of very red alluvium, pebbles abundant. The tops of the remnants of the terrace are mostly cleared and grassy in the immediate vicinity of Barranca Bermeja, some quava trees. The ravines generally have quava scrub. Low areas are swamp, some with mixed wood, some pure Enterpe, others open and grassy.

~~Over San Blas is a compound barrier reef with small apparently quite dry islets, white sand showing in woody vegetation in interior of islands. Mostly seem to be planted to coconuts which do not look too flourishing. The coast of the Isthmus here is a typical drowned coast. The peninsula that hooks south toward the islands has a fringing reef on its outer side, a barrier reef around its point and reef at all on the bay side.~~

April 9 - flight from Barranquilla
in small plane.

Part of terrace is skeletonized
into narrow ridges.

Many oil wells on this
terrace s.e. of B.B.

A large part of the terrace
in the general vicinity to s.e.
is cleared, but less and
less as we leave B.B.

Part of cleared area is
growing back to Cecropia
and other trees. Much is
~~cleared from the terrace~~

being cleared or has recently
been.

11.6

Within 5 minutes the clearing
has largely been left behind.

Flying about 3000' the forest
appears very mixed, many
light green, a few completely
bare at this time.

11.7

Ascending Rio Bogamosa.

11.8

Some clearings, scattered,

in various stages of regrowth.

Hilly land. Clearings either
on slopes show some growing
Rio Bogamosa is wide and
braided.

11.9

Enter completely cleared
country rather abruptly
at confluence with Guaya.
Rivers have extensive
gravel bars & terraces

with scattered trees. Patches
on slopes, mostly grass,
slopes and ridges with
considerable rock showing.
Ridges, especially, eroded.
Slopes here very steep.

11.10

Turned west down river then up again.

Most of steeper slopes
have abundant boulders
showing, even where there
is grass. There are still
some patches of forest, but
clearing is going on. Perhaps
70% is cleared.

11.11

A large area of moderate
relief, with patches of
woody vegetation in depressed
places and ravines, the
soil completely removed
from ridges and higher spots
leaving pinkish to reddish
scars. (around bridge)

11.12

~~Down river~~ A much
greener area, much of it in
bananas, some patches
of woods, little erosion, but
shows much but cleared
slopes have abundant
boulders showing. Trails
and roads tend to be on
tops of ridges, and erosion
initiated there. Soil in
general reddish but lighter

where badly eroded. More and more woods as we go back toward Rio Magdalena toward ~~the~~ west. Erosion of serious proportions seems to initiate and proceed very rapidly here after clearing.

713
714
Mostly forest, few clearings. A road, lined on both sides by clearings. Then the railroad to Santa Wilches. Puerto Wilches

Then much forest and little clearing for a while, then broad cleared strips. Course about northwest. Much clearing. Some slightly hilly section badly eroded.

717
718
Upper line of new railroad. Much forest left here but clearing is started on fairly large scale.

Forest here with many emergent trees, tall, canopy appears rather open.

719
Approaching lake n.e. of San Pablo Rio Magdalena - dense tall forest. Many of emergents are bare. Much inundated land on east side of river. Water in numerous lakes black. Green islands of probably

floating vegetation. Ex-bow and channels. Inundated land separates from river proper by several km. of wooded slightly higher ground, much of this cleared east of Boca del Rosario. Above this especially, the river is broad and much braided, with extensive sand bars and sandy channels.

Small lakes some miles west of river. Some forest and some low wet grassland, muddy channels and ponds. Some apparently sandy ground, clear or almost clear of forest.

What may be some natural grasslands - outlines of patches very irregular - south of Sumita.

Land here has a rather grass-like aspect. Small hills just south of lake some grassy, some wooded with many varieties many bright yellow tabebuias. Patches of what appears to be deciduous forest and bare places on these hills. Considerable savanna. Land around

Rio
Magdalena
White

limiti apparently subject to serious burning and grazing. Hills to west largely denuded and very overgrazed and eroded in cleared parts. Cattle trails form a fine network in cleared parts.

Westward largely forested but some hilltops bare. Then mostly forest with occasional clearing as mountain are ascended to west.

Then turned and went back to east because of weather, then northward west of Lago de Simiti.

This area seems, judging from proportion of deciduous trees, to be rather marginal, climatically, and the savanna patches tend to bear this out. Large areas in hilly part are savanna and locally very badly eroded. The forest on hills north of Lago de Simiti seems at least half bare of leaves. Many very large bright light green trees.

North of this much

land that appears to be seasonally inundated, with areas of higher ground cleared or almost so much of it apparently, showing some recently burned. Some of this rather abruptly higher than river channels all show as swamp on map but there is a large proportion of high ground which is definitely seasonally deciduous forest, much of this apparently subject to burning.

This east of Cray Papaya and Cray Simiti.

Northward much seasonally inundated land around Ciénega de Morata, much somewhat high ground, also, around Morales. Land to west ~~is~~ is hilly and wooded.

Ciénega de Morales is at this season a great series of channels with strips of dry ground and large ponds. Muddy.

Toward Rio Magdalena is much less high ground and most of it must be

seasonally inundated.
 Innumerable ponds.
 Some patches of forest.
 Apparently a natural
 levee ~~is~~ west of Rio
 Magdalena, or perhaps
 a terrace slightly above
 high water, as that in
 which Gamara is
 situated, across the river.
 Down river now, less
 the same sort of country
~~is~~ mostly subject to
 flooding, much open
 somewhat grassy or
 just muddy land,
 patches of wood,
 patches of savanna.
 Many lakes and
 ponds. Much more water
 than appears on map.
 (Large lake n.e. of Gamara
 not located).

Forest on islands w of
 Rio Magdalena appears
 greener than around Simiti
 and Gamara.
 Approaching La Gloria
 most of land is grassy
 and very green, scattered
 bits of wood, no high
 ground here on islands.
 Large areas of grassland
 east of river as far as

we could see (visibility
 rather poor)
 Road from La Gloria to
 Guachaco.

Island, grassy toward
 river, wooded westward,
 but with much clearing.
 More wooded westward.
 Lake north of La Gloria
 is really a great series
 of small lakes and ponds
 at this season.

Large sand bars in river
 Island more wooded
 northward but still
 mostly cleared.

North of lake much
 grassland, extending
 to and beyond Tabalameque.
 Hundreds of ponds in
 island west of river
 much grass, some woods.
 Many of trees bare.
 Much evidence of burning
 everywhere.

Patches of forest toward
 river on east side north
 of Tabalameque, much
 savanna, some clearing
 and burning going on.
 Northward toward
 Ciénaga de Zapato, ~~the~~
 hundreds of ponds
 east as well as west of

river, land mostly grassy, some patches of woods, trees along boundaries between patches, some scattered in grassland.

Area s. and w. of Ceneqa is mostly grassy and certainly seasonally flooded. Gallery forest along channels, probably on natural levees. Many cattle on grassland.

Great differences in appearance of grassland with very slight differences in elevation. Some patches of thick woods on islands, but more grassy than wooded. Considerable woods on west side of Ceneqa. Northward in Ceneqa, the islands have some elevation, largely denuded, but some still wooded. Woods here semi-deciduous. Many palms. This whole area is extensively burned every year.

Around Chumichagua mostly cleared. East of Chumichagua the lake bed is an intricate labyrinth of channels, ponds

and natural levees, the highest of these wooded - northeastern low high ground, but hundreds of ponds, etc. and varying from grass to savanna to woodland to scrub forest to patches of taller semi-deciduous forest, but these mostly being cut. The woody vegetation is mostly scrub or scrub forest, some rather dense. The tall forest rather open. Northward much less water, some grass, burned areas everywhere. Much of this probably flooded seasonally, some areas probably not.

Toward Chinguaná savanna more and more of area, less flooded land. North and east of it are vast areas of savanna, gradually replaced toward foot of mountains by forest.

Angular outlines of of these patches of woods suggests that the savanna is of rather recent human origin. Landed at small dirt strip at Chinguaná.

Apr 9 Chiriquana
 cult. plants seen
Gliricidia sepium
Actinonon papilionata
Ficus retusa
Euphorbia tirucalli
Coccoloba pentandra

Savanna east of town
 thin grass with
 scattered small bushy
 trees 4-25 m apart,
 very thin grass,
 patches of small bushes
 up to 4-5 m tall mostly
Brysonima ^{crassifolia}
 and *Coussateia* ^{americana}
 badly overgrazed. Many termite nests.
Barbasco
 savanna - strip of
 gallery forest
 in the savanna
 with large *Cecropia* ^{gibba}
 tall palms of at
 least two kinds
 or a few large leguminous
 trees *Cassipouira* etc.
 forming open & closed
 forest, with thick
 undergrowth of
Pantheoplyon, a common
 suberose shrub *Annona* ^{annona}
Randia, *Mimosa* and
 other vines, some
 very thickly growing
Triplaris ^{triplex} common
 especially around
 edges.
 Ground moss but
 mostly not any
 standing water. Much
 water borne debris shows
 - that in other seasons there is
 standing water.

April 9 - Baragana, about
15 km. e. of Chiriquana

small patch of thick
low wet woods

39392

5

3 93 *Lapinum*3 94 *Psidium guineense*4 95 *Faramea?*

very common in undergrowth

4 96 (*Alseod.*)

rare

3 97 *Faramea*

common in undergrowth

4 98 (*Annona*)

rare in undergrowth

4 99 *Randia*

occasional
in margins of thicket

39400

5

Randia
occasional
in margins of thicket

4 01 *Vitex cymosa* Des. det. by ~~...~~
occasional5 02 *Ilex?*

occasional

3 03 ~~*Miconia*~~ (*Ypor.*)3 04 (*Purag.*)

flowers white

lactiferous tree,

shrub, flowers white.

"*guyana*"

shrub 3 m. tall,

fruits dry, black.

shrub 1 m. tall; flowers

scarlet.

shrub 2 m. tall;

fruit black.

slender small tree,

buds green

shrub 4 m. tall, ~~flowers~~

fruit immature

flowers white shrub 2 m. tall

tree 10 m. tall; ripe fruit

black, fleshy, eaten

but of very flat taste

"*acartura*"

tree 3 m. tall, flowers

white.

flowers white

1958 Colombia (Magdalena)

April 9 - 8 km. e of
Chiriquana
in open dry savanna

- 3940 5) *Miconia?*
occasional
- 4 06 *Brysonium crassifolia*
commonest shrub
- 9 07 *Tournefortia*
occasional
- 10 08 (rub.)
very common
- 5 09 *Couratella americana*
very common
- 3 10 (Bign.) *Cydista aequinoctialis* (L.) Miers det. A. Gentry 1974
occasional
- 1 11 *Leijanum*
occasional
- 1 17 (rub.)
common

shrub 1.5 m tall,
buds white.

shrub 3 m tall,
petals ~~very~~ bright yellow.
wood used for firewood.

"*peraleja hembra*"
shrub 3 m tall, buds
greenish; fruits fleshy,
black when ripe.

shrub 2 m tall,
fruit green.

small tree.

"*peraleja macho*" wood said
to be useless for firewood
as it breaks pots.
scandent shrub,
climbing in bushes,
flowers pale pink.

shrub 2 m tall,
fruit black, fleshy.

April 10 - From Chiriguana
savanna with gallery
forests along shallow
watercourses.

To northwest - about 2 km. to
seasonally flooded land
semi open forest with
palms, many ^{Talipania} Tabebuia with
yellow flowers, around
edges of inundable land.
This is almost completely
dry now except for a few
small ponds and a small
lake much of it has been
burned; is a mosaic of
patches of deciduous or
semi-deciduous forest,
open grass, meandering
water channels, mostly dry,
ponds, patches of savanna.
Ponds have, in places, green
floating vegetation. Through
this meanders the Rio Cesar, very
muddy, little or no current,
surface somewhat below banks.

West of this is a mosaic
of deciduous forest and
savanna, now more forest
than savanna but clearing
and burning going on very
noticeably. Palms abundant
in this forest. The larger trees
are mostly bare, some
newly leafed out, lower

story green, much more
continuous than upper,
but locally quite open,
locally dense. Back toward
Chiriguana this is
more and more cleared,
in places as much as 75%
open. Burning has
killed the palms in place.
Every stage in develop-
ment of savanna represented
here. Farther back good
forest is almost absent,
but gallery forest along
watercourse and degraded
patches are common, as
well as patches of scrub,
but mostly grassland
and savanna. Palms are
frequently left in clearing.
Around Lake Zapatosa is
a woodland-thicket
complex, with bare shores
or with very thin grass. Even
the islands in the lake
have been mostly burned
where there is land high
enough to have anything
to burn. In lake are winding
channels bordered by ~~at least~~
natural levees, forming, at
this season, long winding
islands consisting of two
parallel strips of low land.

A few of larger islands in lake are well wooded but badly burned. Islands appear sandy, from air. Those toward southeast side of lake wooded if large, but woods are very scrubby and badly burned, in places changed to savanna.

Zapato

From Lago de Zapato passed Hatillo - park-land, very badly eroded in immediate vicinity of town. Beyond, in direction of Ocaña is a mosaic of grassland and forest, the forest being cut and burned very rapidly, the grassland locally eroded, locally being converted to savanna. Gallery forest and dense patches apparently marking low wet spots. Crossed line of new railroad under construction.

Similar mosaic continues with slight elevation and dissection resulting in local serious erosion. Forest mostly gone here.

Farther on, as first ridges of foothills of Cordillera is much more forest, but partly very badly degraded. From here north, parallel with railroad route, is a mosaic of clearings, forest, and second growth.

South of Ayacucho is mostly grassland with some broad strips of forest and scrub. Much more grassland than forest. Southward much of the grassland is growing back to scrub and most of the forest is being cleared. Dry stream beds meander across this toward the Rio Magdalena. Mosaic of grass, scrub, forest and recent clearing more sharply marked southeast.

part north
of Ayacucho
Ayacucho

Approaching the mountain the dissection is much greater, in a somewhat radiating arrangement of ridges and valleys. This somewhat more wooded, but largely cleared or in secondary scrub. Eastward, toward Ocaña the country is rougher and more wooded, but as though mostly cleared and grown back to secondary vegetation. High mountain west and northwest of Ocaña very largely denuded, but with considerable woods locally in steeper ravines. The usual tracks

on tops of ridges, farms in apparently impossible spots. Highway to Ocaña winds along steep canyon walls. Locally some erosion and landslide scars.

Valley of Ocaña with lower but complicated relief is strikingly eroded. Also much erosion on east slope of mountains. The valley bottom, much dissected, has some trees and thickets in ravine bottoms. Patches of cultivation on flat places, but in most places a fine mixture of exposed bedrock - red to pink to white, and ~~low scrub~~ ^{thin scrub} ~~herbaceous vegetation~~ thin grass. Gullying is intricate and deep. The surrounding hills seem to be covered by ~~scrub~~ a very dark dull grass, ^{more silty grey than green.}

The streams are in very low water, but the water is very clear.

Some sugar cane and granadilla in cultivated spots. Perhaps 1-2% of land cultivated.

The soil is fine and pale gray or yellowish gray. Weathering is deep and subsoil changes downward from red to white. The

reddish part is a finely mottled clay with some coarse sand and fine gravel, occasional pebbles.

The grass is a bunchy dark gray-green pubescent type sterile at this season. More or less uniform to tops of surrounding mts. except for eroded spots. Essentially no forest except thickets in ravine bottoms.

The soil has in general lost its A horizon and probably most of the B. In a few protected spots there is a ~~gray~~ brownish gray layer up to 3 dm thick, which indicates that there was once a fairly good soil here weathering to ~~part 2-3 m.~~

On many of the hills an extreme grazing pattern is evident. There are many goats and donkeys and immediately around the town the slopes are a mass of gullies.

Left Ocaña on strip at 10:55 for Temalameque to NW.

On high ridges west of Ocaña are some scraps of montane forest left, much degraded, but with a few

white Lecropias left. Some patches also in steepest ravine heads but mostly these hills are bare to their tops.

Alluvial slopes at west base of mountains have forest in ravines and a mosaic of forest, scrub and clearings between the ravines.

The line of the railroad ~~is~~ construction is sparsely ~~is~~ patches away from the river than is shown on ~~the~~ map.

Visibility poor because of dense haze.

Strip of forest extending from the foot of the mts toward the Rio Magdalena in the region of Ayacucho - ^{La Gloria} apparently represent stream bottom-lands. Northward in the region of Costilla these seem to be badly degraded and largely changed to scrub and savanna except for the immediate banks of the streams themselves, which may retain a narrow strip of trees.

north of this the gentle slopes near the mts. have mostly thin grass away from mts.

Ayacucho

The terrace is badly eroded.

More roads here than appear on maps.

In area of Hatillo - Tamalameque ^{guz} are grasslands, patches of woods and some palm savannas ^{EP} ^{Buena}

Landed at El Barró at 11:20 - grass strip east of Tamalameque. Scattered tall trees

here remaining from forest. Some of the fields that appeared to be green scrub from the air are fields of manihot that are overgrown with a growth of weedy shrubs, vines and herbs ^{herbs} 1-2 m. tall - several legumes

^{Bauhinia} Bauhinia, ^{Tajapoha} Tajapoha, ^{Cardiospermum} Cardiospermum, ^{Ipomoea} Ipomoea, ^{Triumfetta} Triumfetta, etc.

When allowed to remain for a time this develops into a dense tangle of shrubs and vines about 3 m. tall thickly, wiry, and impossible to penetrate on foot without constant and disagreeable labor with machetes. In places this is broken down and criss-crossed by trails made by cattle.

This area is of low rounded hills rather than flat as it appears from the air. However,

Ipomoea

from here westward it is essentially flat. The hills are gradually ~~long~~ higher eastward, mostly denuded but with scattered trees left standing.

Left El Barro 12:50.

Wooded strips mostly are ravines or broken ground. Many of taller trees bare, probably *Ceriba*. ^{Coliba}

Northward are broad areas of forest, quite thick, probably semi deciduous, but only tallest trees bare now. Partially cleared. Some areas of grass with spots of forest. east of s. end of Lago de Zapatosa.

Then a mosaic of patches of woods, grass, clearings, low eroded hills. Burning going on actively. Some patches of typical savanna, and all stages between forest and savanna. Grassland is intermediate stage in this anthropogenic succession. Animé River. Much grassland and gallery forest. Small mts called *Filod'Animé* wooded except ridges of which are in part bare and eroded. Then relatively flat

area almost completely in shifting agriculture. Some tall woods left but active clearing of these in process. Much second growth.

Then a stretch that is still more than half still wooded, then more and more clearing. Above *Chiriquiana* savanna and grassland extends almost to foot of mts. except for narrow gallery forests along shallow ravines.

Then some large patches of forest alternating with savanna-gallery forest pattern. Always many palms. Large areas being cleared, some of these converted to rather green grass. Most of savanna is reddish with just a light wash of green. Some spots eroded to a bright orange-pink. Some areas in savanna, some in shifting agriculture, some still in forest.

Aspect becomes drier, more savanna, forest patches thinner, more obviously deciduous.

Very peculiar irregular purple-brown areas in savanna separated by pinkish sand. Then large areas of deciduous

forest, some very good, some very degraded, some grass and incipient savanna.

Course generally north-northwest paralleling but away from ^{Cerro} Cerro de Perija. Perija

1:23

Deciduous forest becomes very general except scattered clearings, old and new.

Can see foothills ahead on both sides. Much burning in progress.

Forest here has a continuous green lower layer and a deciduous emergent layer. Some ~~large~~ large clearings, said to be for cotton.

Foothills on left are just isolated small ranges away from main Andean range. Near Codazzi. More and more very flat cleared land, burning on every side going on. Ranges of hills almost completely bare and dry, even the grass largely burned off. Beyond the first large hills large areas of palm savanna, some other large trees left, some areas of forest, less cultivated fields. The small ranges of hills are rough, of bedded rocks dipping east or southeasterly. Santa Marta Mts visible to left.

Much savanna and grassland, some forest left.

Now following Rio Cesar, which meanders in the center of a large flat plain. Deciduous forest and savanna form a mosaic of angular patches. The hills to the right are largely brush-covered. River not muddy.

1:41

Hills east largely brushy - San Diego + La Paz - hills above these completely denuded.

Much of flat land is savanna with very large scattered trees. Some ordinary savanna, some bare deciduous scrub forest. Above La Paz an alluvial slope with green scrub or scrub forest.

1:45

Valle de Upar. Much forest and park-land in valley - slopes of hills Nevada and alluvial slopes, at base largely wooded except some higher slopes which are denuded. The west side of valley much greener than east side. Foothill range ^{near Perija} has scrub forest, upper slopes mostly denuded except well up toward top where some forest remains. In valley

is much parkland with grass and large trees, much scrub forest on alluvial slopes.

Lower ranges of ~~the~~ Sierra Nevada thinly wooded.

152: scrub forest in valley extensive and becoming very sparse, mostly bare-
really woodland. Parkland here less extensive and very dry

153: Uramita

154: Villa nueva.

Much open dry pasture and parkland. Then between here and Badilla ^{San Juan} scrub forest varying to woodland, parkland and savanna. Mostly rather open. Many large spreading trees. On both sides lower slopes mostly covered by scrub forest

From here on the valley floor is almost entirely scrub woodland, probably thornbush, a few clearings near bases of cuts on both sides. Thorn forest rather green but perhaps 1/3 of trees bare.

Upper slopes of mts on east about 1/2 cleared, on west perhaps more, to 3/4 cleared.

Toward Rozario more clearing, in center of valley patches of very dry savanna.

205

Rozario. For near de Cesar.

Many green fields, banana patches. Mosaic of clearings, parkland and deciduous woodland.

Alluvial slopes and foothills on both sides covered by deciduous woodland.

Higher slopes partly wooded.

Some greener woods along Rio Cesar

209

Fonseca. Above this, along Rio Cesar a strip of parkland, otherwise than woodland.

Cerro de Peiyo becomes more wooded. Middle slopes of range on west side very bare. Aspect of low range on right of course very dry, almost all trees bare.

213

General vegetation a very dry thorn bush with few green trees except along stream valleys, esp. Rio Cesar, where trees are large but well separated.

216

Over here a few clearings. Woodland variable, patches are greener, patches

- very thin and dry.
Stream courses sharply outlined in green trees.
Last areas of almost completely bare woodland.
- 2:20 Rio Hacha bend northwestward a broad band of thick green woods in expanse of gray thornbush. Locally are scattered light green trees in thornbush.
- 2:24 Fewer green river courses except near base of ridge to east. This ridge rather well wooded, perhaps semi-deciduous woods.
- 2:27 Cuesticita - some cleared land pasture. Highway to Urbis looks passable for jeeps, perhaps.
- 2:30 Occasional large dry pastures. Otherwise thornbush with some green water courses. Clearings become more frequent, much savanna.
- 2:38 Maicas
Landing strip oiled.
Thorn bush thins out here to thin savanna. Shallows abrupt dry ravines reappearing northward. Large tree *Cereus*. Flat-topped acacia(?) or *Prosopis* green. Much dry herbaceous growth on ground between trees.

- Height of trees not more than 3m except cacti which may reach 4-5m. Cacti only occasional.
- 2:40 Left Maicas
There is some extension of thin savanna to east, especially on south side, but almost immediately and abruptly it changes to desert - or thin desert grassland with occasional patches of bushes or sandy patches. Northward is generally a sparse scrub or what seems to be mostly drifted sand. Perhaps the sand is caught by the vegetation or possibly the vegetation grows there because of sand. To south seems to be characteristic of flat area west of corner of Lake Maracaibo, but inland the same sort of thin savanna as around Maicas but perhaps denser is almost continuous with some more open patches, probably drifted sand.
- 2:41 The general color is tawny with gray vegetation. *Cereus* is a roughly cone-shaped plug with a thin scrubby vegetation except
- 2:54

on rocky knob at top.
The rock is pale yellowish.

Ahead is a watercourse
running to ~~Golfo~~ Maracaito

Except for this, which has
a strip of thorn-forest,
the savanna is now
very sparse, but quite
uneven, denser to westward.

Would now certainly be
classified as desert, from
about Cerro Teta westward.

7:00

Cordillera de ~~Cajera~~ Cajera -
very dry, lower parts
tawny, with scattered uneven
bush. Higher parts fairly
well vegetated with what
appears to be a thorn scrub
bush which seems to be
general on hilly area to east,
except on playas and braided
dry watercourses, which are
nearly bare.

11:00

Serrania de Cocinas - well
wooded with thorn bush -
a woodland - nearly leafless,
many arboreal cerei, enough
in parts to be the dominant feature
of the vegetation. A small reservoir
~~west~~ north of this between
ranges of this.

Two main ranges of this
running east and west. Somewhat
dissected country north east

of this, with thorn-savanna
of this very uneven, with
some completely bare areas.
There, in some cases, seem
to be ~~deserted~~ desiccated ponds.
Some tiny Indian villages
with corals.

11:30

Serrania de Jarava - a
high rugged range with
a curious contrast in higher
parts between a red rock
and gray talus or scree slopes.
In upper parts the vegetation
is a scrub with scattered
bare trees, in lower parts
thornbush. Some green
in bottoms of ravines.

This range is fairly
extensive. In flatter
valley are many ^{small} corals,
completely bare of vegetation
except an occasional greentree.

Valley Plain north of this
somewhat irregular, partly
wooded with thorn savanna,
partly ~~or~~ absolutely bare and
eroded.

Watercourses here have
little more vegetation along
them than the surrounding
country.

Generally a fine mosaic of
completely bare eroded areas
and patches of dry grass (gray)

and scattered shrubs or small trees, all bare
 4:23 Directly north of Sierra de Chimare, but turned back directly west. over almost painted desert type of erosion, but colors only gray, ~~and~~ brown, and tan.

A few low ridges ~~is~~ north at an angle to coast. North coast appears, from distance, to be rather extreme desert. Some very large apparently very shallow lagoons. Apparently lined with mangrove swamps, at least east of Bahis Honda. These very irregular in width.

Large area southeast of Bahis Honda is absolute desert, very smooth and flat. Probably salt flats. Some eroded slightly higher ground immediately around bay is eroded and has scattered brush.

Large bay called El Portete on map has mangrove swamps on east side but these appear to be somewhat deciduous.

Salt flats? on south side higher ground with thorn savanna on northwest, narrow mangrove fringe around west extension. Large flats

of rather extreme desert west of El Portete, and general landscape west of it desert and thorn savanna mosaic. South of Cabode la Vela the bay is lined with dunes and east of these are bare salt (?) flats, very smooth, without vegetation.

Coast southwest from here has a broad belt of such flats, back of a narrow belt of dunes immediately back of shore. Dunes have some vegetation.

Back of the salt flats seems to be so thin bush.

4:45 Carrizal - tiny village in dunes along coast.

4:47 ^{in Guayama?} Turcuracas - another tiny village, beyond which the salt flats are flooded, forming a lagoon. ~~They~~ The salt flats extend a short distance beyond the lagoon, then the thorn bush reaches the beach.

A considerable interval, more than is evident on map, before the first of the lagoons, at 5:53 Manauare is reached.

Here is a large salt pan and extensive lagoons and

note
at the mouth

salt flats extend along the coast from here on. A beach ridge ~~is~~ with vegetation separates the salt flats and lagoons from the sea. At s.w. end of large lagoon is a series of vegetated concentric beach ridges curving in toward lagoon, then a small outlet. Then extensive desiccating lagoons and salt flats in places with scarcely any beach ridge. The flats here are white rather than tawny, apparently a crust of pure salt, some sandy ridges in it with vegetation. After this broad bare flats, dull tawny in color, extend along the coast behind a well developed coastal dune ridge, this with humbly vegetation. Evidently the tawny flats are sand. Some slightly higher spots vegetated. All along back of the flats is relatively level country with gray thorn bush. ~~beach flats extend~~ The sand flats extend to just before the big lagoon just east of Riohacha. There are also rather bare flats back of

this lake but the thorn bush extends out onto the narrow peninsula east of it and leading into the sea that separates it from the sea. This bar has apparently herbaceous vegetation. Slight mangrove swamp at west end of this lagoon. The sand flats extend to Riohacha. From there on is thorn forest, to the top of the beach for a good distance.

A few miles southwest of Riohacha is another extensive flat, saltier sandy, and a stream mouth with sand flats on both sides. Then the first of two large lagoons, with extensive sand flats east of it. The second lagoon seems to be almost dry, except in center, where there is a little water. The dried bed is very salty. S.w. of this another small flat and some grassy dunes. Other than thorn forest or semi deciduous forest near the coast.

Possibly some swamp, but clouds cut off visibility. At least some water in a greener area than the surrounding

5:17 forest

5:17 Inca.

5:17 Dibulla

considerable cleared land around Dibulla.

Some to west possibly low and marshy.

5:20

The coastal area here is mostly open and quite green, possibly marshy, considerable forest, but clearing and burning going on. Some rather dry pasture in flat area. Some low hilly land with forest. Then alternating low wooded hills, flat forested land, swamp, low hills with semi deciduous forest, then considerable reasonably level gently sloping forested land, this forest mostly evergreen except tallest trees. Some cleared land near coast growing back to brush.

5:24

a large river with cleared flat land along it.

Then the coast becomes rather abrupt, densely wooded mountain slopes, with an abundance of large *Tabebuia* in flower, rose and greenish white (Cuipe?) These slopes seem undisturbed right down to sea.

5:25

Then a flat area, newly cleared, partly planted bananas (B?), then a narrow coastal reasonably flat strip, partly cleared, back of which are steep forested slopes.

5:29

More extensive clearing near mouth of large river, issuing from a canyon, then more flat cleared land, rather narrow coastal terraces, certainly not generally more than 1/2 km wide.

6:30

Another river valley and extensive clearing, broader terraces west of this, partly cleared, another stream, then the

5:31

coast becomes abrupt again and wooded to the shore. Some clearing in flatter places and narrow stream valleys. Thus to Cabo San Juan de Guis. The mountains above this coast are extremely rugged and densely forested to crests of coastal ridges. Forest on crests is dwarfed, typical mountain forest.

1958 Colombia

West of the cove the aspect becomes gradually dryer. Some clearing at heads of bays. Forest on coastal bluffs and headlands rapidly changes to a dry ~~scrub~~ deciduous scrub or thorn bush which surrounds the several beautiful bays. Higher mountain slopes still have wetter forest but only above 1000 m, a somewhat more.

This coast is very steep and has low wave cut bluffs. Aspect drier as Santa Marta is approached. Wave cut cliffs are almost white. Soil above is red. Back of Santa Marta the flat land is largely cleared some thorn bush, hills scrub covered.

Valley south of Santa Marta green, mostly in bananas. Many trees. Hills scrub forest or scrub, some slopes bare.

Alluvial slopes above air strip have thorn forest, small part cleared.

Flats south of where coast turns west in bananas. Low lower spur of mts.

Colombia

south of airport bar and road.

April 11

The thorn forests on the lower slopes are about 5-7 m tall, leafless at this season. *Cereus* (*Leimnocereus*) of a fastigiate habit are abundant. *Bursera*, *Porechloa* also, and several legumes. Undergrowth of leafless shrubs and an abundant large *Bromelia*. In the flat valley mouths, where there is no cultivation there is a thick scrub about 1.5 m tall of a green *Prosopis* or *Acacia*, flat topped, forming a continuous canopy. The thorn forest comes down to the ~~east~~ flat ground in places, practically to the beach.

Around Ciénega are banana plantations, some coconuts near the sea. Mangrove swamps abundant but not continuous around the eastern edges of the Ciénega. Much open water in them. Marana area south of Ciénega along the foot of the mountain is perhaps $\frac{1}{4}$ - $\frac{3}{4}$ planted to bananas. Grassy fields sometimes with scattered bushes or small trees make up the rest. This pattern extends south to Guabamoyal.

where the plantations become almost continuous. A broad belt of plantation, with occasional grassy fields, extends to Aracataca.

Fields are crossed at intervals by irrigation canals and ditches.

Some sugar cane near foot of mts., not much.

West of the plantations and south of the Ciénega the land is mostly cleared and in pasture, locally with many palms left standing. From the appearance of the remnants the original forest must have been a ~~deciduous~~ or semi-deciduous forest with an abundance of palms. It may be partly flooded at high water.

Around the shores of the Ciénega on all sides is a broad belt of mangrove, and many islands and strips in the lake itself forming a labyrinth of channels.

West to the Magdalena is a complicated area of ponds with floating vegetation, bare saline soil, meadows, slightly higher ^{areas} of

scattered palms, dense grass that may be *Maize*, patches of mangrove.

A canal connects the river with the Ciénega. Near this the land is mostly inundated; even now. Some higher sandy areas cultivated. *Arachis* esp. across from Barranquilla. Much burning even in the marshes.

In the middle of the Ciénega ~~is~~ are two towns on pilings, one of them, Nueva Venecia, quite large, with churches, ^{shops} etc. as well as large numbers of houses.

Below Barranquilla, east of the river the land is mostly inundated or marshy.

Mangroves line the east bank. A tremendous breakwater or jetty ~~is~~ ^{makes up} the west bank and projects far out to sea & conducts the silt out of the port. West of this are lagoons with considerable mangrove.

The mud from this river mouth a "torca de cenizas" colors the Caribbean as far as one can see.

The land to the east of the extreme end of the entrance seems completely bare, landward becoming gradually ~~to~~ grassy, then great trunks of reeds with some brush. It appears that waves sweep completely over this projecting part during storms.

Seaward of Barranquilla itself is flat land with deciduous scrub forest and woodland, mostly bare now.

Between Barranquilla and Soledad airport is a similar vegetation but much sparser, more scrubby and disturbed, with a network of cow paths, some of it savanna, some just dry grass. South of Soledad much of this has been cleared for cultivation and is in various stages of regrowth.

11:45

Left Barranquilla for Cartagena & Tolu

Same pattern of various stages of regeneration of scrub and condition of overgrazing west of Barranquilla as south of Soledad. A little farther west there seems to be less overgrazing, but somewhat more land cleared for agriculture.

Following the coast south-westward, less clearing, some rather low relief, showing spots of serious erosion, tawny against the gray-brown of the scrub forest.

11:59

Marro Hermosa - Rough areas here partly wooded with fairly good deciduous forest.

Then some flat areas that are cleared, with a pale buff soil, and areas of some relief with deciduous forest and scrub forest.

More flat cleared land, narrow green gallery forest or scrub along dry watercourses. Inland a mosaic of deciduous scrub forest and cleared land.

11:59

Some relief, with deciduous forest, with intervening cleared flat land.

Much clearing and burning going on in the patches of forest that are left, obviously the ~~rate~~ rate of clearing to be seen far exceeds that of regrowth.

12:01

12:03

serious overgrazing
Puerto de la Galera - salt pans on east side of point.

Back of point some fair deciduous forest.

12:24 Ciénaga del Totumo - a shallow very complicated lagoon with some slight mangrove development, opening to sea.

~~North~~ West of Punta de la Galera a very striking parallel series of bars curving south and inward.

12:08 Around ciénaga the flat land is cleared and overgrazed the rough land with deciduous woods being cleared and burned. A small crater-like pond surrounded by queer forest, back of an extensive salt flat extending back from the point.

Turned inland all of this area has much the same pattern of cleared flat pasture and wooded hills being cleared and burned. Inland there are more and more green trees and bushes, a few bananas planted here and there in ravines. Many palms scattered locally in the pastures circled over the area northeast of Cartagena. Several small reservoirs. Country generally very overgrazed.

12:16

Santa Catalina

17 fires visible at no time from plane at 1750' alt., many more

burned areas.

Some poor looking banana patches east of Cartagena mangroves around bay north of Cartagena, forming a very complicated pattern.

12:21

Cartagena. Hill between the two bays covered by deciduous scrub forest, but even on this a burned area.

Much less mangrove around bay south of city. Some on north end of Isla Tierra Bomba, a little bit around other parts. The island generally covered by deciduous scrub. North end of Isla de el Rosario with considerable mangrove development. The island itself a mosaic of scrub woodland in various stages of regeneration.

Head of Bahía de Barbaovar lined with a very considerable mangrove development, also its east and southeast shores outside the Canal del Dique, a little to landward of canal, also. Many sandy areas and desiccated ponds in these mangrove swamps - some patches of higher ground with deciduous trees. Very complex mosaic.

The interior of the large swamp area of Punta de Barajas is probably fresh water swamp. South of this is an area of ~~low~~ brown overgrazed savanna, and patches of woodland and scrub. The coast is lined by a narrowing belt of mangrove swamp. Some low wooded hills just back of coast, increasing inland. Here also much burning and clearing.

Southward these hills get lower and lower, more and more burned and denuded. On flat ground is extensive palm savanna.

Mangrove belt has practically vanished.

~~The~~ Palm savanna very extensive. The palms seem to resist, somewhat, the burning. Some scrub forest with many palms. Scattered large Ceiba (?) along the ravines.

12:49 Much burning in low hilly area back of Punta San Bernardo.

Some sparse deciduous and palm forest left inland from point. Extensive grassland and open savanna farther inland.

Mangrove belt along Golfo de Morrosquillo much narrower than shown on map.

Inland from them extensive palm savanna "Los Sabanas de Bolivar".

Some semi-deciduous forest along coast. Some marsh and swamp back of this, but not extensive.

12:56

Tolu - back of it extensive savanna. South of it a tiny landing strip. South of this a very narrow belt of swamp, back of this considerable green woodland.

Around Tolu some crocots. Woodland in various stages of regrowth. Back of woodland some palm forest.

1:00

landed at Tolu.

Mangrove swamps here very dense, trees up to 10 m. Mostly Rhizophora, with aerial roots originating as high as 6-7 m. and hanging vertically. Some Avicennia, Hibiscus tiliaceus. Thesperia populnea planted along beach in front of town.

2:19

Left Tolu, for Cartagena going considerably inland. Southward inland savannas inland from Tolu have green trees and bushes, mostly palms. Very few patches of woods left, these green

or partly green, palms and Ceiba common. Going inland the woods become less green, but there are narrow gallery forests along streams and ravines. Smoke from burning is so thick that visibility is poor. Many patches of palm savanna, patches of grassland without trees.

Came to a rather high range of hills, wooded somewhat along the top of main ridges and in places on the slopes with tall forest, semi-deciduous to deciduous, many palms in lower parts. Cleared slopes mostly scrub-covered, scrub deciduous, some bare and planted to something or in pasture.

Followed this upland ^{eastward} ~~northward~~. Hills get lower and more denuded, very rocky.

Country to east is hilly and very much denuded. Ravines tend to be wooded and green. What wood there is on slopes is deciduous. ~~Some~~

Sincelejo. Turned north and northwest. Vast savannas and grasslands, some patches of scrubby second growth, especially on hilly areas. Smoke so thick that there is no

visibility in mt. to west. They seem more bare below, with woods on higher ridges.

Hills along course more or less scrub covered, with green to bare woods in ravines.

Northwestward, hilly to mountainous country mostly bare but with many irregular patches of green second growth. Then hills that have some deciduous woods then more bare ones. Most of open area recently burned over. Considerable flattish burned over land then the strip of lakes and marsh and swamp complex along the Canal del Dique, east of Corfer. The woods here are green and contrast sharply with the brown savanna on both sides.

Northwestward a mosaic of cleared land and woods, south and east of Arjona. West and north of it almost all is cleared and much of it covered by low scrub, some grassy with scattered trees, some scrubby wood in hilly places, but far more low scrub.

around Turbaco almost all is cleared, mostly overgrazed and covered by a thin low brush. Some second growth wood on escarpment between the terrace around Turbaco and the Cartagena plain. Cartagena plain cleared and overgrazed, some areas of green to deciduous woodland. Mostly grass, ~~scrub~~ scrub, and savanna.

Trip by car to Turbaco -
Soils of hills near Cartagena are gray or gray brown, darker near surface. Those of the low flats are black to a considerable depth, appear very fertile. On rolling ground toward foot of the escarpment ^{soil} is gray brown to dark brown, ~~the surface~~ ~~soil~~ subsoil gray-brown, lying on a dense semi-consolidated clay. Here the plants look much greener.

The escarpment is of ~~crust~~ ^{mass} limestone. The soil on top is a dark chestnut brown or chocolate brown when moist.

Cartagena - most of the coconut trees here are diseased, characterized by extreme shortening of leaves, then death.

Mud volcano
A field of several hectares of very low cones 1-3 m high, with considerable area, with craters in their tops from which slowly bubbles and oozes a gray fine mud and a certain amount of an odorless gas. The mud cracks into polygons with desiccation. The area is irregular, mostly bare of vegetation (slope about ~~1/10-1/20~~ ^{1/10-1/20}). Dense clumps of a sedge. Dry forest around it with *Bromelia* on ground.

Bubbling produces sound like plunking ~~pebbles~~ ^{pebbles} in a ~~half~~ ^{half} barrel of water, or like certain frog half full of

No obvious relation between activity of neighboring craters.

Craters vary in size from several cm. to about 1 m., mostly less than 30 cm.

Some of them seem to issue from a very narrow throat others very broad, probed with a pole to 25 m. before encountering

resistance.

The mud is gray, tastes very slightly alkaline, is coarse enough so that the particles are felt between the teeth. After exposure to air the surface turns rusty brown, but not rapidly.

On the surface of one of the pools was a circular patch of a brownish oil-like material. One of the local people said that at times the production of mud was much greater, especially during the night, and that the amount of oil on the surface was at times much greater, also. He said, also, that there were other areas of these volcanoes also.

The mud is firm enough to walk on soon after emission.

The temperature is very slightly below body temperature as judged by feeling several of the more active pools.

Some of the craters have a distinct rim, others are merely rounded on top.

The cones 3 m. high are compound ones and do not stand that high

separately. The character of the slopes varies from straight and very low to definitely tending to be hyperbolic.

Apr. 12 - Cartagena to
Barranquilla via Turbaco.
Photographed mud volcano from air. Unable to locate any more, except possibly one small patch situated in a depression on top of a low hill some distance north east of main area.

The main area is definitely on a somewhat dissected terrace.

East of Turbaco the country is hilly, largely burned over, covered by secondary deciduous scrub or scrub forest in various stages of regeneration.

Approaching Repelón there is some level cultivated land very dry now, overgrazed pastures, and some swamping with green trees.

East of this is a vast complex of lakes and ponds and seasonally flooded land.

Some green floating vegetation forming large rings festoons

1957 Colombia

and patches in Ciénaga de la Guajara. East of this savanna, burned over and overgrazed hills and flats, a patch of palm savanna, watercourses with green trees, these large and spreading. Locally north of Sabanalarga some serious erosion on hilly places.

Grazing even more intense east of Baranva and northward to Soledad.

April 13 - Drive out of Barranquilla.

Cordia sebastena sloop much used as street tree in Barranquilla also *Delonix*. *Inga casei* and *I. coccinea* common. A red flowered and an orange flowered form of *Cordia sebastena*. *Casuarina* common, also *Pithecharidia pacifica*.

Calotropis is common as a weed around outskirts of city.

Where there has not been very recent clearing and no grazing (on road to Puerto Colombia, the vegetation is a scrub forest of bare trees up to 6 m. tall.

Colombia

of several species not identified except that one is a *Cuscutia*. Undergrowth too dense to walk through, mostly bare but some species green, up to 3 or 4 m. high. The whole is tangled with woody vines, also mostly bare. Most of these plants are not spiny, except a small palm with excessively spiny stems and a *Theophrasta* with leaf tips spinescent.

Also what appears to be *Pisonia aculeata*, completely bare of leaves but with flower buds. *Cordia* rather common with green leaves, white fls.

Across street, where the land is fenced, the undergrowth is broken down by cattle.

Soil here is a gray sandy loam but is rather thin on a white shaly ^{soft} rock, occasional ^{small hills of} compact brown sand.

Fence posts all living trees of *Glinuicidia sepium* a "mata raton", which seems to be universally used for this purpose here.

In ravines the trees reach at least 10 m. in height. A species of *Sterculia* is evergreen and conspicuous but not abundant. *Pereskopsis* with long

needle-like spines and a spiny *Pithecellobium* ~~set~~ vel aff. we found but rare large *Cereus* is rare.

Road to Boca de Cenizas - much industry, especially on river side of road. Vegetation low and weedy or brushy. Beyond industry a patch of bare sand dunes crescent shaped, moving away from river. Then a low leguminous scrub, mostly green, some *Cereus*. Scrub generally 1.5-2 m. high, maximum 3 m.

Farther out the scrub is lower, more wood swept. Cacti become common.

Then mangrove swamps alternating with consolidated dunes. On the dunes is a rather thorny scrub of *Acacia*?

Pandia, *Cereus*, *Theophrastia*, ~~*Passiflora*~~, *Opuntia*, etc. to 3 m. tall.

cm.

On flat low ground between patches of mangrove are ~~*Distichlis*~~ *Distichlis*? and *Batis maritima*.

The mangrove here is *Avicennia* sp. and is mostly quite low, 1-3 m. but occasional trees that have escaped

cutting for a time are up to 7 m. tall. Prop roots are present but not well developed. Above a certain tide level the *Avicennia* survives cutting and sends up sprouts.

However, out in the flats that are submerged large areas have been cut and have not recovered. It is possible that the stumps represent some other species, of course.

On the ^{low} bluffs landward is a spiny scrub of *Acacia* sp. and a number of other bushes including a very spiny and painfully stinging *Cnidioscolus* with a sulcate stem. Though grazed this scrub is still very hard to walk through. It is about 3/4 deciduous.

Acrostichum aureum common locally in the mangrove.

On way back, green leguminous scrub is on flat low ground, giving way to deciduous as soon as slightly higher ground is reached.

April 12 - Buriaes mud
Volcanoes about 6-8 km.
e. of Turbaco, s.e. of Cartagena

39413

3

Fimbristylis
the only plant on the mud
volcanoes

with
E. Parry
and
C. Arboleda

April 12 ^{e. of} Turbaco, s.e. of
Cartagena
in second growth thickets

1

14

Cassia

1

15

(Caper)

occasional

April 12 - north of Barranquilla
on road to Boca de Cenizas, Atlantic
on consolidated sand dune
just above mangrove swamp

2

16

Randia

common in deciduous scrub

4.1

17

Conocarpus erectus L.occasional just above
mangroves

April 12 - west of Barranquilla
on road to Puerto Colombia
in dry deciduous forest

2

18

*Crotalaria*common in ~~scrub~~ clearing.

4.1

19

Cordia

common in

densely caespitose, forming
patches.

fruit immature.
shrub 2 m. tall, flowers
white, contorted, fragrant.

2 m.

stiff shrub 2 m. tall,
fruit black.

1 m.

small tree ~~4~~ 4 m. tall.

5 m.

low suffrutescent herb
standard lavender, lined with
purple, keel deep purple.
shrub or small tree 2-4 m. tall
flowers white, fruit immature;
buds curiously appendaged.

April 14 - between Bananquilla and airport Soledad.

The deciduous woodland has between the trees or rather thick herbaceous ground cover, now completely dry. The trees are mostly spiny acacias about 2-3m tall. Farther away are some larger bare trees, perhaps 8m., widely spreading. Cacti are common - *Opuntia* and a low *Cereus*.

Glinisidia sepium is present as living fence posts, fully leafed out and green.

April 14 - flight Bananquilla - Tocumen, Panama (1 hour 35 min)
Calotropis ~~very~~ abundant around airport, locally.

11:25
21-1911

Took off.

Open grassland between airport and Rio Magdalena, also on island in river.

Bananquilla is a great sprawling city with many trees in residential areas, rather concentrated business area.

Deciduous woodland with scattered green trees northwest

of city. Water courses lined with green trees. Some open bog grassy fields. A few small ponds made by damming ravines - water very green.

12:00

Many small burned areas. Puerto Colombia - port with no harbor - pier projecting beyond bar which enclose lagoon.

12:05

From here went out to sea. Rather muddy apparently shallow water for a considerable distance, bounded very sharply by blue water - perhaps this is not shallow but is merely the mud from the Magdalena.

1:00

Over Archipelago de las Mulatas (San Blas Is.) - Cayos Holandes, Cayos Simon - apparently a compound barrier reef with small, apparently quite dry islets with white sand showing through woody vegetation in interior of islets - apparently a very thin coconut plantation. The coast of the Isthmus is here a typical drowned coast line - San Blas Peninsula has a fringing reef on its outer side, a barrier reef around its tip and no reef inside around the Gulf of San Blas. In the gulf near the

mainland coast are several tiny islets in the bay are completely covered by thatched houses, crowded so closely that no ground shows. The coast of this bay shows much shifting cultivation, inward for perhaps several km.

After that is solid unbroken rain forest until first small river is crossed, along which are scattered clearings, and others from here on.

1:03 Approaching a largely cleared valley

Ridge-tops in part with dwarfed vegetation, some bare and brown, obviously burned.

1:10

over airport. Country ~~is~~ around it bare, burned over, showing patchy red and pale buff soil 2-3 fires visible at once toward canal zone.

1:14

Approached Touman -
Fires in all directions
Some ~~reg~~ forest along stream

has escaped burning
grass is mostly brown and dry.

2:30

Took off from Touman.
Soil here is generally reddish.
Along the Pacific coast there is a well developed but narrow belt of mangroves as far as Panama City. The coast is remarkably straight.
Visibility very poor after leaving Panama City.

2:50

Clouds cleared away revealing a fantastically complex drowned coastline or lake, the country around it green, largely in shifting cultivation, but partly forested. Hilly, soil bright red.
Apparently this is the southeast extension of Gatun Lake.

Between here and the coast west of Donoso is forested country but showing many clearings in various stages of regrowth, some fresh ones.
Small streams entering all along this coast have very black water, at least where from high altitudes left coast.

2:56

327 Passed Isla del ~~Est~~ Zap.
in distance to left. Poor
visibility. Considerable
open country along coast
northwest of this. Probably
banana plantations.

C.R. 1954

3-34

Puerto Jimen - Peninsula
is about half cleared and
planted to something in
geometrical arrangement -
possibly citrus. The rest wooded.
Coast northwest of here
very straight.

The shore is a dark gray
rather narrow beach.

Close in are masses of
very muddy water whose
origin is not evident. Back
of the beach ridge is
a vast area of swamp
with black-water and
rivers running through it
are green (photos).

3-39

Crossed a very muddy river
which probably is origin
of the mud, which is evidently
swept southeastward by a
long-shore current, as no
ground seen north of the river.
Probably the river running
down from Matina.

Northwest of here solid
dense forest.

3-45

Some patches of grass, origin

not obvious (photos).

Possibly old clearings, but
no evidence of recent human
activity.

4-46

Very small grassy areas along
small meandering stream.
Many small very irregular
ponds, black water.

4-47

Then more grassy spots.
Then a larger area of
grass with abundant
patches of trees; two very
muddy small rivers -
this may very well be the
work of man.

4-48

4-50

Large, very muddy Rio
San Juan, with some
clearing along banks. South,
west of it an area of
complicated grass and forest
mosaic, similar to that
noted above, but very evident
ly wet.

Many ^{irregular} areas of fine textured
vegetation in the forest near
river - probably swamps.

4-51

Hills with dense forest
for as far as eye can see to
northeast. Relief rather low
but dissection complicated.

4-52

Abundant bare emergent
trees in ~~area~~ what appears to
be dense rain forest. These
become more and more

abundant. Much clearing
along rivers.

4:05
5:00 General aspect of forest becoming
drier. Clearings more
frequent, dry looking,
many recent ones. Much
burning going on.

4:06
5:02 Crossed a low range of hill
transverse to course.

Then more hills. Forest
takes on a semi-deciduous
appearance.

5:04 Forest gives way to grassy hills

5:05 East of lake with savanna
thin forest, grass mosaic.
Some cultivation.

East ~~sides~~ of lake appear
to be quite dry and brown
wherever woods have been
cut away.

Visibility over lake very poor.
Isle San Bernards (?) very
dry.

5:16 Passed a very symmetrical
volcanic cone on left which
blew a nice puff of smoke
as we passed. Base hidden
by haze, so it is not possible
to tell if it is Conetopa or one
of those to north.

We are above a diffuse
dusty looking haze that
cuts off view entirely.

5:25 passed head of lake - country

very dry.

5:28 Passed Managua.

Everything very dry.

5:31 tiny island in Lake Managua
- wooded except for dry grassy
west slope.

5:33 Volcano east of Monumbo
- smoking cone, rubber
slopes & reddish ash or
cinders, top whitish,
lower slopes sparsely wooded.
Cordillera de los Marabios
generally sparsely wooded
except upper slopes around
craters.

Middle peak of second
mass has a round
sharp hole on the west slope
just below the top.

Country at base to west
intensively cultivated but
very dry. Hedgerows between
fields.

5:35 some slight smoke from
second ^{crater} other most craters
several wooded lava flows
on west slope and at base.

Much burning at base
and lower slopes of highest
with peak of range.

Possibly the smoke from the
burning is responsible
for the haziness and poor
visibility, as many fire seen

1958 Nicaragua - El Salvador

543 Intensively cultivated country continues northward some low sparsely wooded hills, locally cleared, various stages of regrowth. These continue onto the peninsula south of Gulf of Fonseca. Great bare flats along the south side of Gulf, separated from it by a vegetated beach ridge. Flats seem to have no vegetation at all.

Huge crater on mountain on peninsula, smoke issuing from many places on slopes of mountain but not from crater. The sides appear to be of scoria or lava, covered by a woodland of rounded green trees.

Wave cut cliffs along coast northeast of Punta Casquivá.

544 Punta Amapaia - mangrove swamps around bay back of barb of point.

West of this a long very straight pale gray beach.

Back of this a long inlet parallel to coast, lined with mangroves.

Back of this dry mountain slopes, mostly cleared but some forest left on higher slopes.

El Salvador,

- westward. Hilly country, dry, mostly cleared.
- 600 Passed a very symmetrical cone to north, with a crater in top - not active.
- 601 Usulután - country very intensively cultivated.
- 602 Another cone, lower but closer, smoking some, deeply eroded, slopes steep. Visibility very poor because of smoke. Mountain slopes west of this steep, wooded. Lower slopes and lowlands cleared, dry.
- 603 Crossed Rio Limpá. Wide sandbar. Country cleared, dry, more level parts cut up into fields separated by hedges.
- 604 Approaching San Salvador - Ridges radiating from volcano - ravine wooded, slopes and ridges bare and dry. Streams with little water, clear. Some woods on tops of hills east of Laguna de Chapango. Some tiny steep hills in lake. This lake is probably a large caldera. Country west of lake

cut into intricate pattern of bare pale ridges and wooded ravines.

Slopes cultivated when possible. Soil apparently a light gray ash.

Many trees in San Salvador. Some woods on slopes above city.

Plants planted in pits on slopes. Sugar cane and banana on level ground.

500

Took off from San Salvador (clock back 1 hour) for Guatemala. Inner slopes of Chapango caldera mostly cleared, grazed or cultivated.

Very deep parallel gullies separated by sharp ridges, cut in ~~interior~~ ^{north} side.

Gentle ash slopes above this, leading up to volcano near Suchitot, cut very intricately by deep crossed gullies. Cleared except ravines.

Smoke very thick, visibility very poor.

Many of gentle slopes in sugar cane. Country generally cleared, cultivated or grazed. Hedge rows between fields.

This pattern continues, except for some deep brushy canyons, cultivation becoming less, but clearing still almost complete.

5:13

5:25

Then little or no visibility. Arrived Guatemala, smoke and clouds very thick.

Deep gorges cut in tableland of volcanic ash - walls wooded where not too steep.

5:39

Landed.

6:22

6:30

Took off.

Ravine heads vertical, with no gullies running to them above - how does this come about?

Visibility about zero after any altitude is reached.

198

199

18200



