SOUTH FLORIDA RESEARCH CENTER

Report T-592

A Survey of Fire History and Impact in Tropical Hardwood Hammocks in the East Everglades and Adjacent Portions of EVER

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Lloyd L. Loope and Nancy H. Urban

INTRODUCTION

Tropical hardwood forest vegetation is found in the United States only in the southern portion of Florida. Small islands of such forest, surrounded by other vegetation types, are traditionally referred to as "tropical hardwood hammocks" or often simply as "hammocks" (Davis, 1943; Robertson, 1955; Craighead, 1974). The scientific and esthetic value of these hammocks is considerable. Hammocks contain numerous tropical plant species not found elsewhere in the United States. Their preservation as natural ecosystems is a primary concern of the U.S. National Park Service and of state and local governments. This study provides baseline data on the nature and recent successional history (since 1940) of tropical hardwood hammocks of the "East Everglades" area and adjacent portions of Everglades National Park, west and northwest of Homestead, Florida. The area of investigation is located between Grossman Hammock (in Chekika State Park, 30 km northwest of Homestead, Florida) and Long Pine Key in Everglades National Park (ENP).

The hammocks occurring in the study area are small, ranging up to a few hectares in size, and number in the thousands. They occur on islands of higher ground within a seasonally inundated prairie, dominated by Muhlenbergia filipes, Cladium jamaicense (sawgrass), and/or Schizachyrium rhizomatum, on a rugged limestone bedrock and marl substrate. The species composition of the rarely flooded hammocks consists primarily of tropical hardwoods, in marked contrast to "bayheads," tree islands with a seasonally inundated rooting zone dominated by temperate swamp hardwoods including Persea borbonia, Myrica cerifera, and Ilex cassine. The larger, better known hammocks of Long Pine Key (Craighead, 1974) are located to the southwest, just outside the study area. Many hammocks of the study area have been severely affected by fire in recent years. Lowered water tables, particularly in the eastern portion of the area (adjacent to L-31W and C-111 canals) are believed to increase hammock vulnerability to fire and jeopardize their long-term survival as hammocks. Everglades National Park has a Fire Management Plan (Everglades National Park, 1979) which involves almost annual prairie burning along ENP boundaries which pass through the study area to establish fuel barriers to wildfires burning in the vicinity of the boundary within or outside ENP. Lightning-caused and other fires are allowed to burn under specified conditions within ENP. A more extensive program of systematic prescribed prairie burning late in the wet season (August-October) or early in the dry season (November-January) has been advocated by some to periodically remove fuel surrounding hammocks, reducing their susceptibility to fire during dry periods.

Invasion of the exotics Casuarina spp. (Australian pine), Schinus terebinthifolius (Brazilian pepper) and Melaleuca quinquenervia is also widely recognized as a threat to these hammocks and to the adjacent prairie ecosystem.

This survey was initiated in June, 1978, as part of a biological survey of Taylor Slough and vicinity. (The study area largely corresponds to what has traditionally been considered the watershed of upper Taylor Slough.) Objectives are as follows: (1) Provide an adequate floristic survey of the hammocks of the study area to allow evaluation of the significance of the "resource" and the probable effects of attrition resulting from ecosystem modification by man in recent decades. (2) Determine fire history of representative hammocks and relate it to current species composition. (3) Provide baseline data to enable long-term monitoring within and outside ENP to detect degradation of the "resource." (4) Provide a broad evaluation of the current distribution and impact of exotic plants in the study area, with special emphasis upon impact to hammocks.

METHODS

After preliminary examination of available maps and aerial photography and aerial reconnaissance, ten 1 square mile quadrats were chosen for detailed study. These quadrats, which coincide with or are related to surveyed section lines, were located subjectively with the intention of selecting representative portions of the entire area with relatively high concentrations of hammocks. The usefulness in South Florida of 1 square-mile quadrats related to section lines has previously been established by Alexander and Crook (1973; 1975). Locations of quadrats are shown in Figure 1. Quadrats I-V and VIII-X were located and sampled with the aid of December, 1976, infrared color aerial photographs at a scale of 1:10,000. For Quadrats VI and VII, color aerial photographs taken in February, 1980, at a scale of about 1:12,000 were used. Quadrat boundaries were placed on the aerial photographs (from topographic quadrangles or orthophotomaps) with the aid of a Map-O-Graph. Within each quadrat, 10 hammocks were selected for field examination, with a view (initially) toward obtaining the ability to interpret hammock composition and history from available aerial photography. Once we were confident of our ability at photointerpretation, we selected mainly relatively mature hammocks - those expected to have the greatest species diversity - for field examination.

When hammocks were visited in the field, a listing of woody (tree, shrub, and vine) tropical hardwood hammock species was made. (Bayhead species, Persea borbonia, Myrica cerifera, Ilex cassine, Magnolia virginiana, and Chrysobalanus icaco, were not included on the list since they are virtually ubiquitous along hammock margins on seasonally flooded ground.) Presence of these species in the canopy or in the understory was recorded. Percentage canopy cover of tropical hardwood species and of bayhead species was noted, since it was noted very early in the study that predominance of tropical hardwood species is apparently an indicator of maturity. (As discussed below, bayhead species frequently are replaced by tropical hardwood species as recovery from fire proceeds.) Percentage cover of "fireweeds" Pteridium aquilinum var. caudatum and associates) was recorded for stands with an open canopy. As experience was gained in evaluating hammocks of the area, a 1-10 diversity/fire impact scale was developed for hammocks as follows:

10: Canopy coverage within hammock is essentially 100% by tropical hardwood species. (Scattered "bayhead" species may be present.) Understory has tropical shrubs and tree seedlings. Understory of hammock interior open. Ferns and vines not prominent in understory. Ten or more tropical hardwood species present in canopy.

9: Canopy coverage within hammock is 80-100% by tropical hardwood species. Remainder of canopy coverage by "bayhead" species. Understory has tropical shrubs and tree seedlings. Understory of hammock interior open. Ferns and vines not prominent in understory. 6-10 tropical hardwood species present in canopy.

8: Canopy coverage within hammock is 60-80% by tropical hardwood species. Remainder of canopy coverage is by "bayhead" species. Understory has tropical shrubs and tree seedlings. Understory of hammock interior fairly open, but ferns and vines are moderately prominent. 6-10 tropical hardwood species present in canopy.

7: Canopy coverage within hammock is 60-80% by tropical hardwood species. Remainder of canopy coverage is by "bayhead" species. Understory has tropical shrubs and tree seedlings. Understory of hammock interior fairly open, but ferns and vines are moderately prominent. 1-5 tropical hardwood species present in canopy. Tropical hardwood species important in understory.

6: Canopy coverage is approximately 50% by tropical hardwood species and 50% by "bayhead" species. Gaps may occur in the canopy. Ferns and vines form a dense understory. 1-5 tropical hardwood species present in canopy. Tropical hardwood species important in understory.

5: Canopy coverage is 50-100% by "bayhead" species. Up to 50% of the former hammock area has an open canopy with a dense growth of ferns and vines. 1-5 tropical hardwood species present as trees. Tropical hardwood species important in understory.

4: Canopy coverage is 20-50% by "bayhead" species. 50-80% of the former hammock area has an open canopy with a dense growth of ferns and vines. 1-3 tropical hardwood species present as trees. Fallen trees make penetration of site difficult.

3: Tree cover is 20% or less, primarily by "bayhead" species. 80-100% of the former hammock area has an open canopy with a dense growth of ferns and vines. 1-3 tropical hardwood species present as trees or as sprouting saplings. Fallen trees make penetration of site difficult.

2: Tree cover is 20% or less, primarily by "bayhead" species. 80-100% of the former hammock area has an open canopy with a dense growth of ferns and vines. No tropical hardwood species present. Fallen trees make penetration of site difficult.

1: Essentially 100% of the former hammock area has an open canopy with a dense growth of ferns and vines. A few individuals of "bayhead" tree species may be present, but tropical hardwoods are absent. Fallen trees make penetration of site difficult.

Special attention was given in field work to recording the presence and impact of exotic plant species in and near hammocks of the study quadrats.

Hammocks of the square-mile quadrats were mapped from December, 1976, infrared color aerial photography at a scale of approximately 1:10,000. The aerial photography allowed differentiation of the following hammock classes: recently severely burned out hammocks (1-3 on diversity/fire impact scale); successional stands dominated currently by "bayheads" species (4-6 on scale); and relatively mature hammocks (7-10 on scale). The presence of concentrations of the exotic Casuarina was mapped from aerial photography within quadrats.

Fire history of the 10 hammocks in each quadrat designated for detailed study was determined as accurately as possible from stereoscopic viewing of aerial photography: black and white photography for 1940 (scale of 1:40,000), 1952 (1:20,000), 1964 (1:30,000), 1971 (1:70,000) and the color infrared photography for 1976 (1:10,000).

RESULTS

Tables 1(a)-1(j) present data from field surveys of the 100 selected hammocks, 10 per quadrat. Quadrat numbers and locations are indicated on Figure 1. The data in these tables include species presence in canopy or understory, coverage in the canopy of tropical hardwood and bayhead species and coverage of "fireweeds" and Schinus and the "diversity/fire impact rating" for each hammock. Table 2 presents a summary of the distribution of tropical hardwood hammock species, giving the number of hammocks in which they were present (of a possible maximum of 10) per quadrat.

Figures 2(a)-2(j) are maps of each of the 10 quadrats showing the current post-fire successional status of each hammock, using one of three classes, based on the 1-10 diversity/fire impact scale. The least mature hammocks, recently damaged severely by fire and having minimal tree cover (1-3 rating on "diversity/fire impact" scale) are shown in white. Hammocks with closing or closed canopies with bayhead species prominent (4-6 on scale) are cross-hatched. Relatively mature hammocks, dominated by tropical hardwood species (7-10 on scale), are shown in black.

Tables 3(a)-3(j) give a tabular summary of fire history as determined from aerial photographs dating back to 1940.

Data on distribution and abundance of exotics within the quadrats is presented in Table 4. Distribution of concentrations of Casuarina is indicated in Figures 2(a)-2(j).

DISCUSSION

Nature and floristic composition of the hammocks

The tropical hardwood hammocks of the study area are mostly in the size range of 0.1-3 ha. The number per square mile (256 ha) within the study quadrats ranges from 85 to over 300.

The following tree species are the dominants in the canopy of hammocks of the study area: Metopium toxiferum, Bursera simaruba, Bumelia salicifolia, Ficus aurea, and Coccoloba diversifolia. Small trees important in the understory include

Myrsine floridana, Eugenia axillaris, Psychotria nervosa, and Ardisia escallonioides. All species listed above are present in 69% or more of the hammocks sampled.

In general, species richness of tropical hardwood tree and shrub species in the hammocks declines with increasing distance from Long Pine Key (Fig. 3). There is, however, a secondary peak of species richness in the vicinity of Grossman Hammock. Greater species richness near Long Pine Key and Grossman Hammock is probably largely a result of proximity to larger, more diverse hammocks. Other possibilities are that hammocks of these areas may be, on the average, larger or that fire impacts may have been less severe over the years in these areas.

Mature hammocks (7-10 on fire-diversity scale) in the study area have 4-12 species of tropical hardwoods, in the overstory and 10-21 woody species in the understory (including seedlings and saplings). These hammocks are not rich in epiphytic orchids and bromeliads. Only Encyclia tampense and several of the more common Tillandsia species were recorded in this study.

The distribution of several species merit special mention. Lysiloma latisiliquum and Quercus virginiana are among the dominants of Long Pine Key hammocks, but are not common in the study area. Lysiloma occurs only in quadrats in or adjoining Everglades National Park. Quercus is very rare north of Context Road (Quadrat X). Mastichodendron foetidissimum, not common on Long Pine Key, is conspicuously present in many hammocks near Grossman Hammock. Some tropical tree species of Long Pine Key hammock were not encountered in this study: Prunus myrtifolia, Krugiodendron ferreum, Ateramnus lucidus, Drypetes lateriflora, Hypelate trifoliata, and Citharexylum fruticosum. The following woody temperate tree species of Long Pine Key were not encountered in this study: Morus verbra, Celtis laevigata, and Diospyros virginiana. The above species are not abundant on Long Pine Key and their absence from the study area is not surprising.

Impact of fire on hammocks: 1940-1976

Aerial photographs for the years 1940, 1952, 1964, and 1976 were examined to determine fire history as nearly as possible. Of the 100 hammocks selected for study (10 in each of 10 quadrats), 31 showed no evidence of fire impact during the 1940-1976 period. Of the 31, 27 appeared relatively mature in the 1940 photography.

In the 1940 photography, 44 of 100 hammocks were rated "mature" and 22 showed recent severe damage by fire. In the 1976 photography, 67 of 100 hammocks were rated "mature" and 10 showed recent severe damage by fire. Table 5 shows progressive recovery from fire damage from 1940 to 1976. How reliable is this assessment? The question is raised here since the methods are somewhat subjective and the results seemingly run counter to "conventional wisdom" which suggests that a progressive degradation of the hammocks has occurred in the past decades.

After reviewing our methods, we conclude that the techniques used seem to produce remarkably reproducible results. Different observers will normally interpret the fire history of hammocks the same way from aerial photographs. In

addition, we did have the opportunity to check our interpretations in a number of instances with Mr. Glen Simmons of Homestead who has a good memory of the history of selected hammocks in the area. However, since the different years of photography differ considerably in scale clarity, and tone, a totally objective analysis is impossible. Was the choice of the study areas biased? Yes, since square mile sections were chosen partially with a view toward obtaining those with the largest, most mature hammocks and partially attempting to give a representative selection of geographic types.

The results are consistent with our preliminary findings of spectacular recovery of hammocks on Long Pine Key of Everglades National Park, the Pinecrest area of Big Cypress National Preserve, and the Bear Island area of Big Cypress, many of which showed severe fire damage in the 1940 photography, but are now rather mature.

Recovery of hammock vegetation following fire

One severe fire can convert a mature hammock to a situation where bracken fern (Pteridium aquilinum var. caudatum) and other herbaceous colonizers dominate for several years by killing root systems of tropical hardwoods. This often happens with a fire which consumes a thick (10-50 cm) layer of organic matter containing the root systems. A 1974 fire in Quadrat III, destroyed a portion of hammocks #4 and #9, where a thick organic layer was present. The time required for recovery from such fires is clearly very long. On the other hand, recovery of tropical hardwoods can be very rapid where root systems are not killed. These species are all capable of resprouting from surviving root systems. Many of these species survive fires at approximately 5-year intervals in pinelands of Long Pine Key in ENP.

Reproduction by seed is also undoubtedly an important means of reproduction for these tropical trees. However, certain temperate trees (Myrica cerifera, Persea borbonia, Ilex cassine) seem to be much more successful in colonizing burned out hammocks by seed than the tropical trees. These temperate trees (or "bayhead species," since these are the same trees which dominate bayheads) are dominant in most East Everglades hammocks which appear to be in an early stage of recovery from fire. Our "diversity-fire impact scale" makes use of the usual dominance of "bayhead species" in hammocks which are recovering from fire or are immature for other reasons (substrate or high water table). We emphasize that we are not proposing this "diversity-fire impact scale" as a scheme of succession following fire since other factors than recovery from fire influence species composition. For example, note (in Table 3) that while the "diversity-fire" rating is generally highest for hammocks that have not burned for at least 15-20 years, there are some hammocks which show no evidence of fire from 1940 to 1976 and which have "diversity-fire" ratings a low as 6 (III-5, IV-1, IV-6). We suspect that this may be the result of a relatively high water table in such hammocks.

The relationship between the date of the most recent fire affecting the hammock and the diversity/fire impact rating is indicated in the following table:

Most recent fires affecting hammock (% of hammocks sampled)		Mean diversity/fire impact rating
none detected in 1940 photography	(34%)	8.5
pre-1940	(9%)	8.0
1940-1952	(19%)	7.4
1952-1964	(20%)	7.0
1964-1971	(8%)	6.0
1971-1976	(10%)	3.4

This type of analysis can only be taken as a very crude estimate of recovery trends since it does not take into account intensity and impact of individual fires, which vary tremendously. Neither does it take into account the fire history of hammocks previous to the most recent fire. It does, however, suggest that much of the recovery is accomplished within 25 years after most fires.

Distribution and impact of exotic plants

Three species of exotic trees, Casuarina equisetifolia, Melaleuca quinquenervia, and Schinus terebinthifolius, occur in the study area. The information in Table 4 provides qualitative baseline information on the current distribution and abundance of these species within the ten quadrats.

Casuarina is rather abundant throughout much of the "East Everglades." Although it is a serious threat to hammocks in other areas (especially in southeastern Everglades National Park), it rarely invades hammocks here. The major concentrations occur on higher ground within the prairie. Organic matter from fallen "needles" accumulates, building up the elevation. In a few locations, species such as Myrsine floridana, Metopium toxiferum, and Ficus aurea are present in the understory of these Casuarina "forests." Casuarina is easily killed by fire. Fire seems to slow the advance of this species, although abundant resprouting frequently occurs from root systems of the dead trees. Past control within Everglades National Park has been fairly successful in keeping Casuarina out of the portion of the study area within the park.

Melaleuca is just beginning to invade the study area. It is abundant in the area northeast of Grossman Hammock and will undoubtedly increase rapidly in this portion of the "East Everglades" if control measures are not taken promptly. The spread of Melaleuca is generally encouraged by fire.

Schinus is an omnipresent exotic in South Florida. This species will gradually increase within hammocks following recurring disturbance and may come to dominate many hammocks in the future. It will invade prairie areas if water tables are lowered sufficiently. Schinus invasion is somewhat retarded by fire in prairie sites and encouraged by fire in hammocks.

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Table 1(a)-(j). Species presence for tropical hardwood hammock species, canopy coverage, and diversity/fire impact rating for hammocks in Quadrats I-X.

X	=	present
XX	=	abundant
(X) (XX)	=	in canopy

Table 1(a)

QUADRAT I

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	X	X	X			(X)	X	X	(X)	(X)
Bumelia salicifolia	(X)		(X)	X	(X)	(X)	(X)		(XX)	(XX)
Bursera simaruba	(X)	(X)	(X)	(X)	(X)	(XX)	(XX)	(X)	(X)	(X)
Calyptranthes pallens				(X)		(X)	(X)		(X)	
Calyptranthes zuzygium	X									
Chiococca alba										
Chiococca parvifolia										
Chrysophyllum oliviforme										
Coccoloba diversifolia	(X)	X	(X)	(X)			(X)	X	(X)	X
Erythrina herbacea										
Eugenia axillaris		X	(X)	X		(X)	(X)		X	
Eugenia foetida										
Exothea paniculata										
Ficus aurea	(X)	(XX)		(X)	(X)		(X)	X		(X)
Ficus citrifolia										
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum										
Mastichodendron foetidissimum							(X)			
Metopium toxiferum	(X)	(XX)	(XX)	(XX)	(X)	(X)	(X)	X	(X)	(X)
Myrcianthes fragrans										
Myrsine floridana		X	X	(X)		(X)			X	(X)
Nectandra coriacea						(XX)	(X)		(X)	
Pisonia aculeata										
Psychotria nervosa	X	X	X				X			X
Psychotria sulzneri										
Quercus virginiana										
Randia aculeata	X		X	X			X		X	
Sabal palmetto	(X)									
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca										
Tetrazygia bicolor										
Zanthoxylum fagara										
Total # Species	10	8	9	9	4	8	12	5	10	8
Bromeliads (Tillandsia spp.)			X			X	X		X	
% Canopy Coverage										
Canopy absent (fireweeds)	20	30						100		30
Bayhead tree species	10		40	50	95	30	30		20	30
Tropical hardwood species	70	70	60	50	5	70	70		80	40
Schinus										
Diversity/Fire Impact Rating	5	5	7	5.5	5	8.5	8	3	8.5	5

Table 1(b)

QUADRAT II

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides				X	X		X		X	
Bumelia salicifolia		X		(X)	(X)	(X)	(X)	(X)	(X)	
Bursera simaruba	X	(X)		(XX)	(XX)	(X)	(X)	(X)		
Calyptranthes pallens				(X)				X		
Calyptranthes zuzygium										
Chiococca alba										
Chiococca parvifolia										
Chrysophyllum oliviforme										
Coccoloba diversifolia		(X)		(X)	(X)		X		(X)	
Erythrina herbacea										
Eugenia axillaris		X		X	X	X	X		X	
Eugenia foetida										
Exothea paniculata										
Ficus aurea	(X)	(X)	(X)		(X)	(X)	(X)	(X)	(X)	(X)
Ficus citrifolia										
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum										
Mastichodendron foetidissimum							(X)			
Metopium toxiferum		(XX)		(X)	(X)	(X)	(X)	(X)	(X)	(X)
Myrcianthes fragrans										
Myrsine floridana	X	X		X	(X)	(X)	X	(X)	X	X
Nectandra coriacea					(X)		(X)			
Pisonia aculeata										
Psychotria nervosa				X	X	(X)	X	X	X	
Psychotria sulzneri										
Quercus virginiana									(X)	
Randia aculeata	X					X	X			
Sabal palmetto										
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca										
Tetrazygia bicolor										
Zanthoxylum fagara										
Total # Species	4	7	1	9	10	8	12	7	9	3
Bromeliads (Tillandsia spp.)		X		X				X	X	
% Canopy Coverage										
Canopy absent (fireweeds)	40		100							10
Bayhead tree species	40	30		30	65	40	30	80	40	90
Tropical hardwood species		70		70	35	60	70	20	60	
Schinus	20									
Diversity/Fire Impact Rating	1	7	1	7	6	6	8	5.5	7	5

Table 1(c)

QUADRAT III

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides		X	X	X	(X)		X	X	(X)	(X)
Bumelia salicifolia	(X)	(X)	(X)	(X)	X	(X)	(XX)	(X)	(X)	
Bursera simaruba	(X)	(X)	(X)		(X)	(X)	(X)	(XX)	(X)	(X)
Calyptranthes pallens	(X)		X	X			X	(X)	X	
Calyptranthes zuzygium										
Chiococca alba	X	X	X				X	X	X	
Chiococca parvifolia	X									
Chrysophyllum oliviforme		(X)	(X)					(X)		(X)
Coccoloba diversifolia		(X)	(X)	(XX)	(X)		(XX)	(XX)	(X)	(XX)
Erythrina herbacea										
Eugenia axillaris	(X)	X	X	(X)	(X)		(X)	X	X	X
Eugenia foetida				X						
Exothea paniculata										
Ficus aurea	(XX)	(X)	(XX)	(X)		(XX)	(X)	(X)	(X)	(X)
Ficus citrifolia										
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum										
Mastichodendron foetidissimum				(XX)	X			(X)	(XX)	(X)
Metopium toxiferum	(X)	(X)	(X)	(X)	(X)	(X)	(XX)	(X)	(X)	(X)
Myrcianthes fragrans										
Myrsine floridana	X	X	X	X	X	X	X	X	X	X
Nectandra coriacea		(X)	(X)	(X)				(X)		(XX)
Pisonia aculeata										
Psychotria nervosa	X		X		X		X	X	X	X
Psychotria sulzneri										
Quercus virginiana	(X)									
Randia aculeata										
Sabal palmetto		(X)		(X)					(X)	
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca	(X)	X	(X)	(X)	X	X		X	(X)	(X)
Tetrazygia bicolor										
Zanthoxylum fagara								X		
Total # Species	12	13	14	13	10	6	11	16	14	12
Bromeliads (Tillandsia spp.)				X	X					
% Canopy Coverage										
Canopy absent (fireweeds)										
Bayhead tree species	60				30	40			10	
Tropical hardwood species	40	100	100	100	70	60	100	100	90	100
Schinus										
Diversity/Fire Impact Rating	5.5	9	9	9	6	6	8.5	9	9	9

Table 1(d)

QUADRAT IV

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	X	X	X	X		X	X			X
Bumelia salicifolia	(X)	(X)		(X)	(X)	X			(X)	(X)
Bursera simaruba		(XX)	(X)	(X)	(X)	(X)	(X)	(X)		(X)
Calyptranthes pallens										
Calyptranthes zuzygium										
Chiococca alba										
Chiococca parvifolia										
Chrysophyllum oliviforme		(X)							(X)	(X)
Coccoloba diversifolia		(X)	(X)	(X)	X	(X)	(X)	(X)	X	
Erythrina herbacea										
Eugenia axillaris	X	X	(X)	X		X	(X)	X	X	X
Eugenia foetida										
Exothea paniculata		(X)								
Ficus aurea		(X)		(X)	(X)	(X)	(X)		X	(X)
Ficus citrifolia										
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum										
Mastichodendron foetidissimum			(X)	(X)		(X)	(X)	(X)	(X)	(X)
Metopium toxiferum	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Myrcianthes fragrans										
Myrsine floridana	X	X	X	X	X	X	X	X	X	X
Nectandra coriacea		(X)								
Pisonia aculeata										
Psychotria nervosa		X		X		X				X
Psychotria sulzneri										
Quercus virginiana										
Randia aculeata		X		X						X
Sabal palmetto	(X)	(X)	X	(X)		X	(X)			(X)
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca	(X)	(X)		(X)		(X)	(X)	X		(X)
Tetrazygia bicolor										
Zanthoxylum fagara		(X)								(X)
Total # Species	7	16	8	13	6	12	10	7	8	14
Bromeliads (Tillandsia spp.)						X	X	X		X
% Canopy Coverage										
Canopy absent (fireweeds)			80		85				30	
Bayhead tree species	40		5	10	5	50	30	30	30	
Tropical hardwood species	60	100	15	90	10	50	70	70	30	100
Schinus									10	
Diversity/Fire Impact Rating	6	10	4	9	3	6	8	7	1	10

Table 1(e)

QUADRAT V

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	X	X	X	X		X	(X)	(X)	X	(X)
Bumelia salicifolia	(X)	(X)	(X)	(X)	(XX)	(X)	(X)	(X)	(X)	(X)
Bursera simaruba	(X)	X	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Calyptranthes pallens	(X)		(X)		(X)	(X)		(XX)	(XX)	
Calyptranthes zuzygium										
Chiococca alba	X		X	X	X	X	X	X	X	X
Chiococca parvifolia										
Chrysophyllum oliviforme										
Coccoloba diversifolia	(X)		(XX)	(X)	(X)	(XX)	(X)	(XX)	(XX)	X
Erythrina herbacea										
Eugenia axillaris	(X)		(X)	X	X	X	X	X	X	X
Eugenia foetida										
Exothea paniculata						(X)		(X)		
Ficus aurea			(X)	(X)	(X)	(X)	(X)	(X)		(X)
Ficus citrifolia	(X)								(X)	
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum	(XX)			(X)						(XX)
Mastichodendron foetidissimum	(X)		(X)			(X)			(X)	
Metopium toxiferum	(XX)	(XX)	(X)	(X)	(X)	(XX)	(X)	(X)	(X)	(X)
Myrcianthes fragrans										(X)
Myrsine floridana		X	X	(X)	X	(X)	(X)	X	X	(X)
Nectandra coriacea	(X)		(XX)	(X)	(X)	(X)		(X)	(X)	(X)
Pisonia aculeata										
Psychotria nervosa	X	X	X	X	X	X	X	X	X	XX
Psychotria sulzneri						X				
Quercus virginiana			(X)			(X)				
Randia aculeata	X	X	X	X	X	X	X	X	X	X
Sabal palmetto			(X)			X		(X)		
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca										
Tetrazygia bicolor		X							X	
Zanthoxylum fagara										
Total # Species	14	8	16	13	12	18	11	15	15	14
Bromeliads (Tillandsia spp.)	X		XX	XX	X	X		XX	XX	
% Canopy Coverage										
Canopy absent (fireweeds)							10			
Bayhead tree species	5	60			5		30	5	10	
Tropical hardwood species	95	40	100	100	95	50	60	95	90	100
Schinus						50				
Diversity/Fire Impact Rating	9	5.5	10	9	9	5	6	10	9	9

Table 1(f)

QUADRAT VI

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	X	X	(X)		X	X	X			X
Bumelia salicifolia	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Bursera simaruba	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Calyptranthes pallens										
Calyptranthes zuzygium										
Chiococca alba	X	X	X		X	X			X	X
Chiococca parvifolia										
Chrysophyllum oliviforme										
Coccoloba diversifolia	(X)					(X)			X	
Erythrina herbacea					X					
Eugenia axillaris	(X)	X	X	X	X	X	(X)	(X)	X	X
Eugenia foetida		X								
Exothea paniculata			X		(X)					
Ficus aurea	(X)	(X)	(X)	(X)	(X)	(XX)		(X)		X
Ficus citrifolia		X				X	(X)			
Guapira discolor	(X)		X						(X)	
Ilex krugiana		(X)			(X)					
Lysiloma latisiliquum	(XX)	(X)	X	(X)	(X)	(X)	X	(X)	(X)	(X)
Mastichodendron foetidissimum										
Metopium toxiferum	(XX)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Myrcianthes fragrans					(X)	(X)				
Myrsine floridana	X	X	X	X	X	X	X	X	X	(X)
Nectandra coriacea	(X)		(X)	(X)	(X)	(X)	(X)	(X)		(X)
Pisonia aculeata										
Psychotria nervosa	X	X	X	X	X	X	X			X
Psychotria sulzneri					X	X	X			
Quercus virginiana			(X)		(X)					
Randia aculeata	X	X	X	X	X	X	X	X	X	X
Sabal palmetto	(X)	X	X		X	X	X			X
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca										
Tetrazygia bicolor		X	X	X	X	X	X	X	X	X
Zanthoxylum fagara										
Total # Species	15	16	17	11	20	18	14	10	11	14
Bromeliads (Tillandsia spp.)		X						X	X	X
% Canopy Coverage										
Canopy absent (fireweeds)										
Bayhead tree species	5	30	30	40	10	20	10	20	10	30
Tropical hardwood species	95	70	70	60	90	80	90	80	90	70
Schinus										
Diversity/Fire Impact Rating	9	6.5	8	6	9	8	8	8	7	8

Table 1(g)

QUADRAT VII

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	(X)	X	(X)	X	X		X	X	X	X
Bumelia salicifolia	(X)	(X)	(XX)	(XX)	(XX)	(XX)	(X)	(XX)	(XX)	(XX)
Bursera simaruba	(X)	(XX)	(X)	(XX)	(X)	(X)	(X)	(X)	(X)	
Calyptranthes pallens										
Calyptranthes zuzygium										
Chiococca alba	X		X	X	X	X		X		
Chiococca parvifolia										
Chrysophyllum oliviforme	X	X		(X)						
Coccoloba diversifolia	X	X		(X)						
Erythrina herbacea										
Eugenia axillaris	(X)	(X)	X	X	X	(X)	X	X	X	(X)
Eugenia foetida										
Exothea paniculata										
Ficus aurea	(X)	(X)	X	(X)	(X)	X	(X)	X	X	X
Ficus citrifolia	(X)	(X)	(X)					(X)		(X)
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Mastichodendron foetidissimum										
Metopium toxiferum	(X)	(X)	(X)	(X)	(X)	(XX)	(X)	(X)	X	(X)
Myrcianthes fragrans	(X)		X							
Myrsine floridana	X	(X)	X	X	(X)	X	X	X	X	X
Nectandra coriacea	(X)	(XX)	(X)	(X)	(XX)					(X)
Pisonia aculeata										
Psychotria nervosa	X	X	X	X	X	X	X	X	X	X
Psychotria sulzneri	X	X		X	X		X			X
Quercus virginiana	(XX)	(X)	(XX)	(XX)	(X)			(XX)	(XX)	(X)
Randia aculeata	X	X	X	X	X	X	X	X		X
Sabal palmetto	X		X	(X)	(X)			(X)		(X)
Serenoa repens							X	X		
Schoepfia chrysophylloides										
Simarouba glauca										
Tetrazygia bicolor	X	X	X		X	(X)	X	(X)	X	(X)
Zanthoxylum fagara	(X)	(X)		X	(X)					
Total # Species	21	18	17	18	17	11	13	16	11	15
Bromeliads (Tillandsia spp.)	X		X	X	X			X		
% Canopy Coverage										
Canopy absent (fireweeds)										
Bayhead tree species						5				
Tropical hardwood species	100	100	100	100	100	95	100	100	100	100
Schinus										
Diversity/Fire Impact Rating	10	10	10	7	10	7	7	9	6.7	8

Table 1(h)

QUADRAT VIII

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	X	X		X	(X)	(X)				
Bumelia salicifolia	(X)		(XX)	(X)	(X)	(X)				(X)
Bursera simaruba	(X)	(XX)		(X)	(XX)	(X)	(X)	(X)		X
Calyptranthes pallens		X	X	X	X	(X)				
Calyptranthes zuzygium										
Chiococca alba										
Chiococca parvifolia										
Chrysophyllum oliviforme										
Coccoloba diversifolia		X		(X)	(XX)	(X)			(XX)	X
Erythrina herbacea										
Eugenia axillaris		X	X	X	X	X			X	X
Eugenia foetida										
Exothea paniculata										
Ficus aurea		(X)	(X)		X	(X)	(X)		(X)	(X)
Ficus citrifolia										
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum										
Mastichodendron foetidissimum	(X)		(XX)	(X)	(XX)	(X)	(X)	(X)	(X)	
Metopium toxiferum	X	(X)	(X)	(XX)	(XX)	(XX)			(XX)	(XX)
Myrcianthes fragrans										
Myrsine floridana			(X)	X	X	(X)			X	X
Nectandra coriacea										
Pisonia aculeata										
Psychotria nervosa		X	X		X	X				X
Psychotria sulzneri		X								
Quercus virginiana										
Randia aculeata				X	X	X				X
Sabal palmetto										
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca		(XX)		X	X					
Tetrazygia bicolor										
Zanthoxylum fagara										
Total # Species	5	10	8	11	13	12	3	2	6	9
Bromeliads (Tillandsia spp.)					X	X		X		
% Canopy Coverage										
Canopy absent (fireweeds)	90		30				90	99		20
Bayhead tree species		5		20	10	30			40	30
Tropical hardwood species	10	95	70	80	90	70	10	1	60	50
Schinus										
Diversity/Fire Impact Rating	3	8.5	6	7	8	9	3	3	6.5	5

Table 1(i)

QUADRAT IX

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	(X)		X	X	(X)		X	X	(X)	
Bumelia salicifolia	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Bursera simaruba	(XX)	(X)	(XX)	(X)	(X)	(XX)		(XX)	(XX)	(XX)
Calyptranthes pallens										
Calyptranthes zuzygium										
Chiococca alba										
Chiococca parvifolia										
Chrysophyllum oliviforme										
Coccoloba diversifolia	(XX)		(X)		(X)	(XX)	(X)	(XX)	(X)	(X)
Erythrina herbacea										
Eugenia axillaris	X	X	(X)		(X)	(X)	X	X	X	X
Eugenia foetida										
Exothea paniculata										
Ficus aurea	(X)	(X)	(X)	(X)		(X)			(X)	
Ficus citrifolia										
Guapira discolor										
Ilex krugiana										
Lysiloma latisiliquum										
Mastichodendron foetidissimum										
Metopium toxiferum	(XX)	(X)	(XX)	(X)	(XX)	(XX)	(XX)	(XX)	(XX)	(XX)
Myrcianthes fragrans										
Myrsine floridana		(X)	X		X	(X)	X	X	X	X
Nectandra coriacea								(X)		
Pisonia aculeata										
Psychotria nervosa	X	X	X	X		X	X	X		
Psychotria sulzneri		X								
Quercus virginiana	(X)	(XX)	(X)							
Randia aculeata	X	X	X	X	X	X	X			X
Sabal palmetto		(X)	X	(X)	X					
Serenoa repens										
Schoepfia chrysophylloides										
Simarouba glauca										
Tetrazygia bicolor		X	X		X					
Zanthoxylum fagara										
Total # Species	10	12	13	8	10	9	8	9	8	7
Bromeliads (Tillandsia spp.)		X	X		X			X		X
% Canopy Coverage										
Canopy absent (fireweeds)	20	15		70						
Bayhead tree species		5	5		20	10			10	10
Tropical hardwood species	80	80	95	30	80	90	100	100	90	90
Schinus										
Diversity/Fire Impact Rating	7	6	9	4	7	6	6	8	8	6

Table 1(j)

QUADRAT X

Species	Hammock # 1	2	3	4	5	6	7	8	9	10
Ardisia escallonioides	(X)	X	X	X	(X)	X	(X)	X	X	
Bumelia salicifolia	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Bursera simaruba	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)		(XX)
Calyptranthes pallens	X	(X)	X	X	X			(X)	(X)	
Calyptranthes zuzygium										
Chiococca alba		X	X	X	X	X	X	X	X	
Chiococca parvifolia										
Chrysophyllum oliviforme		X								
Coccoloba diversifolia	(X)	(X)	X	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Erythrina herbacea										
Eugenia axillaris	X	(X)	X	X	(X)	X	(X)	X	X	(X)
Eugenia foetida		(X)								
Exothea paniculata								(X)		
Ficus aurea						(X)		(X)	(X)	
Ficus citrifolia	(X)		(X)	(X)	X	(X)	X	(X)		(X)
Guapira discolor										
Ilex krugiana			(X)							
Lysiloma latisiliquum										
Mastichodendron foetidissimum										
Metopium toxiferum	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)		
Myrcianthes fragrans										
Myrsine floridana	(X)	X	X	X	X	(X)	X	X	X	(X)
Nectandra coriacea		(X)			(X)	(X)				
Pisonia aculeata										
Psychotria nervosa	X	X	X	X	X	X	X	X		X
Psychotria sulzneri								X		
Quercus virginiana			(X)	(X)		(X)		(X)	(X)	(X)
Randia aculeata	X		X	X		X		X		X
Sabal palmetto			X			X		(X)		
Serenoa repens										
Schoepfia chrysophylloides	(X)	(X)	X	(X)	X	(X)	X	(X)		
Simarouba glauca										
Tetrazygia bicolor										
Zanthoxylum fagara										
Total # Species	12	14	16	14	13	16	11	18	9	9
Bromeliads (Tillandsia spp.)	X	X	X	X	X	X	X	X	X	X
% Canopy Coverage										
Canopy absent (fireweeds)										
Bayhead tree species	20	20	30		10	10			30	30
Tropical hardwood species	60	50	60	100	90	90	100	100	70	70
Schinus	20	30	10							
Diversity/Fire Impact Rating	8	8	7	9	9	9	7	8	7	8

Table 2. Total occurrences (within potential maximum of 10 hammocks per quadrat) of tropical hardwood hammock woody species in the 10 quadrats examined.

Species	QUADRAT # 1	2	3	4	5	6	7	8	9	10	Total occurrences in 100 hammocks
Ardisia escallonioides	8	4	8	7	9	7	9	5	7	9	73
Bumelia salicifolia	8	7	8	7	10	10	10	6	10	10	86
Bursera simaruba	10	8	9	8	10	10	9	8	9	9	90
Calyptranthes pallens	4	3	5		6			5		7	30
Calyptranthes zuzygium	1										
Chiococca alba			6		9	7	6			8	36
Chiococca parvifolia			1								1
Chrysophyllum oliviforme			4	3			3			1	11
Coccoloba diversifolia	9	5	8	8	9	3	3	6	8	10	69
Erythrina herbacea						1					1
Eugenia axillaris	6	6	7	9	9	10	10	7	9	10	83
Eugenia foetida			1			1					2
Exothea paniculata				1	2	2				1	6
Ficus aurea	7	8	9	7	7	8	10	7	6	3	72
Ficus citrifolia					2	3	5			8	18
Guapira discolor						3					3
Ilex krugiana						2	1			1	4
Lysiloma latisiliquum					3	10	10				23
Mastichodendron foetidissimum	1	1	5	7	4			8			26
Metopium toxiferum	10	9	9	10	10	10	10	8	10	8	94
Morinda royoc						4					4
Myrcianthes fragrans					1	2	2				5
Myrsine floridana	6	9	10	10	9	10	10	6	8	10	88
Nectandra coriacea	3	2	5		8	8	6		1	3	36
Pisonia aculeata							1				1
Psychotria nervosa	6	5	7	4	10	8	10	5	7	9	71
Psychotria sulzneri				1	1	3	6	1	1	1	14

Species	QUADRAT # 1	2	3	4	5	6	7	8	9	10	Total occurrences in 100 hammocks
Quercus virginiana		1			2	2	8		3	6	22
Randia aculeata	5	3		2	10	10	10	4	8	6	58
Sabal palmetto	1		2	7	3	7	6		4	3	33
Serenoa repens							2				2
Schoepfia chrysophylloides										8	8
Simarouba glauca			9	7				3			19
Tetrazygia bicolor					2	9	8		3		22
Zanthoxylum fagara			1	2			4				7
Total # Species	15	14	19	18	22	25	24	14	15	21	

Table 3(a)-(j). Fire impact status and inferred fire history of hammocks, by year, as determined from aerial photography.

Legend:

Fire Impact Status

M = Hammock has mature appearance on aerial photograph.

IM = Hammock appears to be in condition approaching maturity on aerial photograph.

R = Hammock exhibits signs of progressive recovery from burn in previous interval(s).

D = Exceptionally severe burn during interval.

B = Evidence of burn during interval.
(N, S, E, W = north side, south side, etc.)
(Mar = margins)

EB = Burn appears to have occurred early in interval, followed by substantial recovery.

Table 3(a)

QUADRAT I

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	EB	M	M	M	D	EB	IM	M	M	M
1952	D	D	M	D	D	M	M	M	M	D
1964	B^{E}	B^{Mar}	M	B^{Mar}	EB	M	M	M	D	D
1971	R	R	M	EB	R	M	M	M	M	R
1976	R	EB	M	R	R	M	M	D	M	R
Diversity/Fire Impact Rating	5	5	7	5.5	5	8.5	8	3	8.5	5

Table 3(b)

QUADRAT II

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	D	IM	M	IM	D	D	M	IM	M	D
1952	D	IM	M	IM	EB	D	D	D	M	D
1964	D	M	M	M	EB?	EB	EB	R	EB?	EB
1971	R	M	M	M	R	R	R	R	M	R
1976	R	M	D	M	IM	IM	M	R	M	R
Diversity/Fire Impact Rating	1	7	1	7	6	6	8	5.5	7	5

Table 3(c)

QUADRAT III

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	D	EB	D	M	M	B R	D	D	M	D
1952	EB	B$^{S\text{-half}}$	EB^{Mar}	M	M	R	R	EB^{S}	M	R
1964	R	R	EB^{S}	M	M	R	EB^{S}	EB	M	EB^{S}
1971	R	M	B	M	M	IM	M	R	M	R
1976	IM	M	M	M$^{N\text{-half}}$ D$^{S\text{-half}}$	M	M	M	M	M$^{N\text{-half}}$ D$^{S\text{-half}}$	M
Diversity/fire Impact Rating	5.5	9	9	9	6	6	8.5	9	9	9

Table 3(d)

QUADRAT IV

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	M	M	M	M	M	M	M	M	EB	EB
1952	M	M	M	M	M	M	M	M	M	M
1964	M	M	M	M	M	M	M	M	D	M
1971	M	M	M	M	M	M	M	M	EB	M
1976	M	M	D	M	D	M	M	M	R	M
Diversity/Fire Impact Rating	6	10	4	9	3	6	8	7	1	10

Table 3(e)

QUADRAT V

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	B	D	M	M	IM	EB	IM	IM	M	B
1952	D	D	B S-Mar	D	M	D	D	M	M	D
1964	EB	EB	M	R	M	R	R	M	M	R
1971	EB	EB	M	R	M	B	B	M	M	R
1976	R	R	M	M	M	R	R	M	M	M
Diversity/Fire Impact Rating	9	5.5	10	9	9	5	6	10	9	9

Table 3(f)

QUADRAT VI

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	D	B	B	EB	B	B	EB	D	EB	B
1952	EB	R	R	B	EB	B	R	EB	M	R
1964	B^{SE}	M	R	R	B	B^{W}	EB?	R	M	R
1971	R	M	M	R	R	R	M	EB?	M	M
1976	M	M	M	M	M	M	M	M	M	M
Diversity/Fire Impact Rating	9	6.5	8	6	9	8	8	8	7	8

Table 3(g)

QUADRAT VII

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	D^{W}	IM	EB	IM	M	EB	D	D	EB	EB
1952	R	M	B^{NW}	B	M	EB	EB	B	EB	R
1964	M	M	R	R	M	R	R	R	R	M
1971	M	M	M	M	M	IM	IM	M	M	M
1976	M	M	M	M	M	M	M	M	M	M
Diversity/Fire Impact Rating	10	10	10	7	10	7	7	9	6-7	8

Table 3(h)

QUADRAT VIII

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	M	M	M	M	M	M	M	M	IM	IM
1952	M	M	B	M	M	M	M	M	IM	D
1964	M	M	B^E	M	M	M	M	M	IM	R
1971	M	M	R	M	M	M	M	M	M	R
1976	D	M	R	M	M	M	D	D	M	B
Diversity/Fire Impact Rating	3	8.5	6	7	8	9	3	3	6.5	5

Table 3(i)

QUADRAT IX

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	D	D	D	EB	M	D	D	M	M	D
1952	D	B	EB^{S}	IM	M	D	D	M	M	B
1964	R	R	R	M	$D^{N\text{-half}}$ $M^{S\text{-half}}$	R	R	M	M	R
1971	R	R	R	M	R	R	M	M	M	R
1976	R	R	R	D	M	M	M	M	M	IM
Diversity/Fire Impact Rating	7	6	9	4	7	6	6	8	8	6

Table 3(j)

QUADRAT X

Hammock #

	1	2	3	4	5	6	7	8	9	10
1940	M	M	M	M	M	EB	M	M	M	M
1952	M	M	M	M	M	R	M	M	M	M
1964	M	M	M	M	M	B	M	M	M	M
1971	M	M	M	M	M	R	M	M	M	M
1976	M	M	M	M	M	R	M	M	M	M
Diversity/Fire Impact Rating	8	8	7	9	9	9	7	8	9	7

Table 4. Summary of distribution and abundance of exotic plants (Casuarina, Melaleuca, and Schinus) within the ten 1-square mile quadrats surveyed.

Quadrat I - Few Casuarina present and scattered over quadrat, with a relative concentration in eastern portion. No Melaleuca seen. Schinus present in some hammocks, but not abundant.

Quadrat II - Casuarina noted only in one location, a small clump just north of hammock #II-4. No Melaleuca seen. Schinus present in some hammocks and growing in open prairie in northeast corner.

Quadrat III - Casuarina abundant, with several concentrated "forests," especially in southeast corner of quadrat. Several Melaleuca saplings, approximately 1 m tall, scattered in prairie. Schinus present in several burned out hammocks.

Quadrat IV - Casuarina abundant in prairie areas of quadrat and is present in hammock #IV-1. Melaleuca and Schinus noted on eastern margin of quadrat.

Quadrat V - Casuarina present in scattered clumps. No Melaleuca seen. Schinus abundant in prairie north and south of hammock #V-5 and present in canopy of several hammocks. Hammock #V-6 has a canopy with 50% coverage of Schinus.

Quadrat VI - Only one dead Casuarina noted in quadrat. No Melaleuca or Schinus seen.

Quadrat VII - One dead Casuarina noted south of hammock #VII-6. No Melaleuca or Schinus seen.

Quadrat VIII - Casuarina is abundant and found throughout prairie areas of the quadrat. Two major concentrations occur, one in the center of the quadrat and one on the east margin. Fire has recently killed most of the larger trees, but abundant resprouting is occurring. No Melaleuca or Schinus seen.

Quadrat IX - No exotics observed.

Quadrat X - Only one Casuarina noted, on margin of hammock X-1. No Melaleuca seen. Schinus seen only in hammock X-1.

Table 5. Compilation of data in Table 3 showing the number of hammocks in each fire impact category, by year (10 for each of 10 quadrats), as determined from aerial photography. See Table 3 for legend of fire impact categories.

	M	IM	R	D	B	EB
1940	44	11	1	22	7	15
1952	45	4	10	20	10	11
1964	48½	1	25	4½	8	13
1971	61	3	28	-	3	5
1976	67	4	17	10	1	1

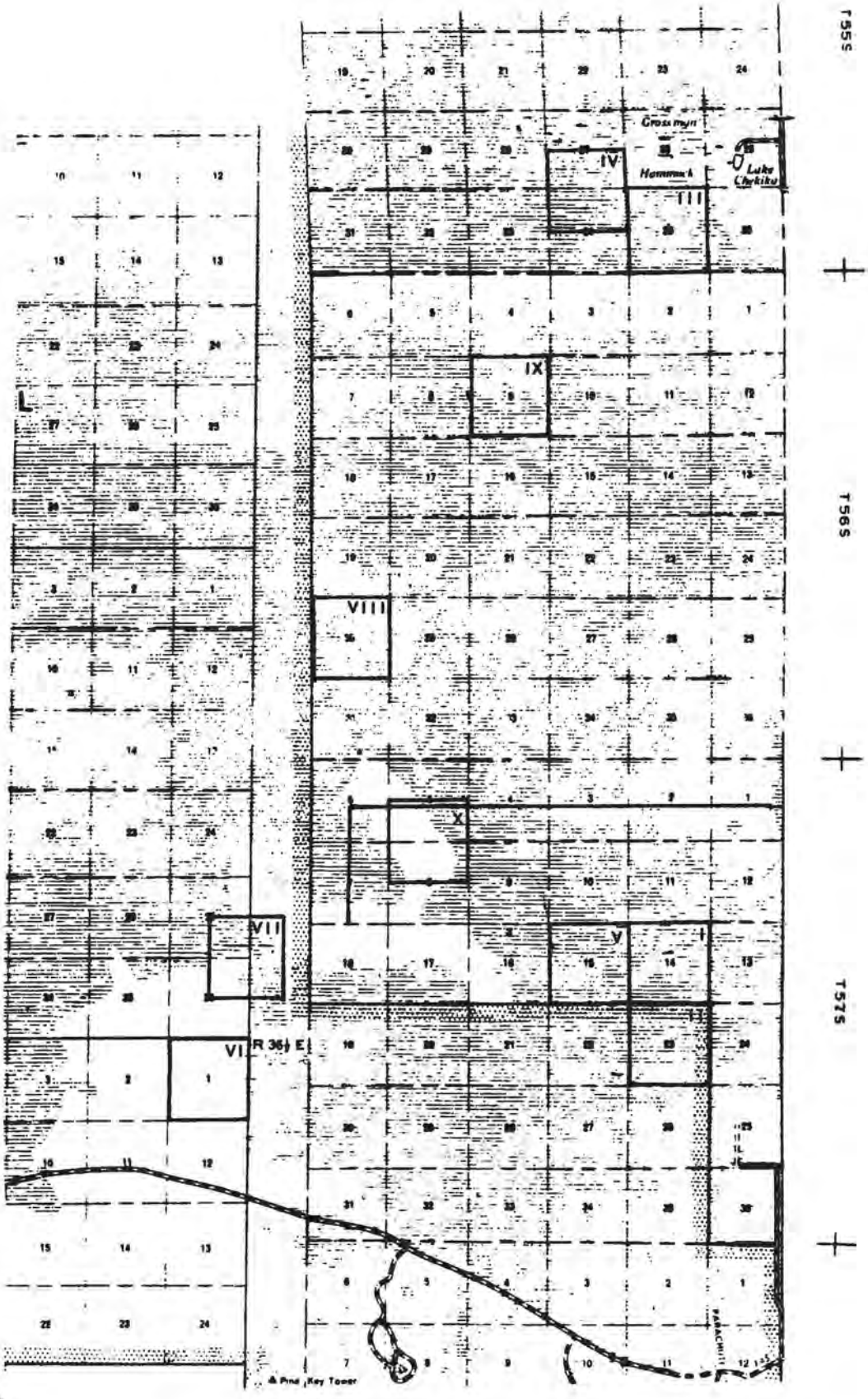
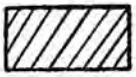


Figure 1. Location of study quadrats in the "East Everglades" and adjacent Everglades National Park

Figure 2(a)-(j). Maps of each of the 10 study quadrats showing the current post-fire successional status of each hammock. Each hammock is rated in one of three categories, based on the 1-10 "diversity/fire impact" scale. The legend is as follows:


= 1-3 on scale (early post-fire succession)


= 4-6 on scale (intermediate)


= 7-10 on scale (relatively mature)

"W" indicates the location of a willowhead. Hammock numbers are placed either at the lower right (SE) corner of each hammock or within the hammock. Groups of dashes indicate concentrations of Casuarina.

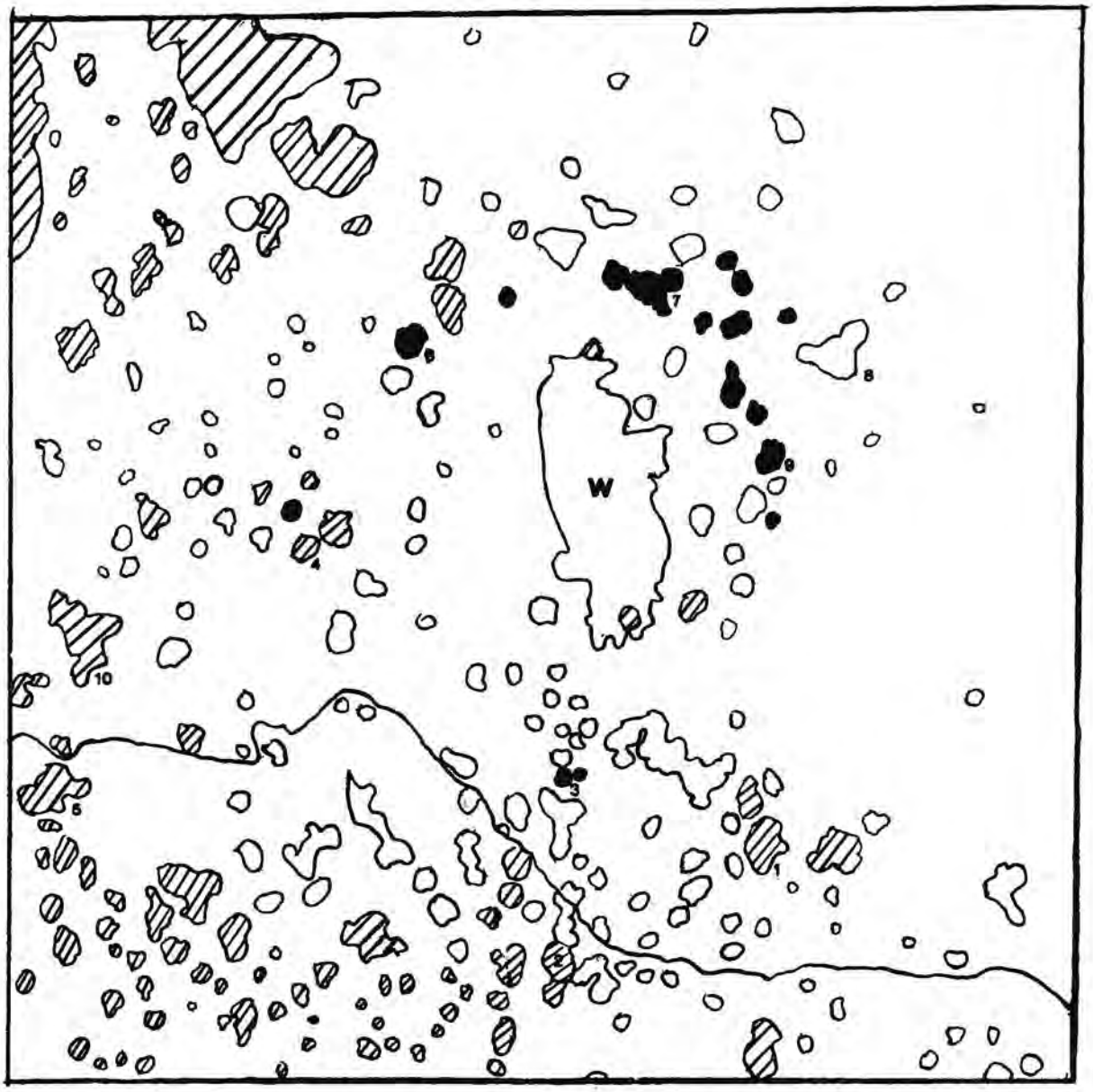


Figure 2(a). Quadrat I.

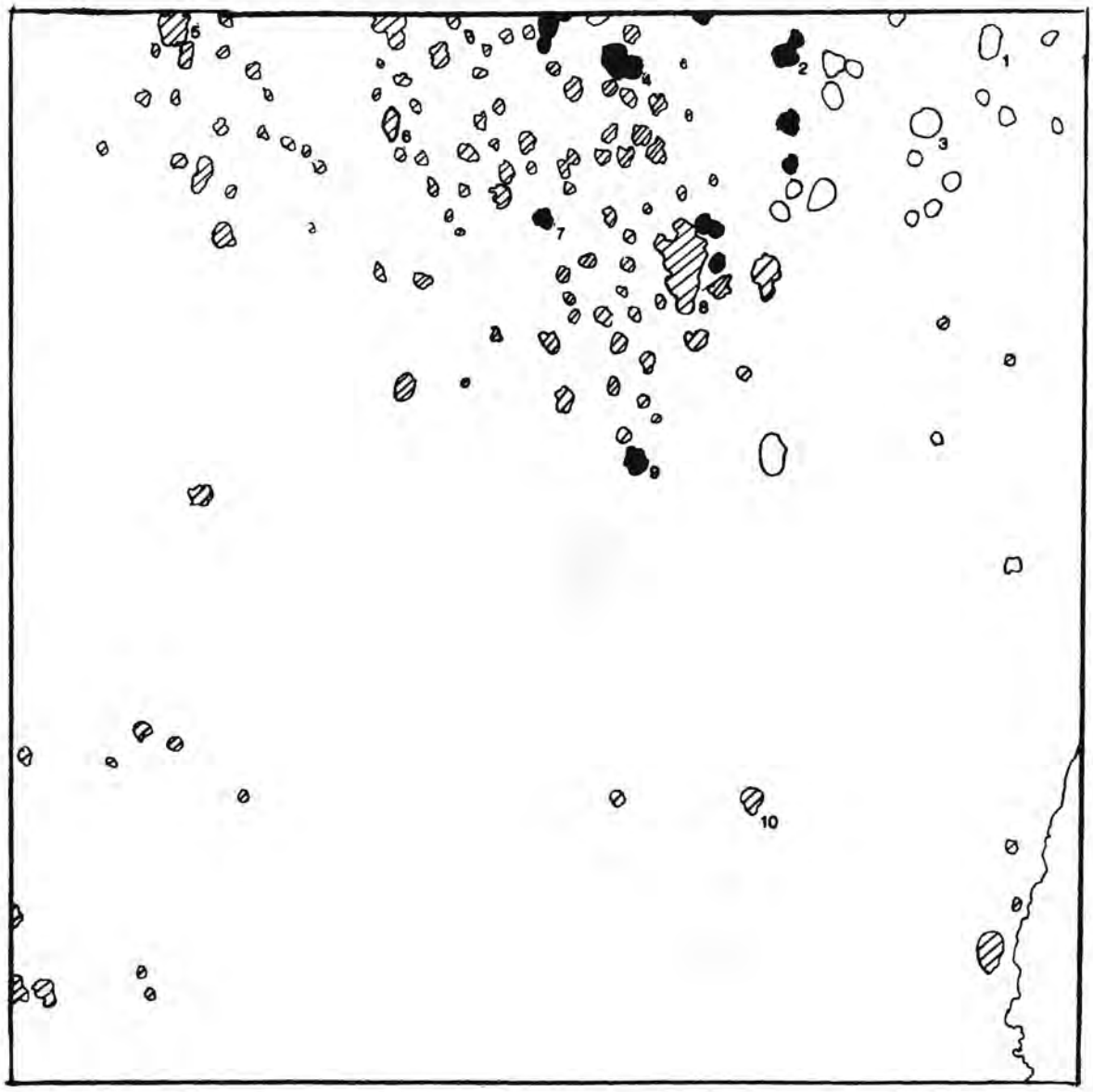


Figure 2(b). Quadrat II.

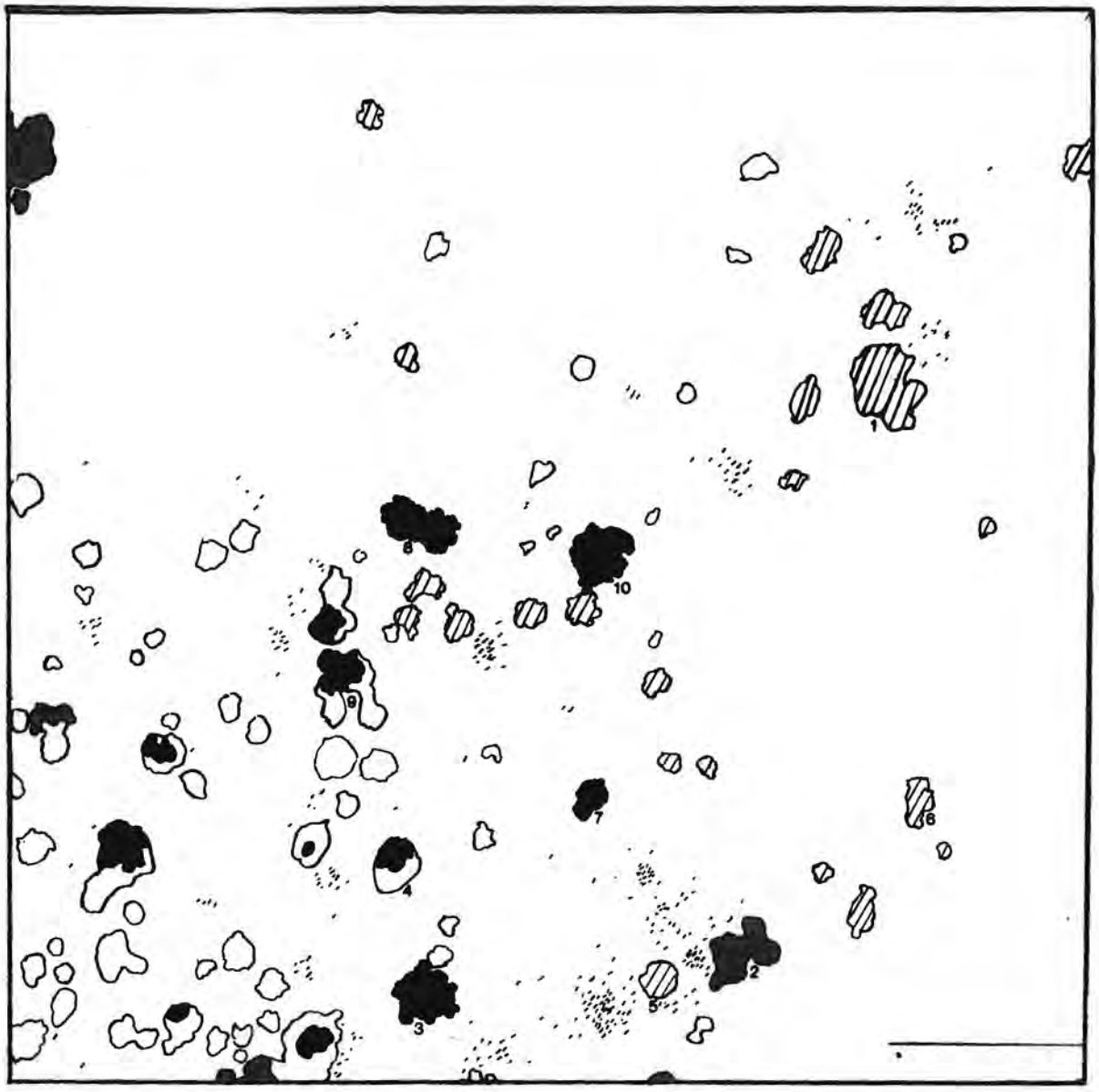


Figure 2(c). Quadrat III.

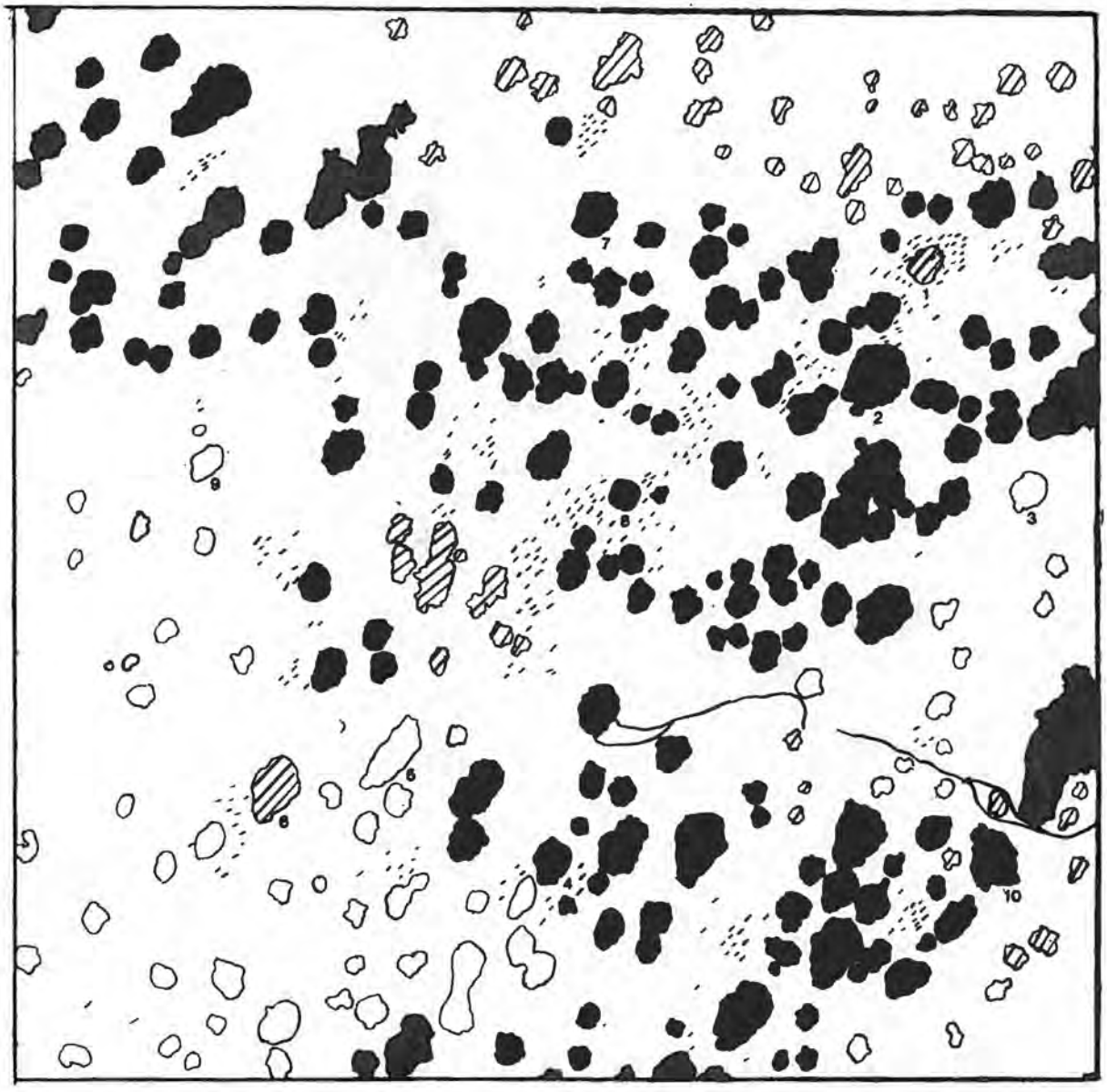


Figure 2(d). Quadrat IV.

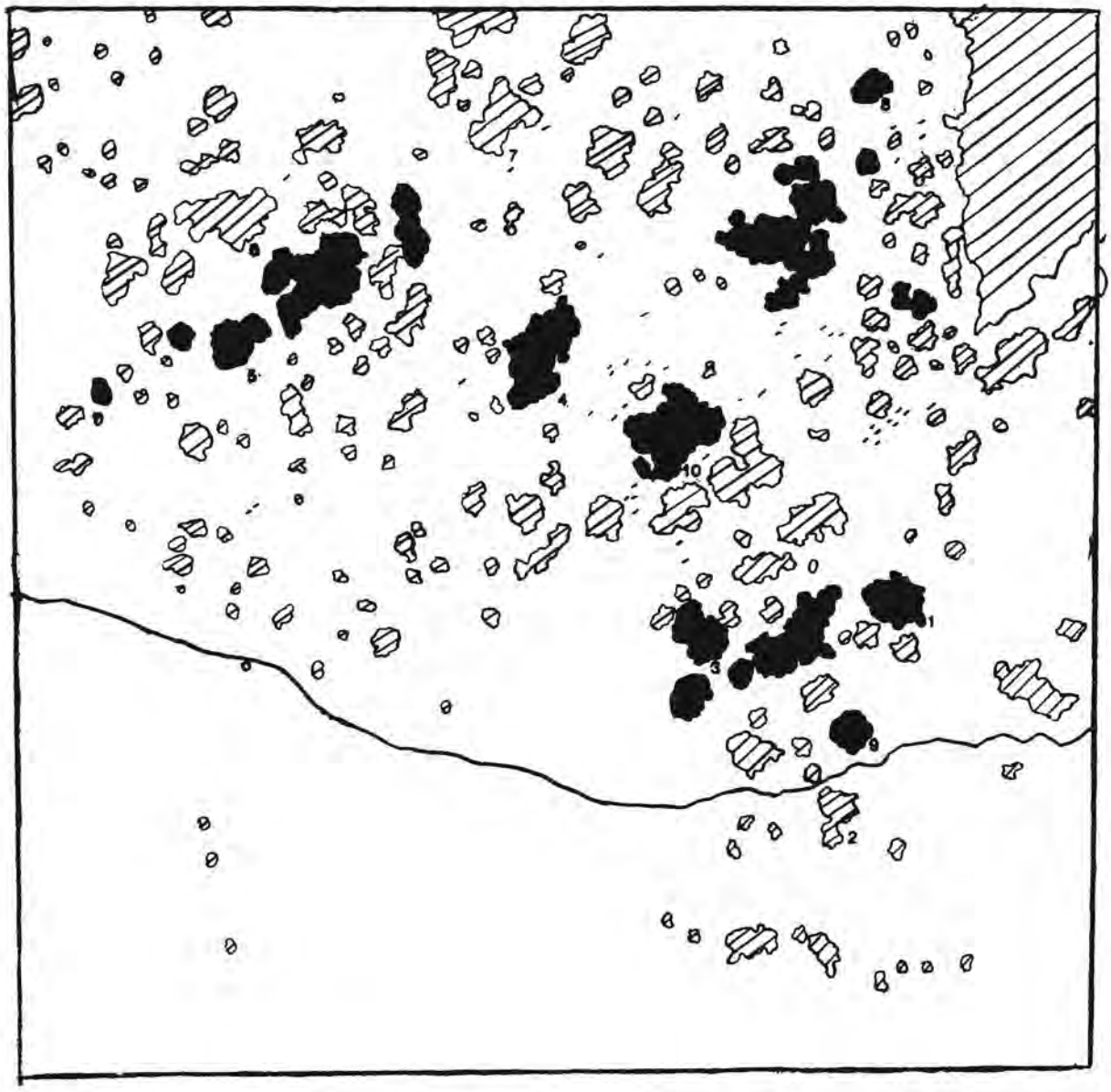


Figure 2(e). Quadrat V.

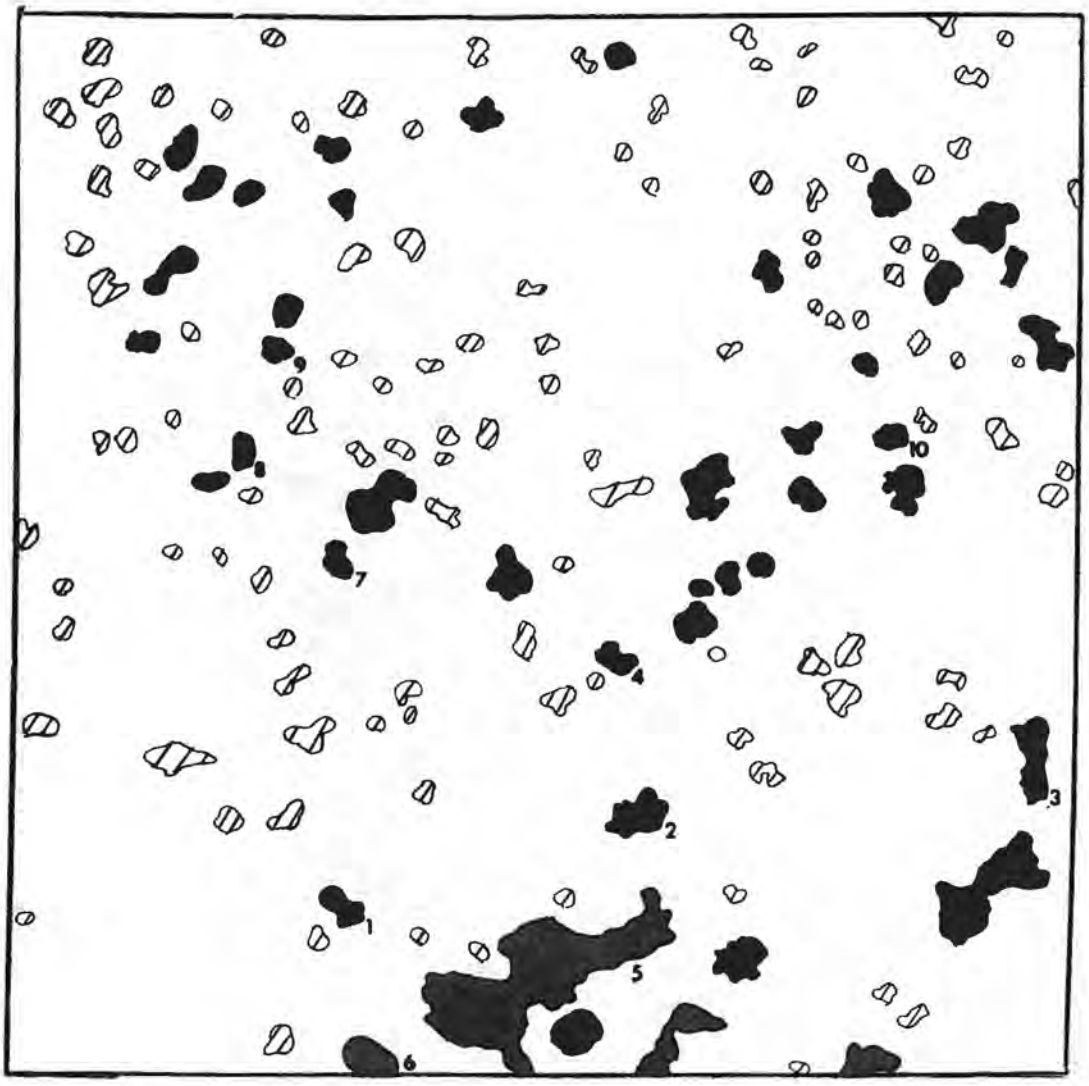


Figure 2(f). Quadrat VI.

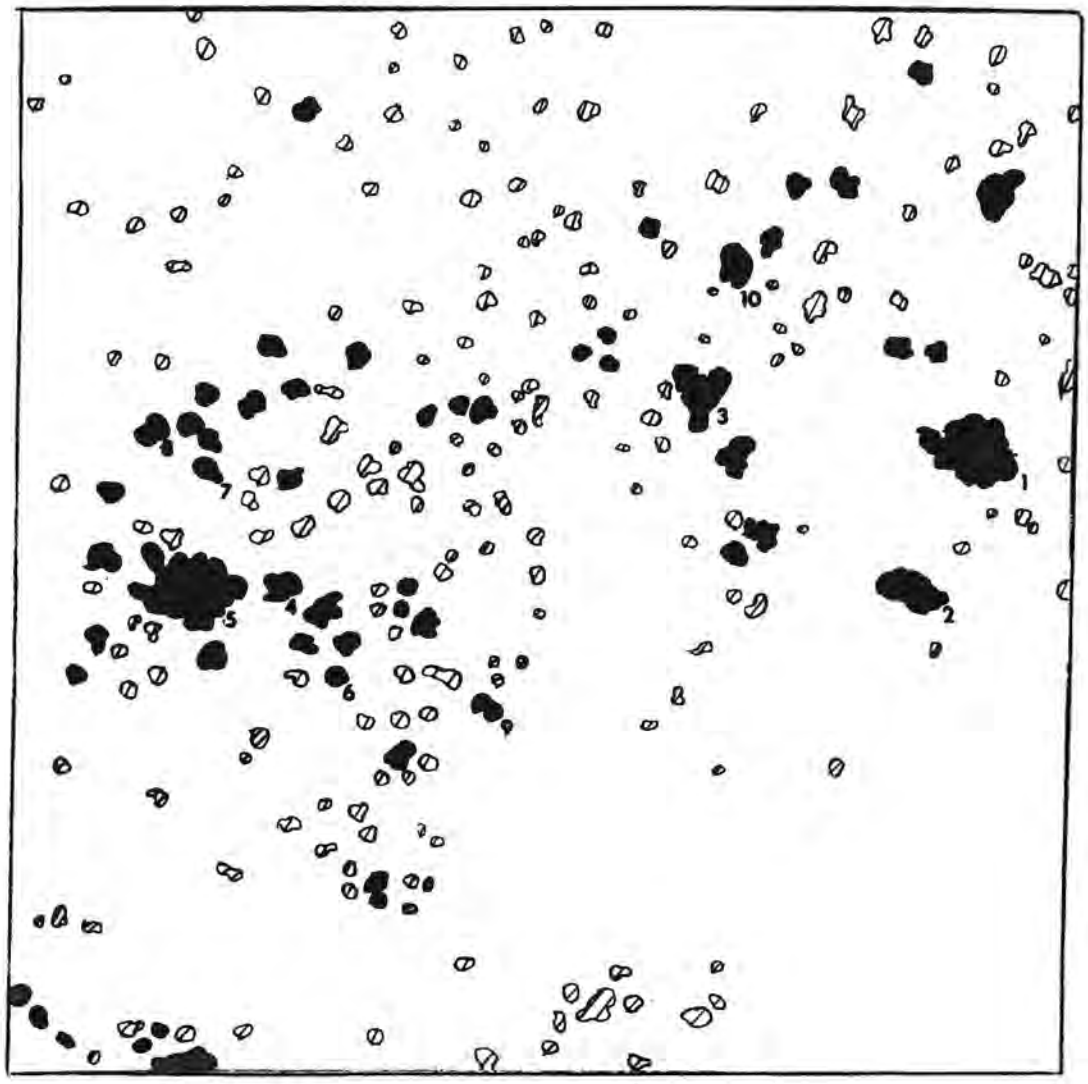


Figure 2(g). Quadrat VII.

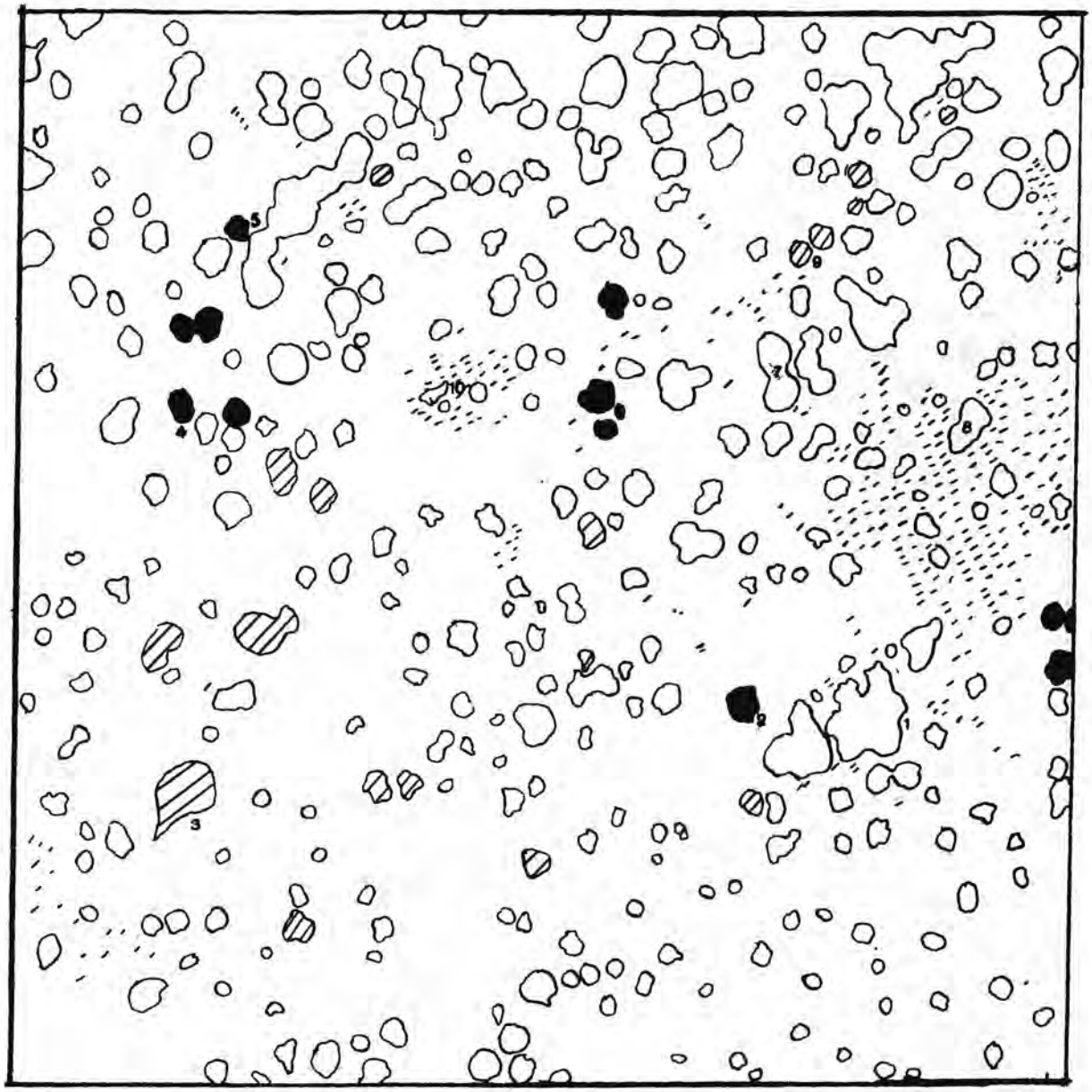


Figure 2(h). Quadrat VIII.

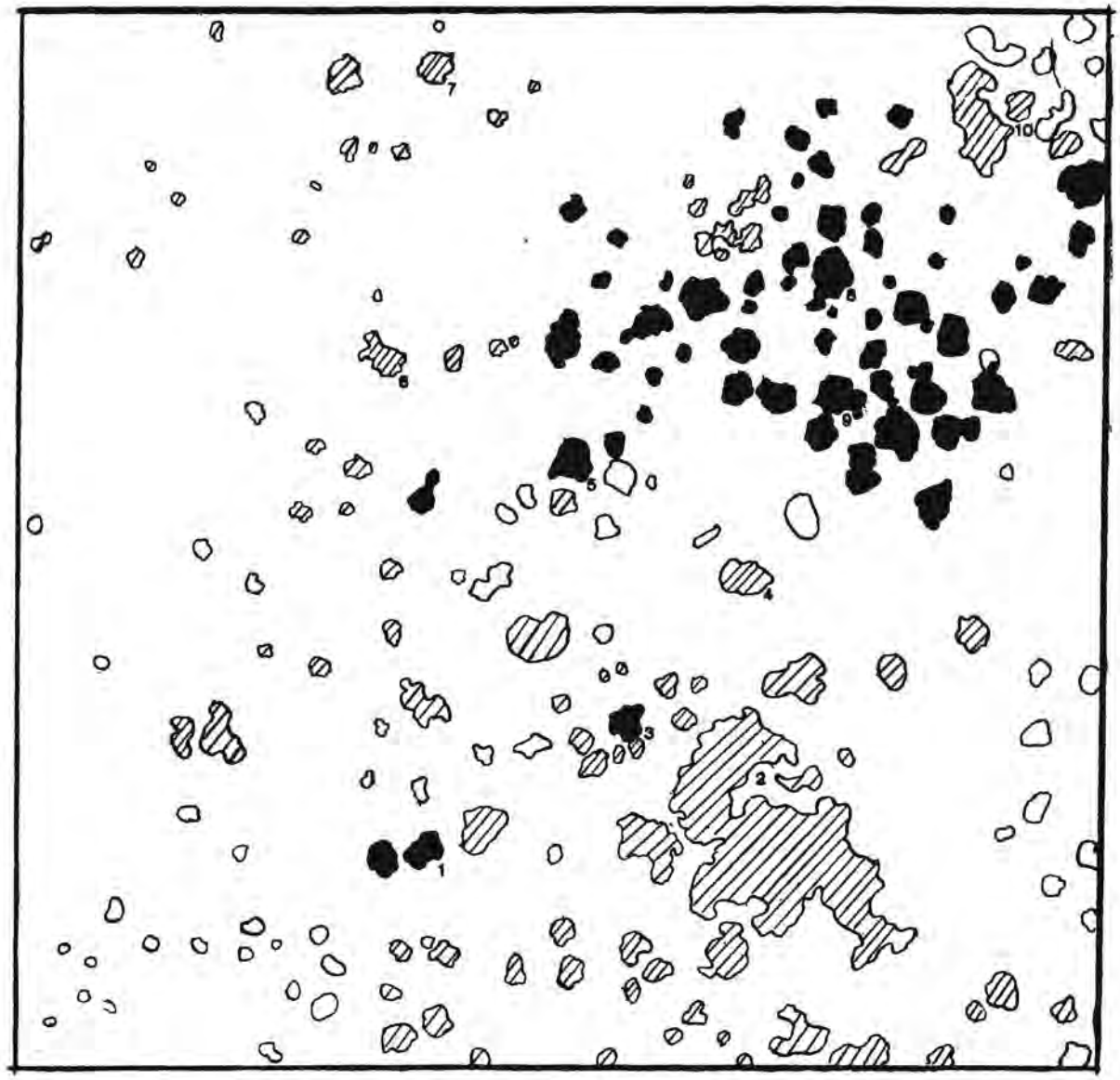


Figure 2(i). Quadrat IX.

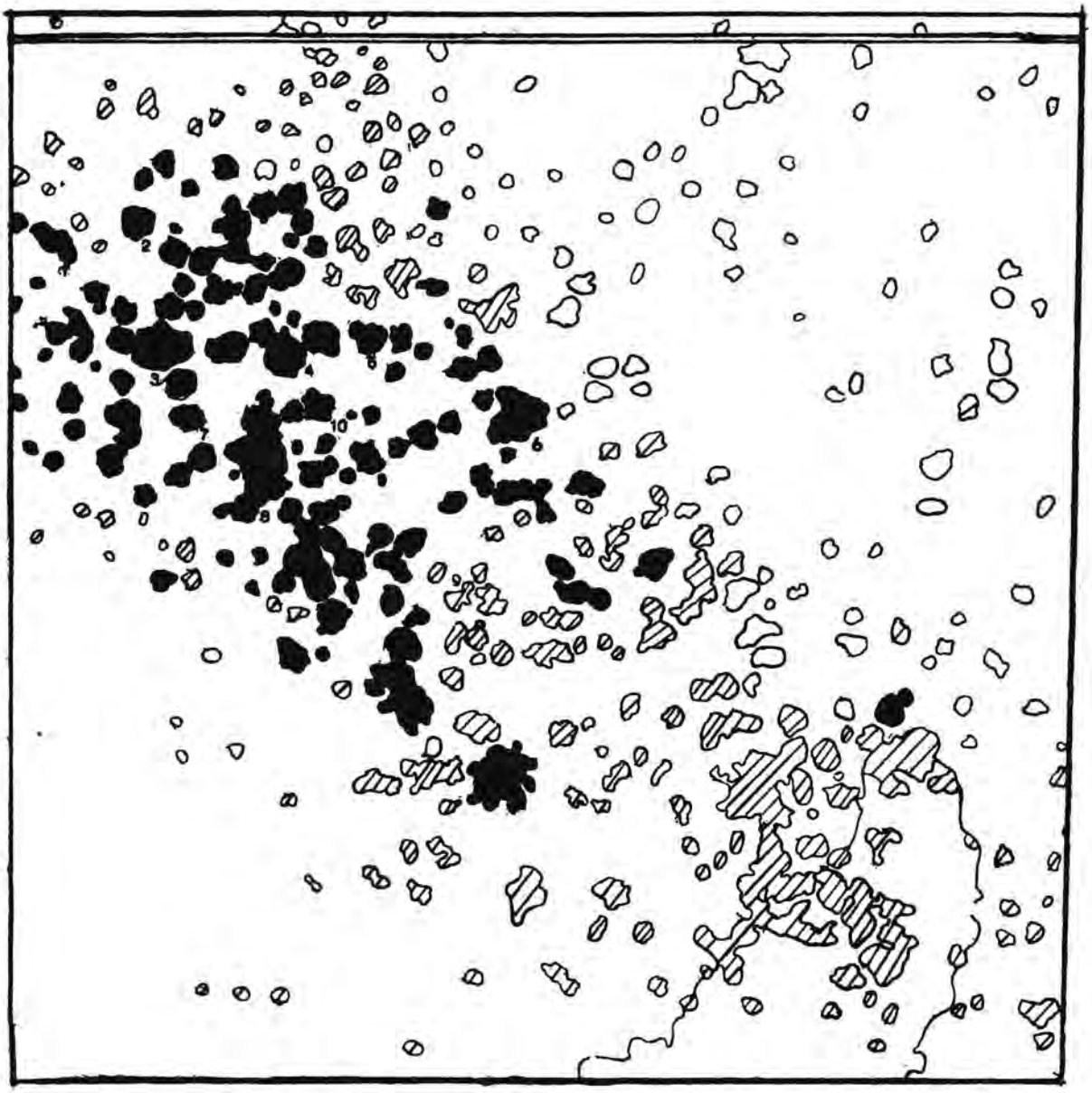


Figure 2(j). Quadrat X.

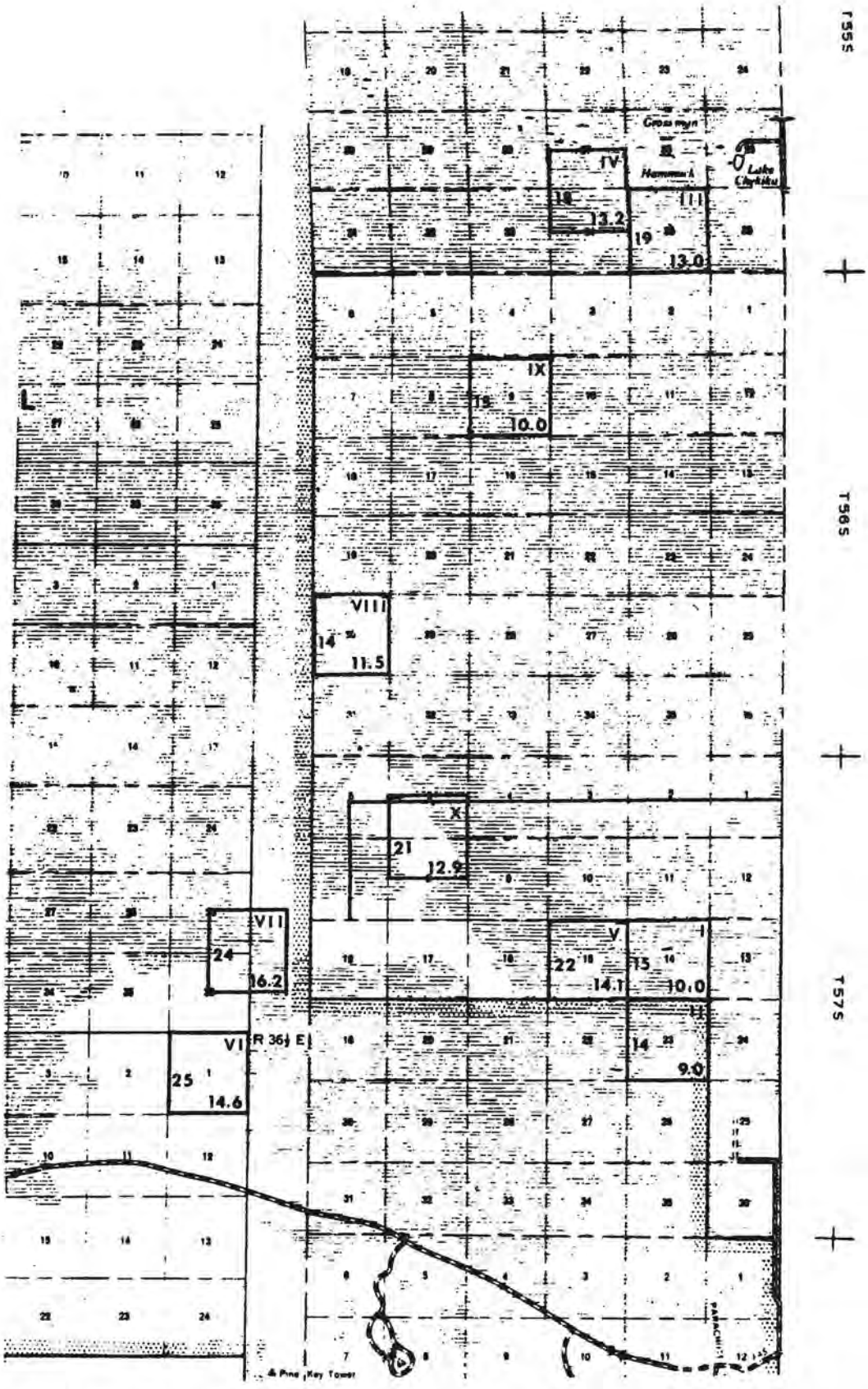


Figure 3. Total number and (in lower right corner) average number of woody tropical hardwood hammock species recorded for 10 hammocks in each of the 10 study quadrats. Note that greatest species richness occurs near Long Pine Key and Grossman Hammock.