

1987-1988

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Statewide Wildlife Research

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7502

Project Title: Florida Panther Research

Project Subtitle: Florida Panther Recovery Plan Implementation

Study Title: Florida Panther Movements, Social Organization and Habitat Utilization

Period Covered: 1 July 1987 - 30 June 1988

Prepared By: David S. Maehr, Biological Administrator I

Abstract --A total of 3,079 radio locations was used to determine home range sizes of 13 Florida panthers (Felis concolor coryi) in Collier, Hendry, Highland, Glades, and Hardee counties. Adult male ranges averaged 661 Km² and adult females' averaged 350 Km². A subadult female used a 97 Km² area. Home range shifts by 2 panthers in the Fakahatchee Strand may have resulted from the loss of 2 adult females and low water levels. Habitat characteristics varied from north to south with higher quality lands more abundant in the northern part of the study area. Female productivity was directly related to prey abundance while female home range size was inversely related to prey abundance.

Florida panthers (Felis concolor coryi) occupy one of the largest remaining contiguous tracts of wildlife habitat in the eastern United States. Public and private lands in Collier, Dade, Broward, Palm Beach, Lee, Hendry and Glades counties make up a contiguous system of wild lands totalling over 5 million acres. However, continued expansion of the urbanized east coast, increasing growth on the west coast and the spread of agricultural development in the interior has placed unprecedented pressures on the external and internal integrity of this system. Human population growth in Collier County alone is expected to increase 46 percent by 1995 (Kiplinger Washington Editors 1985). Further, Broward and Palm Beach counties will lead the state in numbers of new residents during this period.

With increasing human numbers in the region, public lands will experience comparable use pressures. In the Florida panther's south Florida range, conflicts among public use demands, maintenance of quality outdoor experiences for users, maintenance of biological integrity of the area, and the biological needs of the Florida panther have created a complicated management dilemma. Given the high priority for the recovery of the Florida panther (U.S. Fish and Wildlife Service 1986), natural history information including movements, social organization and habitat use is essential to carrying out plans to prevent the extinction of this endangered subspecies. Information of this kind will be useful in evaluating the impacts of significant changes in land use patterns and will serve as a basis for evaluating the success of reintroductions of panthers in currently unoccupied range. Detailed natural history data over that wide and diversified area are essential to determine the ability of the panther to adapt to changing and highly altered environments. Further, the identification of essential components of panther habitat such as day use sites, den cover, travel pathways, and foraging grounds will be helpful in improving conditions on occupied lands and on potential release sites. This study was designed to address those needs.

METHODS

Panthers were captured during winter using trained hounds and anesthetized using a combination of ketamine hydrochloride and xylazine hydrochloride. Captured panthers were reinstrumented as necessary. Standard measurements and indicators of physical condition and health were recorded.

Instrumented panthers were monitored approximately every other day from fixed-wing aircraft and at least 3 times each week per the method of Mech (1983). As opportunities arose, individuals were monitored for 24-hour periods using a digitized data processor (Telonics, Inc., Mesa, AZ) and chart recorder, or by recording radio collar pulse rate changes. Twenty-four-hour activity was sampled among seasons and sex and age classes to determine variability in diel patterns. The minimum convex polygon (Mohr 1947) was used to delineate panther home ranges. Diversity (H') and evenness (J') (Shannon and Weaver 1963) were calculated for habitat use patterns exhibited by each panther. Habitat descriptions are provided in Appendix A.

RESULTS AND DISCUSSION

Panther capture activities from fall 1987 through winter 1988 resulted in the recaptures of 1 subadult female, 1 adult female, and 1 adult male, and the instrumentation of 3 new adult males. Vital statistics of panthers captured or killed in southwest Florida appear in Table 1.

The following narrative summarizes basic home range characteristics of panthers monitored in southwest Florida from December 1985 through June 1988. Included are panthers that have died or have been removed during this 3-year period.

Female #08 was removed from the wild on 13 April 1987. Before this time her movements had been virtually restricted to the Fakahatchee Strand State Preserve. Habitats used in her home range of 163 km² (Fig. 1) consisted of

mixed swamp (57%), hardwood hammock (17%), cypress swamp (12%), cabbage palm hammocks (8%), and open cypress forest (3%) (Fig. 2). The pattern of use exhibited by this panther was characterized by low diversity and evenness indices (Table 2).

Female #09 gave birth to her second known litter on 15 June 1987. Field sign and observations from aircraft revealed the presence of only 1 kitten. Attempts will be made this fall (1988) to capture the subadult if it still is with #09. A detailed description of this panther's maternal behavior is provided in Appendix B. Habitat use by #09 was moderately diverse and even. Her home range measured 319 km² (Fig. 4) and consisted primarily of mixed swamp (38%), hardwood hammock (19%), cabbage palm hammocks (12%), cypress swamp (10%), and pine/cabbage palm woods (7%) (Fig. 3). This fairly large home range was influenced by a recent shift in habitat use which may be due to the removal of female #08. Number 09 and her suspected kitten have used an area in the Fakahatchee Strand once dominated by apparently senescent #08.

Male #10 was killed by male #12 in January 1987 (Maehr 1987). This subadult utilized a 433 km² area (Fig. 5), characterized by mixed swamp (33%), hardwood hammock (16%), low pinelands (14%), cabbage palm hammocks (12%), and cypress swamp (9%) (Fig. 6). The higher diversity and evenness measures (Table 2) are the result of #10's dispersal and subsequent use of better drained landscapes to the north of his natal range.

Female #11 was recaptured on 7 January 1988 for collar replacement. She appeared in excellent condition and still in close proximity to her kittens. A

detailed account of her behavior during the first 6 months after the birth of this litter (14 May 1986) and a comparison with female #09 are presented in Appendix B. On about 16 May 1988, female #11 gave birth to her second known litter, almost exactly 2 years since the previous one at the same location as her previous litter. Simultaneous locations from 7-10 February with male #20 suggest he was the sire of the latter kittens. The size of this litter is as yet unknown. Continuous monitoring (using TR2, TDP2, and chart recorder-Telonics, Inc.) was initiated immediately following denning behavior and continued for about 1400 consecutive hours. Female #11 uses an area measuring 239 km² and frequents hardwood hammocks (37%), low pinelands (24%), cypress swamp (13%), mixed swamp (11%), and pine/cabbage palm woods (7%) (Fig. 8). Diversity and evenness of use was moderate (Table 2).

Male #12 was recaptured on 31 January 1988 for collar replacement. He appeared in good condition but with numerous puncture wounds and abrasions around his head and front legs, apparently the result of encounters with other panthers. Previous movements in the Catherine Island area, new Florida Panther Wildlife Refuge. Habitat use by #12 was moderately diverse and even (Table 2) and included mixed swamp (29%), hardwood hammock (26%), low pinelands (15%), cypress swamp (13%), and pine/cabbage palm woods (Fig. 9). His home range measured 753 km² (Fig. 10).

Male panther #13 was hit by a truck and killed near Sunniland on S.R. 29 on 14 December 1987. His condition immediately preceeding his death appeared comparable to his condition (excellent) at first capture (2/86). Habitat use

had been moderately diverse and even and included hardwood hammock (34%), low pinelands (28%), cypress swamp (14%), pine/cabbage palm woods (8%), and mixed swamp (7%) (Fig. 11). His home range measured 843 km² (Fig. 12). During fall of 1987 #13 primarily used a small area near Sunniland that also was the home range of #11 and her kittens. On at least one occasion #13 was in the company of female kitten #19. The reasons for encounters outside of breeding activities are unknown. One possible explanation is pseudoestrous in these females.

Male panther #17 continued to follow the east-west movement patterns described the previous year (Maehr 1987). Habitat use was moderately diverse and even and included hardwood hammock (36%), low pinelands (23%), cypress swamp (15%), mixed swamp (11%), and pine/cabbage palm woods (5%) (Fig. 13). His home range measured 516 km² (Fig. 14).

Female panther #18 had reduced her frequency of interactions with radio-collared males but continued to travel widely through her home range. No evidence of reproduction, based on behavioral changes, were found. Habitat use was moderately diverse and even and included hardwood hammock (42%), low pinelands (18%), cypress swamp (12%), mixed swamp (11%), and thicket swamp (6%) (Fig. 15). Number 18 is the only panther to use thicket swamps to any large degree, perhaps in relation to high numbers of deer during periods of low water (especially April through June 1988). Her home range measured 680 km² (Fig. 16), an unusually large area for a female.

Subadult female (18 months) #19 was captured and recollared on 9 November 1987. She weighed 32 kg (70 lbs) [9 Kg (20 lbs) increase since 2/87] and appeared in excellent condition. Since her first capture, #19 was infrequently but regularly in the company of her mother, #11. Since #11's renewed reproductive activity and departure from her home range 18 months previously, #19 has remained in her mother's vacated range. Her home range measured 97 km² (Fig. 18), use was diverse and even, and included hardwood hammock (32%), low pinelands (20%), mixed swamp (16%), cypress swamp (14%), and cabbage palm hammocks (6%) (Fig. 17).

Panther #20 was captured 10 March 1987 near Graham Marsh, Hendry County. After 47 days at the Metro Miami Zoo recovering from injuries sustained from a vehicle collision, male panther #20 was released 4 August 1987 in southern Hendry County on a private ranch located within his known home range. His movements since release have appeared normal and he appears to be the sire of #11's most recent litter. Habitat use was moderately diverse and even and included hardwood hammocks (39%), low pinelands (24%), cypress swamp (12%), pine/cabbage palm woods (9%), and mixed swamp (7%) (Fig. 19). His home range covered 891 km² (Fig. 20). Recently, #20's movements have shifted south and east and now regularly include areas once frequented by male #13.

Male panther #24 was captured on 30 January 1988 in southern Highlands County. He weighed 57 kg (126 lbs.), was estimated to be 3.5 years old, and appeared in excellent condition. The capture of this northern-most radio-collared panther resulted from the discovery of tracks in November 1987

at Archbold Biological Station by station staff, subsequent sign surveys by Commission staff and 13 days of continuous hunting. His movements have been concentrated in southern Highlands County and northern Glades County, but one extensive move ended near Avon Park and included activity in Highlands Hammock State Park near Sebring. Deer and hogs are abundant throughout his range. There was no indication of other panthers within his home range, but panther tracks were verified from the Arbuckle Wildlife Management Area adjacent to the Avon Park Bombing Range. Panther #24's habitat use is moderately diverse and even and is composed of low pinelands (36%), hardwood hammock (25%), bay swamp (19%), and mixed swamp (6%) (Fig. 21). His home range measures 1139 km² (Fig. 22).

Panther #25 was captured on 16 February 1988 in northern Collier County. He weighed 55 kg (121 lbs), was in good condition, and was aged at 4-5 years. His home range to date covered 215 km², primarily within the future Florida Panther Wildlife Refuge, as well as small portions of the Fakahatchee Strand State Preserve, and the Ford Test Track. His movements overlap with #09, #11, #12, and #19. These latter observations indicate #25 is regularly crossing S.R. 84 and is traversing through the chain link fence surrounding the Ford Test Track. Males #10 and #12 also have been located inside the track compound in previous years. Panther #25's habitat use is moderately diverse and even and consists of low pinelands (26%), cypress swamp (24%), mixed swamp (19%), hardwood hammock (15%), and pine/cabbage palm woods (10%) (Fig. 24).

Panther #26 was captured on 1 March 1988 in southeast Hendry County. He weighed 54 kg (120 lbs.), appeared in good condition, and was aged at 5-6 years. His home range measures 273 km² to date, primarily on private lands in northeast Collier County and the Seminole Indian Reservation in southeast Hendry County, and overlaps with the ranges of panthers #17 and #18. Habitat use is low in diversity and is even (Table 2), and includes low pinelands (35%), cypress swamp (29%), mixed swamp (18%), hardwood hammock (8%), and pine/cabbage palm woods (6%) (Fig. 26). The small home ranges of #25 and #26 are probably due to the relatively few locations collected on these males since their capture 4 months ago.

Overall, panther habitat use in southwest Florida is highly diverse but low in evenness (Table 2) due to the dominance of a few vegetation types (i.e. hardwood hammock, mixed swamp, low pinelands) (Fig. 27). When examined from a soils/parent material perspective (latitude 26°11'00", UTM NS2897), this pattern changes considerably. South of this line habitat use is dominated by wetlands (mixed swamp and cypress swamp) (Fig. 28), whereas north of UTM 2897 habitat use is more diverse (Table 2) and dominated by uplands (hardwood hammock, low pinelands, and palm forests) (Fig. 29). Further, lands to the south primarily are publicly owned while lands to the north are mostly privately owned.

An important aspect of panther habitat use is cover. Successful hunting, in part, requires the use of cover, and certain habitat characteristics are sought for maternal den sites and day use sites. During attempts to locate

kills made by panthers, 71 day use sites were found and described (Table 3). In every instance dense horizontal cover surrounded the actual bed site, which usually consisted of a 1 x 2 m depression in a sandy/loam soil. Saw palmetto (Serenoa repens) was the dominant cover in 72% of the cases. Ferns and other tropical vegetation accounted for 25% while the exotic Brazilian pepper (Schinus terebinthefolius) and a limestone solution hole accounted for 1% each.

Telemetry data indicate that the Ford Test Track is regularly used by panthers. To date, this 2 mi² area has been used by 3 male panthers (#10, #12, #25). Sign of an uncollared female near the track's eastern fence suggest the actual use rate may be higher. Deer and hogs occur within the enclosure. The large, mowed, grassy areas created in association with the facility, interspersed with a mixture of oak hammock and wetland forests, undoubtedly has improved nutritional conditions for these prey and possibly improved hunting opportunities for panthers. Travel by wildlife in or out of the compound has been facilitated by erosion under the fence and subsequent enlargement by the animals using them. While no endangerment to panthers is suspected, the ease of entry and exit through this fence that was intended to be "wildlife proof" should cause concern for maintenance of the future I-75 "panther proof" fence. The integrity of the ground-fence interface may be an important factor in the construction and effectiveness of such fencing.

CONCLUSIONS

Monitoring of previously instrumented panthers and additional animals that are captured during FY 1988-89 will continue. The work is proceeding as scheduled.

Movement patterns and social interactions described in last year's annual report (Maehr 1987) appear similar this year with few exceptions. Home range shifts by #09 and #12 into the Fakahatchee Strand may have been the result of removing female #08, the death of an uncollared female in late 1986, and/or relatively low water levels during spring 1988.

Habitat use varied from north to south. Diversity of habitats used by panthers is greater in northern parts of the study area and dominated by uplands. Lower diversity and predominately wetland habitat use are characteristic of southern areas. Female productivity appears to be greater and home ranges smaller where food resources provide a higher nutritional plane (Appendix B). The importance of conserving panther habitat on these northern private areas should be addressed.

Capture attempts during FY 1988-1989 will focus on recapturing 5 adult panthers (#09, #17, #18, #20 and #24), instrumenting kittens belonging to #09 and #11, and adding uncollared adult females in the extreme east and west regions of the study area.

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Table 1. Vital statistics of panthers captured or killed in southwest Florida, 1979-1988.

<u>Males</u>						
Date	ID#	Weight (lbs.)	Age	Total Length (cm)	Condition	Location
03/01/88	26	120	5.5	210	Good	S.E. Hendry County
02/16/88	25	121	4.5	219	Excellent	Florida Panther Refuge - dead - 20 Aug 88
01/30/88	24	126	3.5	206	Excellent	Highlands County - dead - 22 Aug 88
03/10/87	20	148	3.5	216	Excellent	Hendry County (Alico) - dead - 24 Aug 88 1000000 release 4 Aug 87
01/20/87	17	142	6.5	221	Excellent	Hendry County (Collier Enterprise)
02/27/86	13	126	5.0	201	Excellent	Bear Island - OR Summerville 14 Dec 87
01/28/86	12	122	5.0	218	Good	Bear Island
01/26/85	07	122	9.5	225	Good	Fakahatchee Strand
03/27/83	07	114	7.5	228	Good	Raccoon Point
03/02/82	07	122	6.5	213	Excellent	Raccoon Point
02/27/82	06	122	7.0	203	Good	Fakahatchee Strand ?
03/18/83	-	115	-	-	-	Palmdale
01/29/83	04	106	8.5	205	Good	Fakahatchee Conservation Club
01/27/82	04	113	7.5	205	Excellent	Fakahatchee Strand
01/29/83	02	117	12	206	Good	Fakahatchee Strand
01/26/82	02	107	11	206	Good	Fakahatchee Strand
02/20/82	02	108	10	206	Good	Fakahatchee Strand
12/14/83	01	124	13	207	Good	Fakahatchee Strand mm#18
01/10/81	01	120	10	208	Good	Fakahatchee Strand

10 - Killed by #12 in January 1988

Table 1 (continued)

Females

Date	ID#	Weight (lbs.)	Age	Total Length (cm)	Condition	Location
02/09/87	19	50	9 mos.	170	Excellent	Bear Island
01/22/87	18	100	7	197	Excellent	Hendry Co. (Collier Ent.)
11/15/86	-	70	5	180	Fair	Fakahatchee Strand mm#16
01/21/86	11	92	4.5	186	Good	Bear Island
01/08/87	09	77	4.5	189	Fair	Fakahatchee Strand
01/26/85	09	79	2.5	194	-	Fakahatchee Strand
01/13/86	08	72	10	191	Poor	Fakahatchee Strand
02/21/85	08	71	9		Fair	Fakahatchee Strand
02/23/82	05	98	7.5	201	Good+	W.L. Cattle Ranch
01/17/83	03	70	9.5	194	Good	Fakahatchee Strand
01/23/82	03	68	8.5	194	Good	Fakahatchee Strand
04/19/81	-	85	2.5	179	Good	Fakahatchee Strand
12/23/79	-	68	2.5	-	-	Fakahatchee Strand

100 lbs. to 160 lbs.
 Sick 13 April 1987
 Died

Table 2. Diversity (H') and evenness (J') of habitat use exhibited by 13 panthers in southwest Florida, 1985-1988.

Panther	H'	J'	Number of habitats	Total number of locations
8F	1.30	.62	8	241
9F	1.78	.77	10	432
10M	1.90	.82	10	195
11F	1.73	.70	11	433
12M	1.77	.71	12	421
13M	1.77	.74	11	308
17M	1.69	.81	8	237
18F	1.72	.75	10	233
19F	1.87	.73	13	230
20M	1.70	.71	11	188
24M	1.65	.79	8	52
25M	1.72	.88	7	58
26M	1.52	.85	6	51
Locations North of UTM 2897	1.84	.66	16	1910
Locations South of UTM 2897	1.70	.71	11	1169
All locations	1.88	.66	17	3079

Table 3. Florida panther day use site composition.

Species	Frequency	Dominant cover ¹
<u>Serenoa repens</u>	53	51
<u>Blechnum serrulatum</u>	13	8
<u>Sabal palmetto</u>	17	5
<u>Taxodium distichum</u>	10	0
<u>Acrostichum danaeifolium</u>	2	2
<u>Myrsine floridana</u>	10	1
<u>Schinus terebinthefolius</u>	1	1
<u>Cladium jamaicense</u>	1	1
<u>Osmunda cinnamomea</u>	1	1
Limestone solution hole	1	1
<u>Quercus virginiana</u>	23	
<u>Vitis</u> spp.	22	
<u>Pinus elliotii</u>	12	
<u>Myrica cerifera</u>	11	
<u>Lyonia ferruginea</u>	10	
<u>Smilax</u> spp.	10	
<u>Thelypteris</u> spp.	10	
<u>Quercus laurefolia</u>	9	
<u>Acer rubrum</u>	9	
<u>Toxicodendron radicans</u>	9	
<u>Rhus copallina</u>	7	

Table 3. (continued)

Species	Frequency	Dominant cover ¹
<u>Ilex glabra</u>	7	
<u>Persea borbonia</u>	6	
<u>Quercus</u> spp.	5	
<u>Callicarpa americana</u>	5	
<u>Psychotria nervosa</u>	5	
<u>Psychotria sulzneri</u>	3	
<u>Parthenocissus quinquefolia</u>	3	
<u>Pteridium aquilinum</u>	2	
<u>Morus rubra</u>	2	
<u>Ximenia americana</u>	2	
<u>Baccharis halimifolia</u>	2	
<u>Ficus aurea</u>	1	
<u>Celtis laevigata</u>	1	
<u>Diospyros virginiana</u>	1	
<u>Erythrina herbacea</u>	1	
<u>Salix caroliniana</u>	1	
<u>Cephalanthus occidentalis</u>	1	
<u>Habenaria</u> spp.	1	
<u>Phlebodium aureum</u>	1	
<u>Urena lobata</u>	1	

Table 3. (continued)

Species	Frequency	Dominant cover ¹
<u>Cornus foemina</u>	1	
<u>Nephrolepis biserrata</u>	1	
<u>Hydrocotyle</u> spp.	1	

¹ Dominance was determined via ocular estimate of the plant or structure accounting for more than 50 percent of the horizontal cover around the day site.

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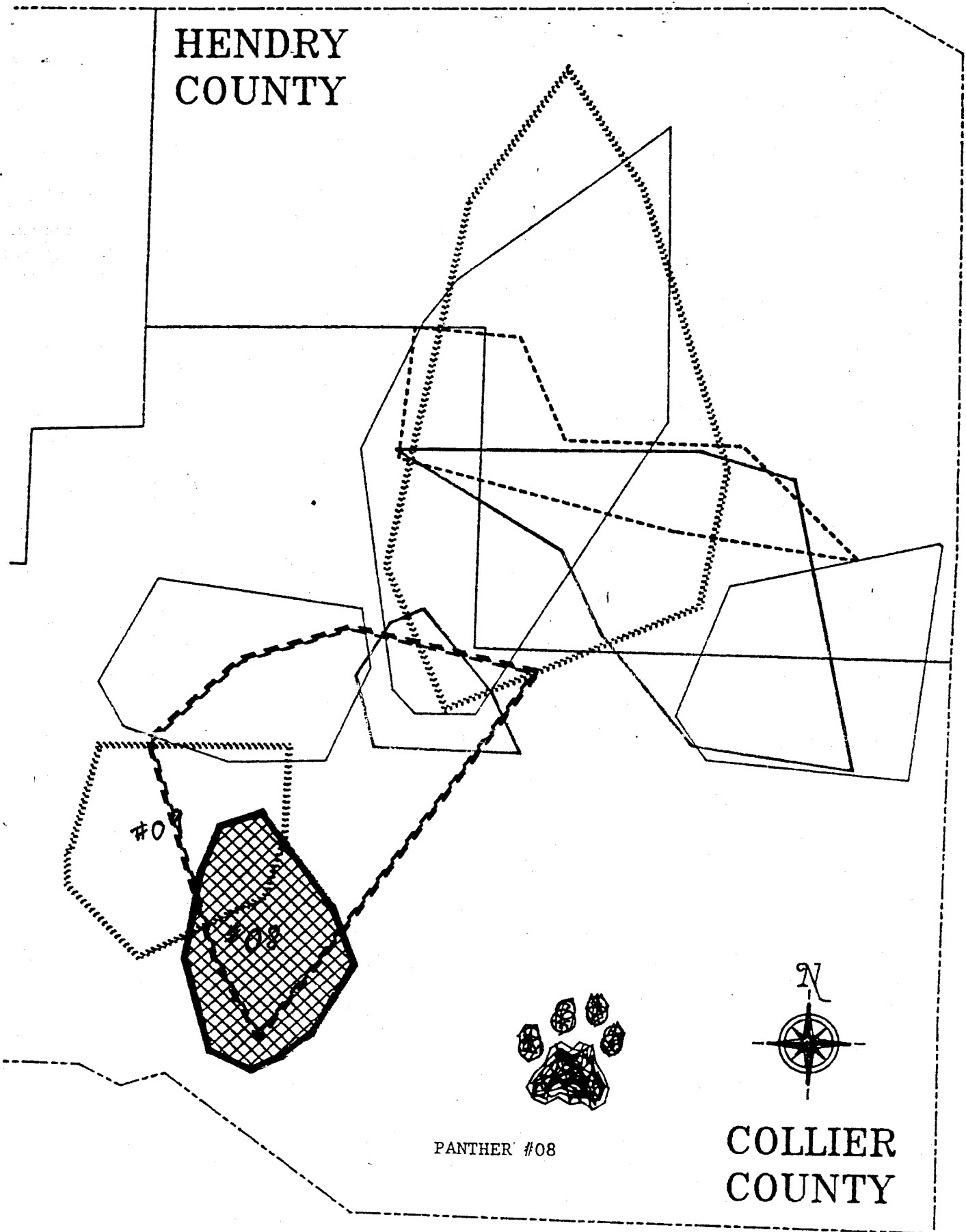
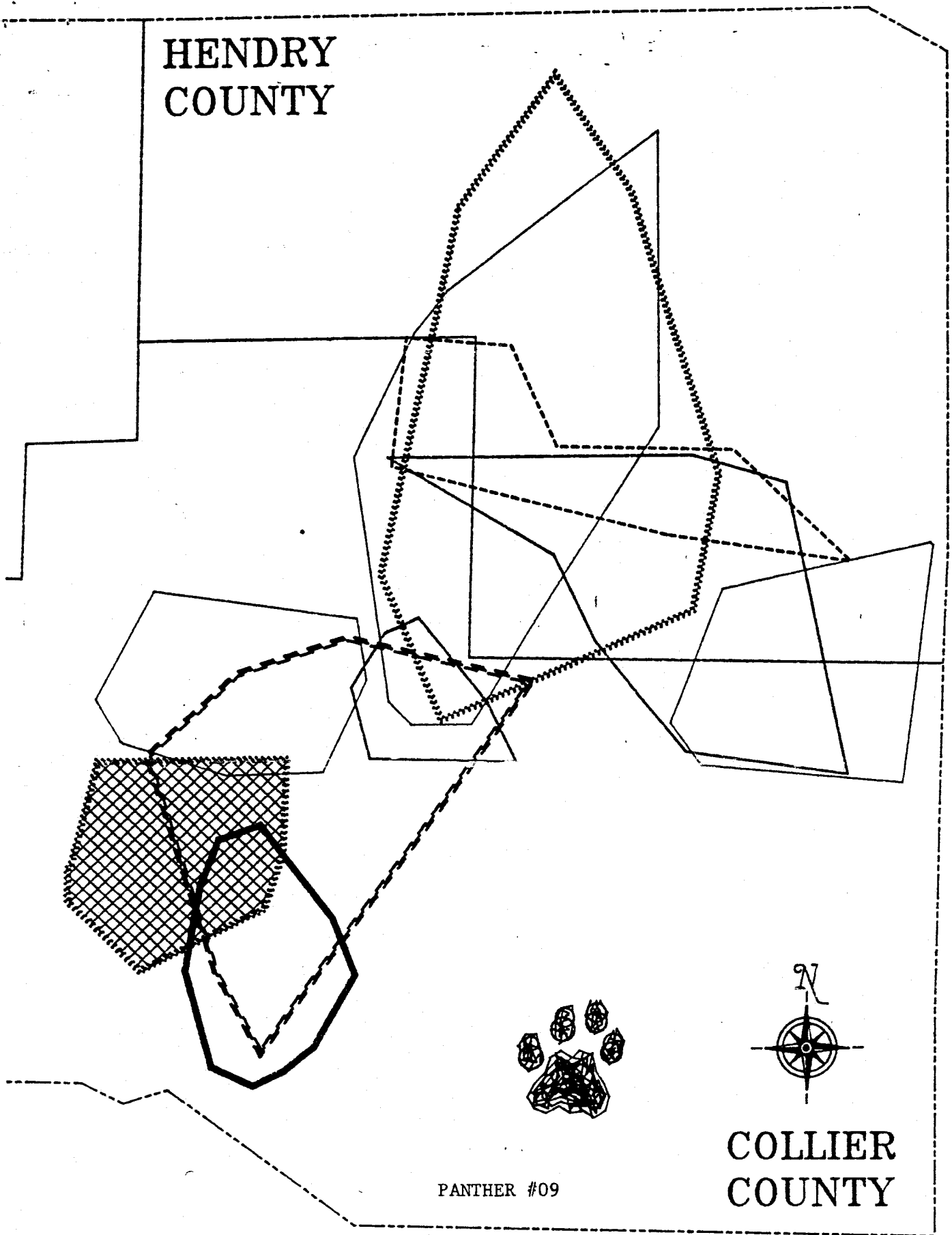


Figure 1

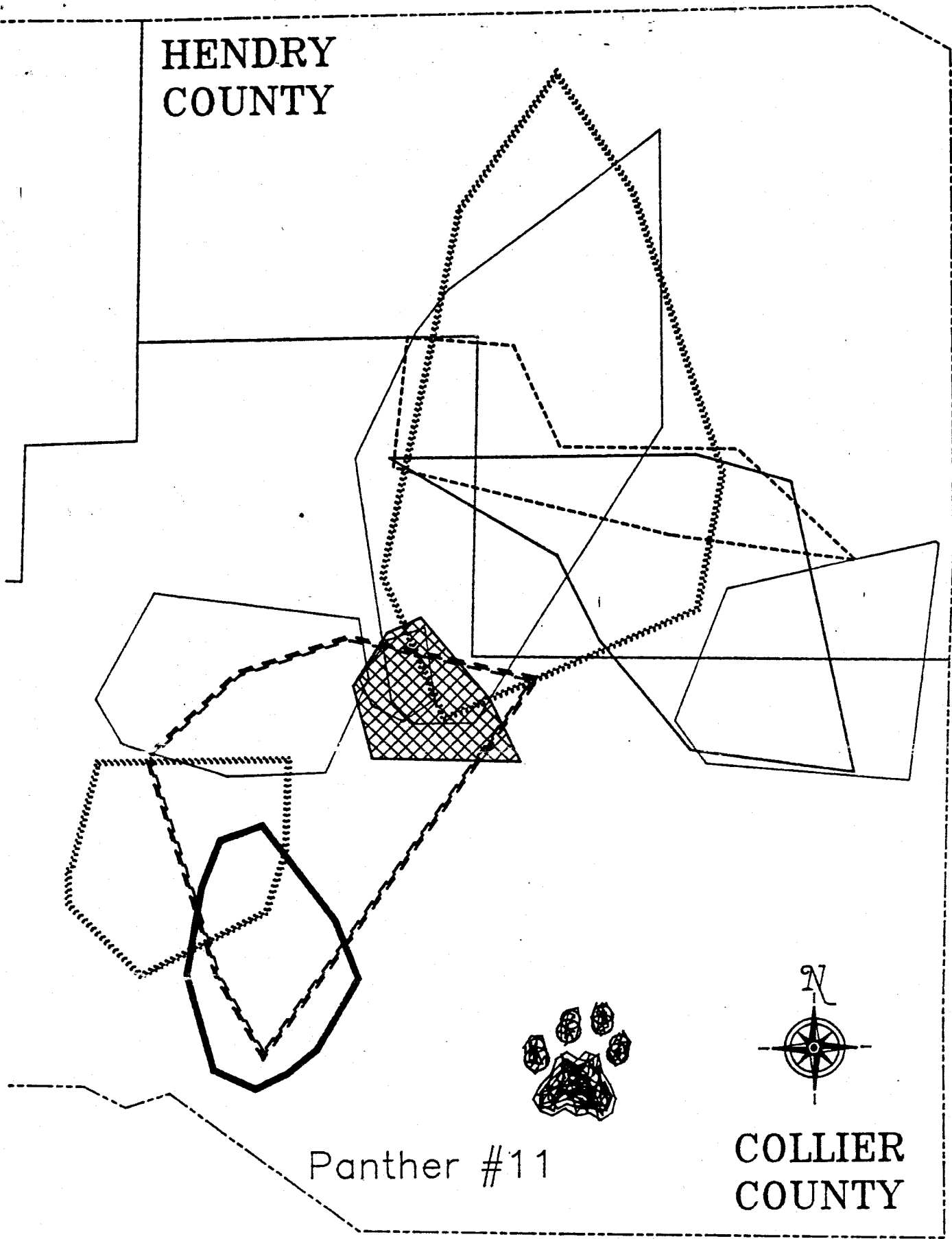
HENDRY
COUNTY



PANTHER #09

COLLIER
COUNTY

Figure 4



Panther #11

COLLIER
COUNTY

Figure 7

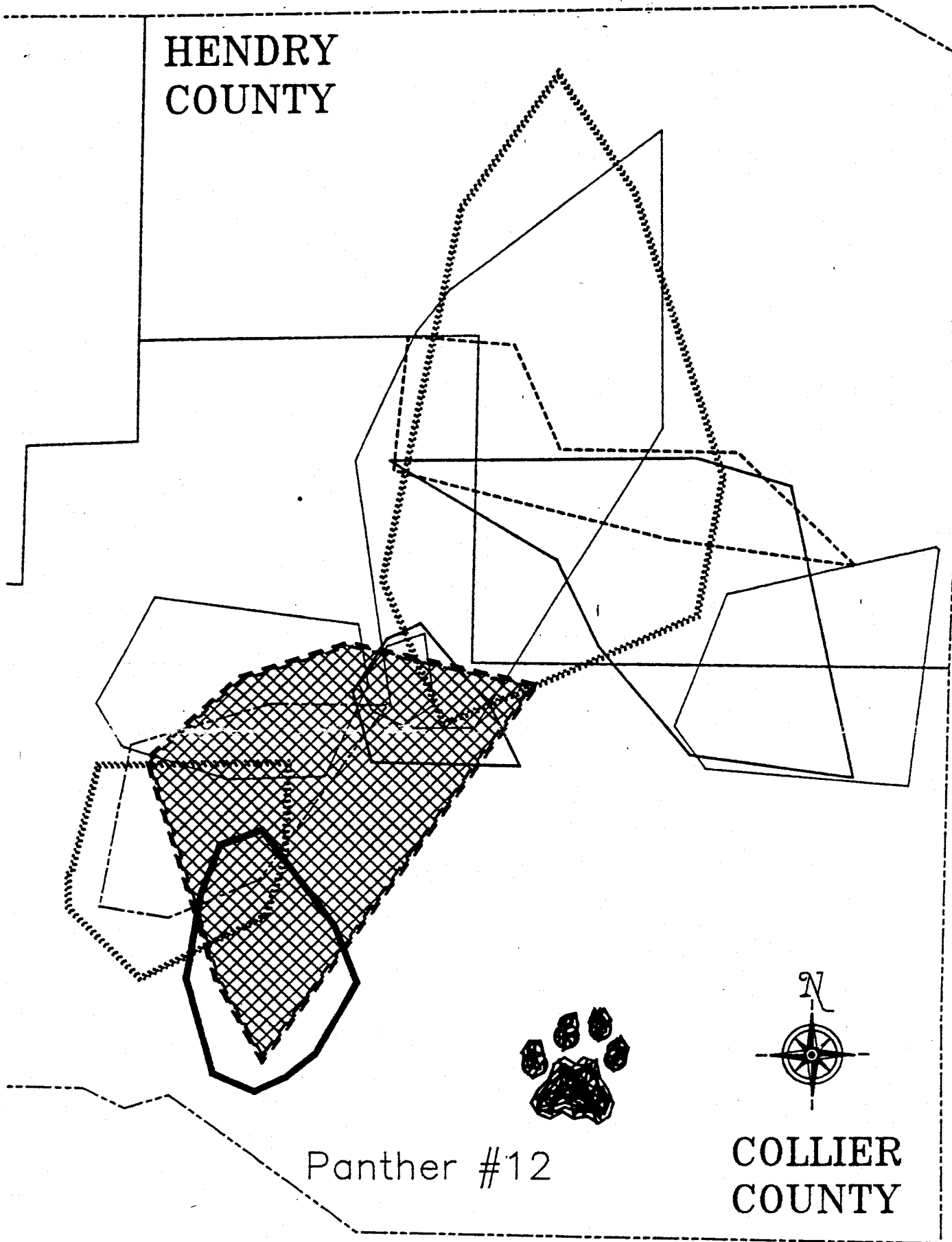


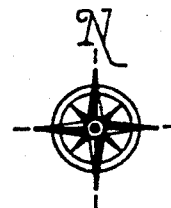
Figure 10

A map showing the range of Panther #13, which spans Hendry County and Collier County, Florida. The map includes county boundaries, a grid of sections, and a shaded area representing the panther's range. A compass rose and a paw print are also present.

**HENDRY
COUNTY**

**COLLIER
COUNTY**

Panther #13



Panther #13

Figure 12

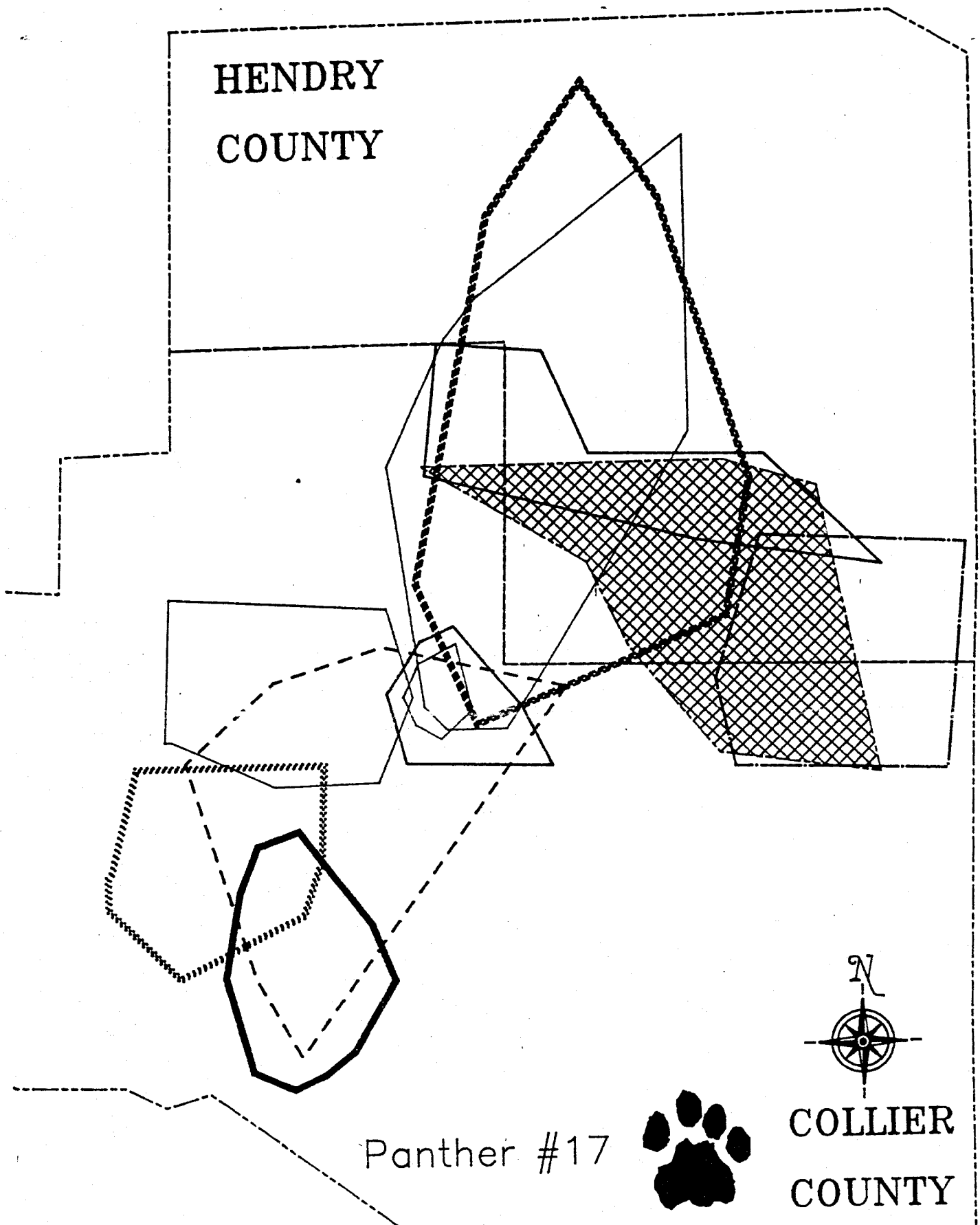


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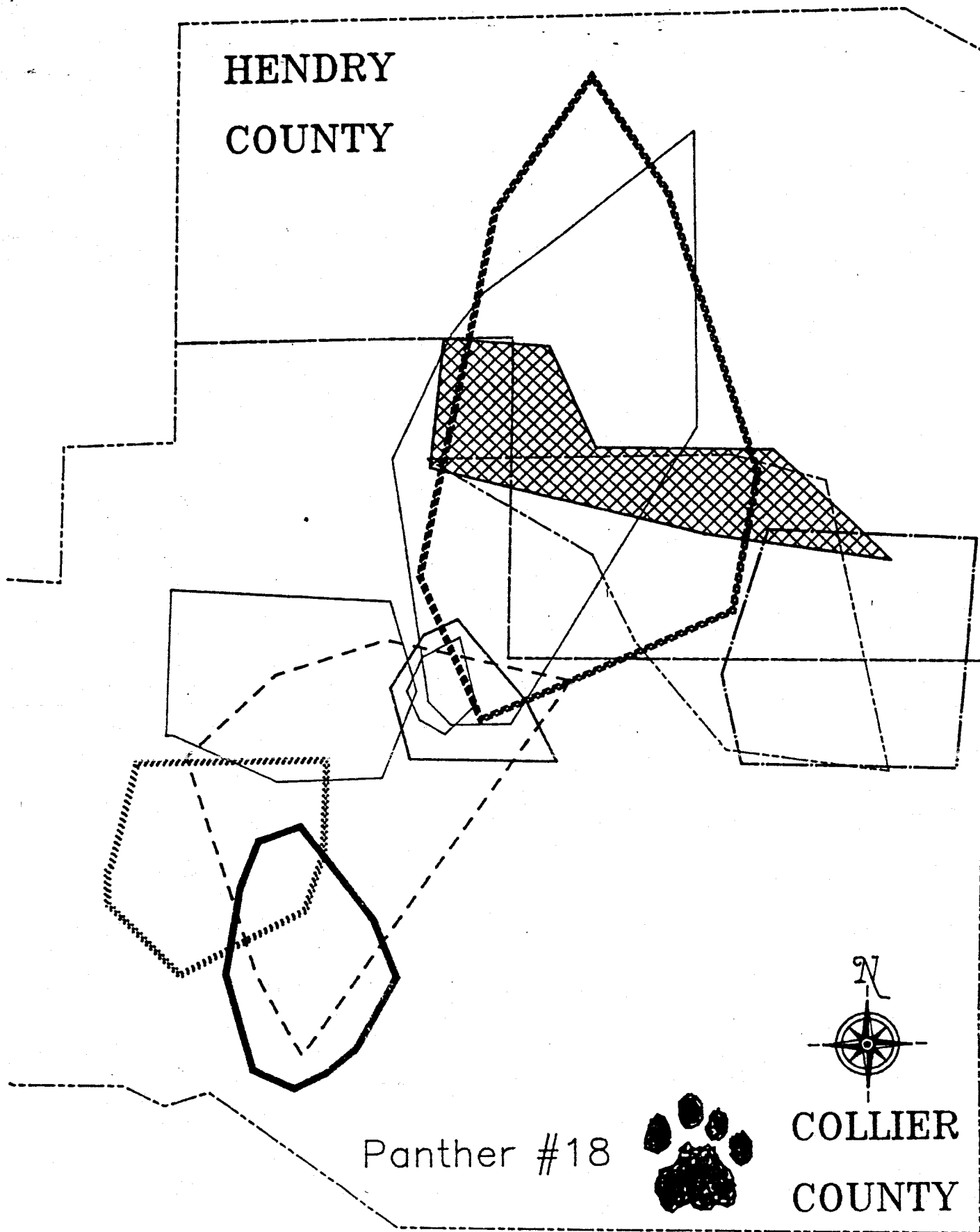


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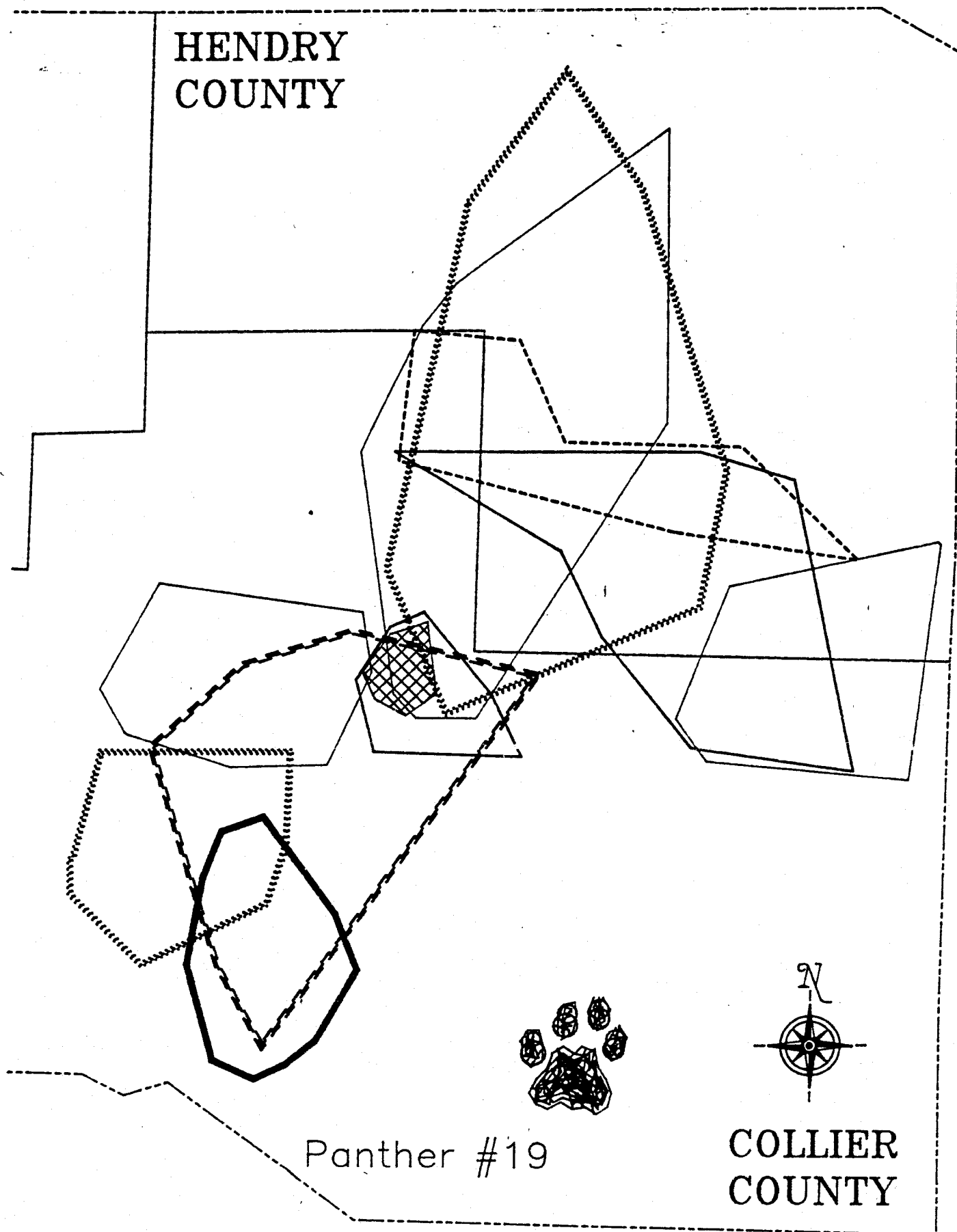


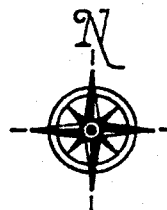
Figure 18

A map showing the range of Panther #20, which spans across Hendry County and Collier County, Florida. The map includes several overlapping polygons representing different areas or territories. A large, irregularly shaped area in the upper right is filled with a cross-hatch pattern. A dashed line traces a path through the lower left and middle sections of the map. A solid black line forms a loop in the lower left. A large black paw print is located in the lower center. A compass rose is in the lower right, with an 'N' indicating North. The text 'HENDRY COUNTY' is in the top left, and 'COLLIER COUNTY' is in the bottom right. The text 'Panther #20' is at the bottom center.

HENDRY
COUNTY

Panther #20

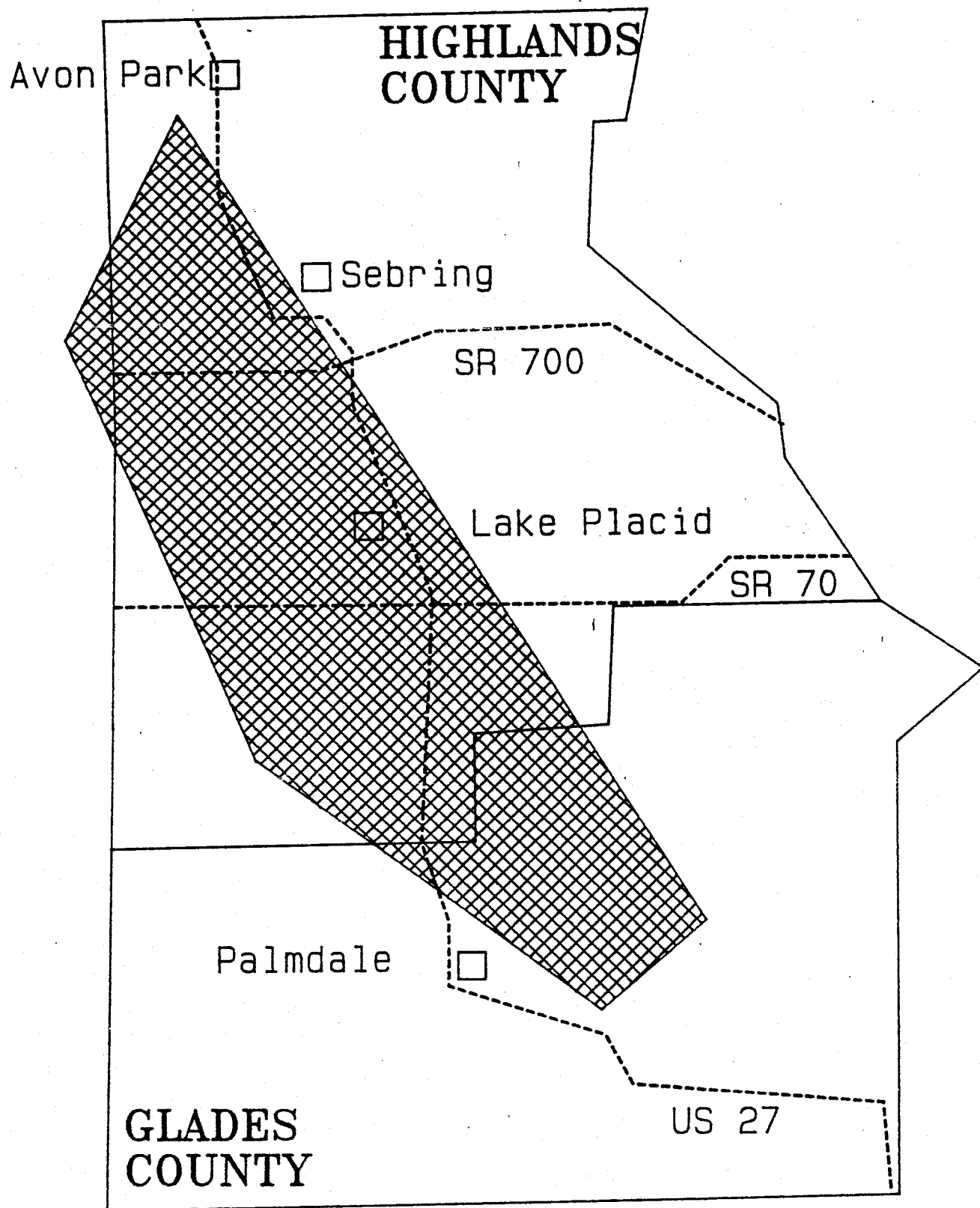
COLLIER
COUNTY



Panther #20

COLLIER
COUNTY

Figure 20



Panther #24

Figure 22

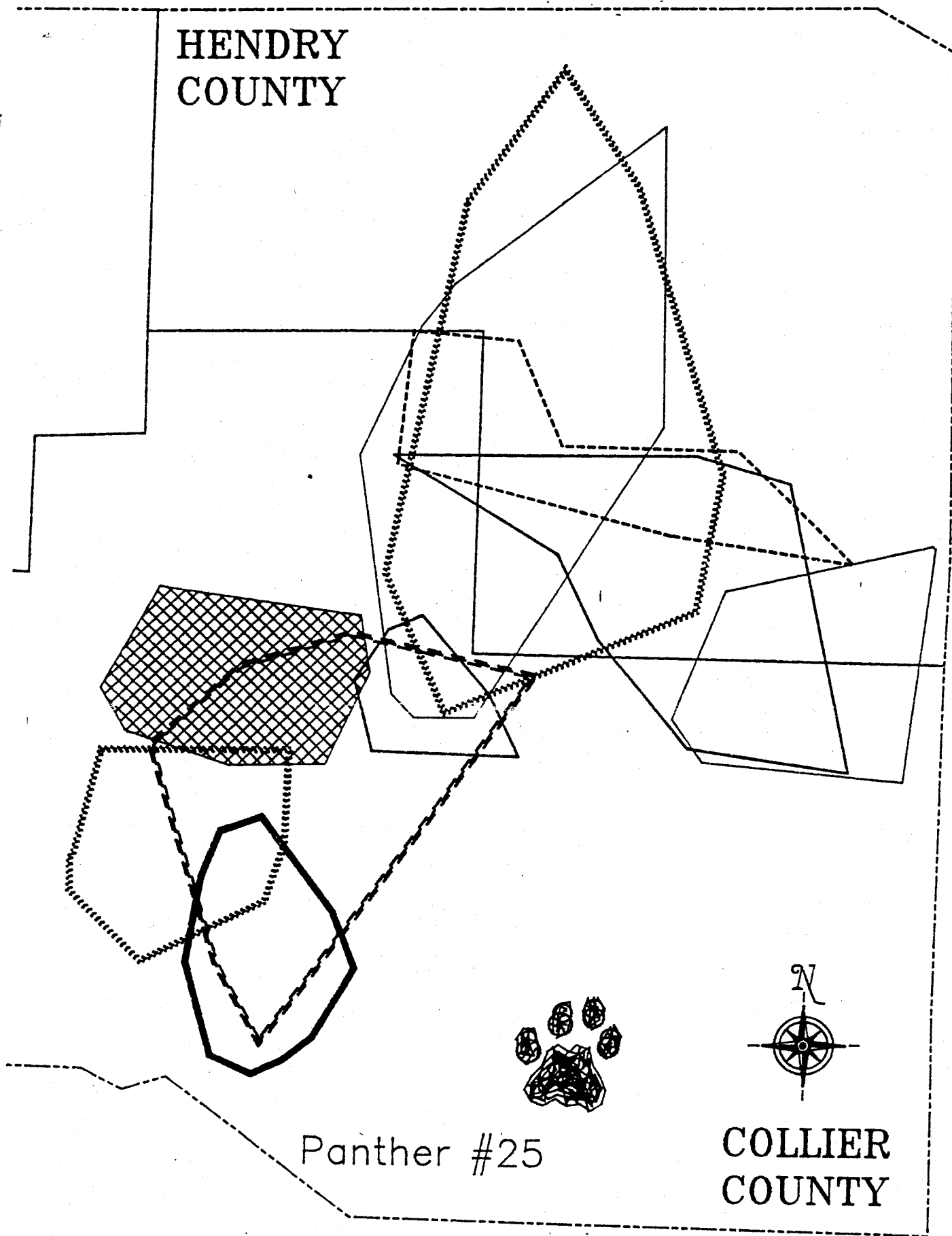


Figure 23

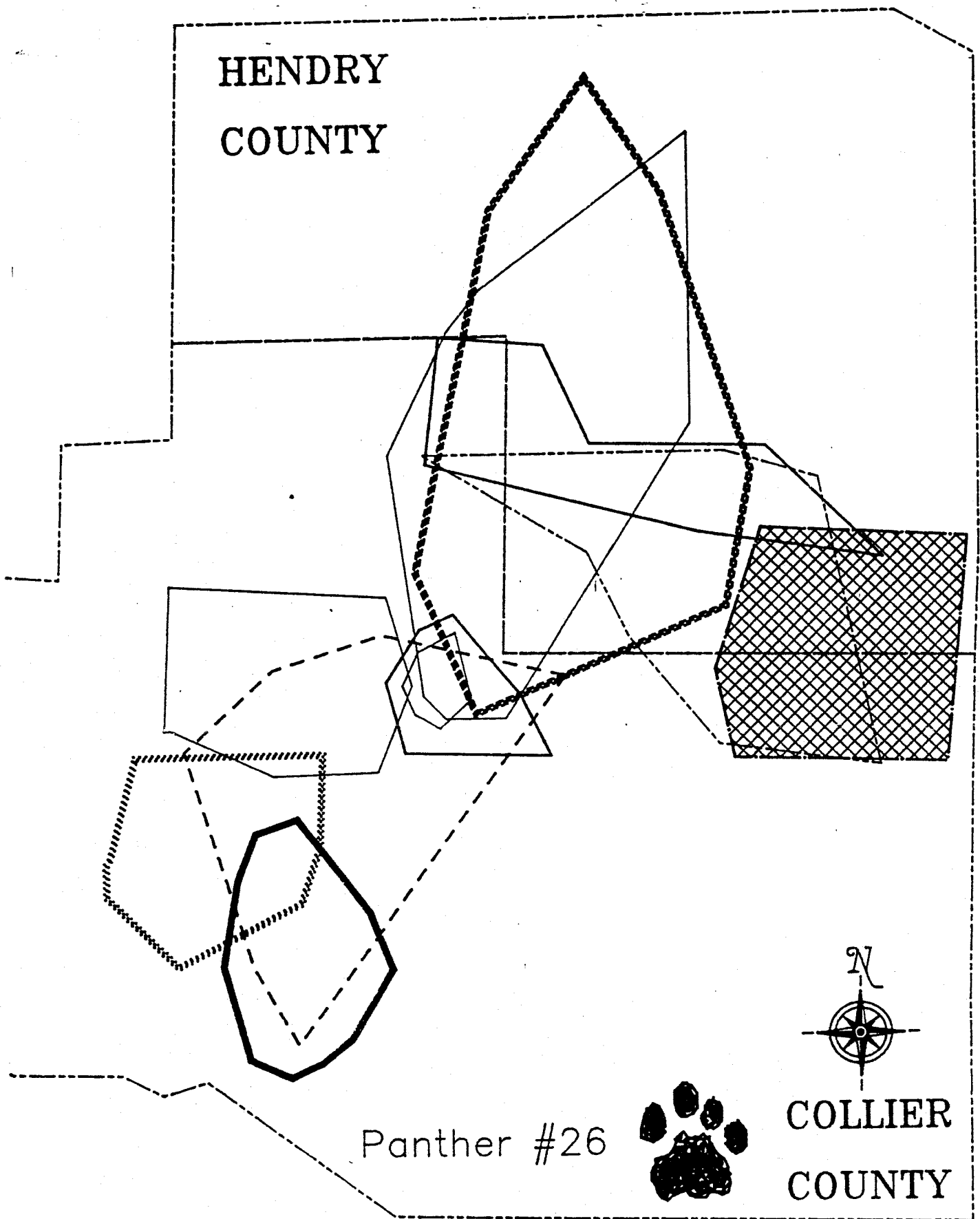


Figure 25

PANTHER #08
(N=241)

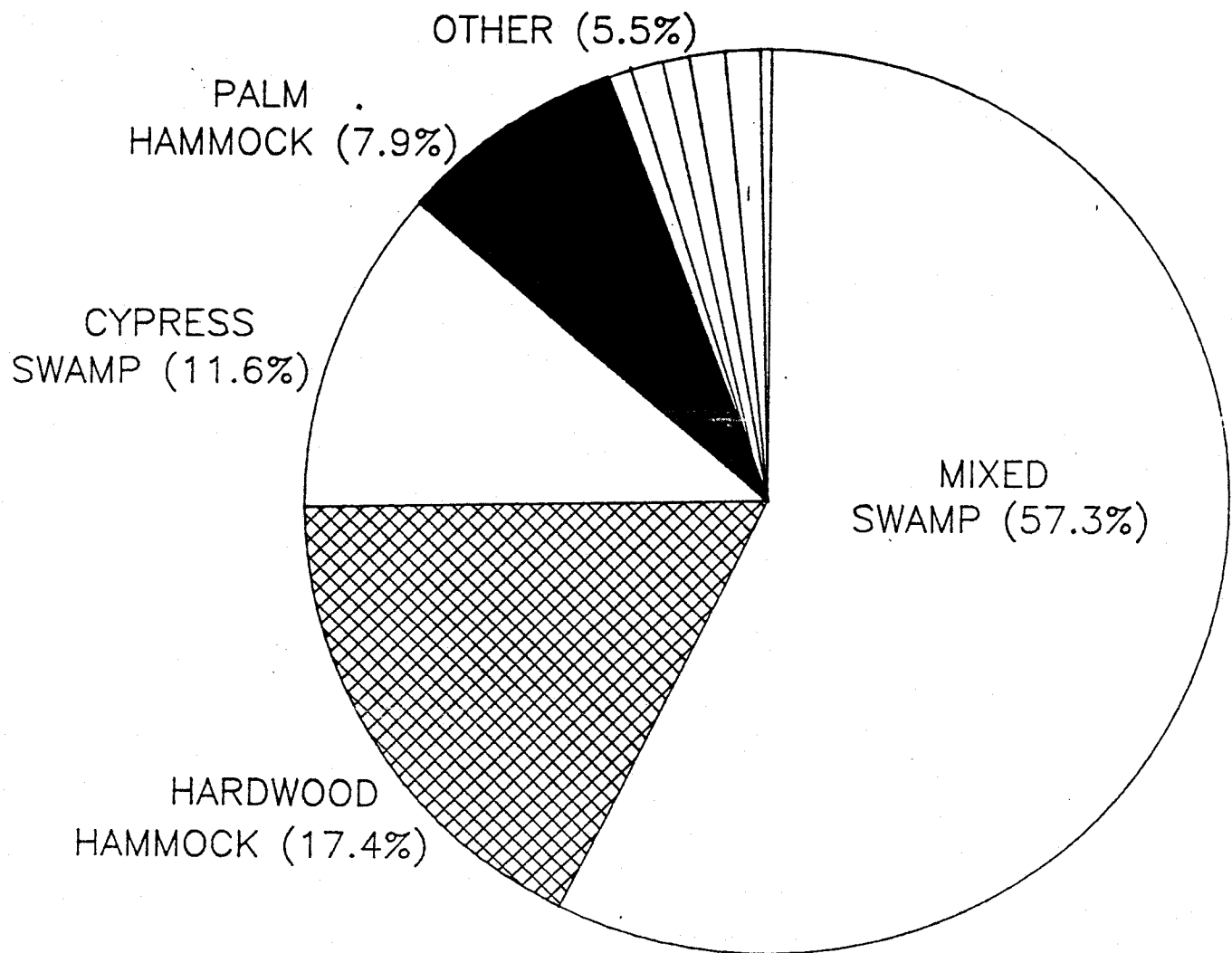


Figure 2

PANTHER #09
(N=432)

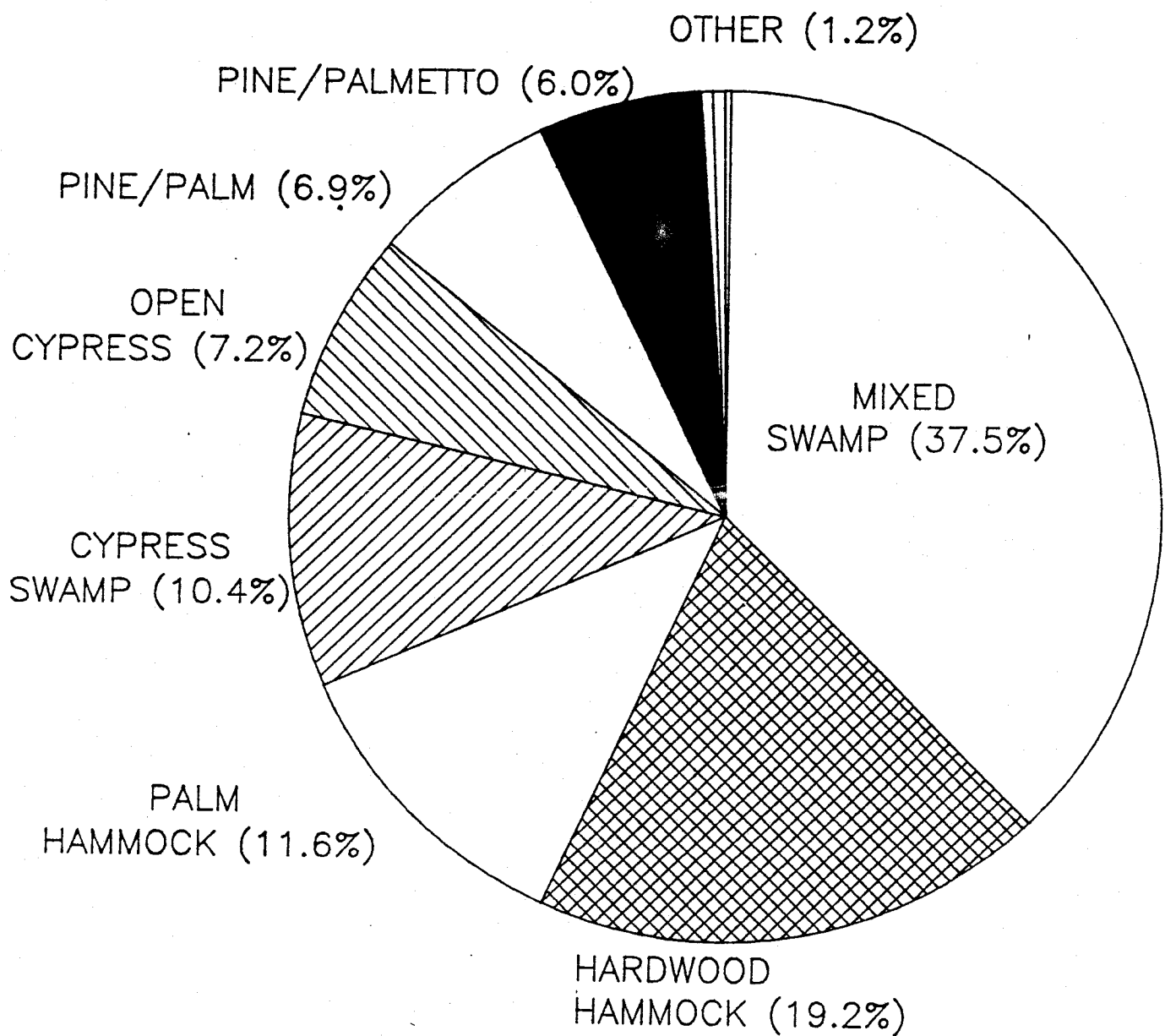


Figure 3

PANTHER #10
(N=195)

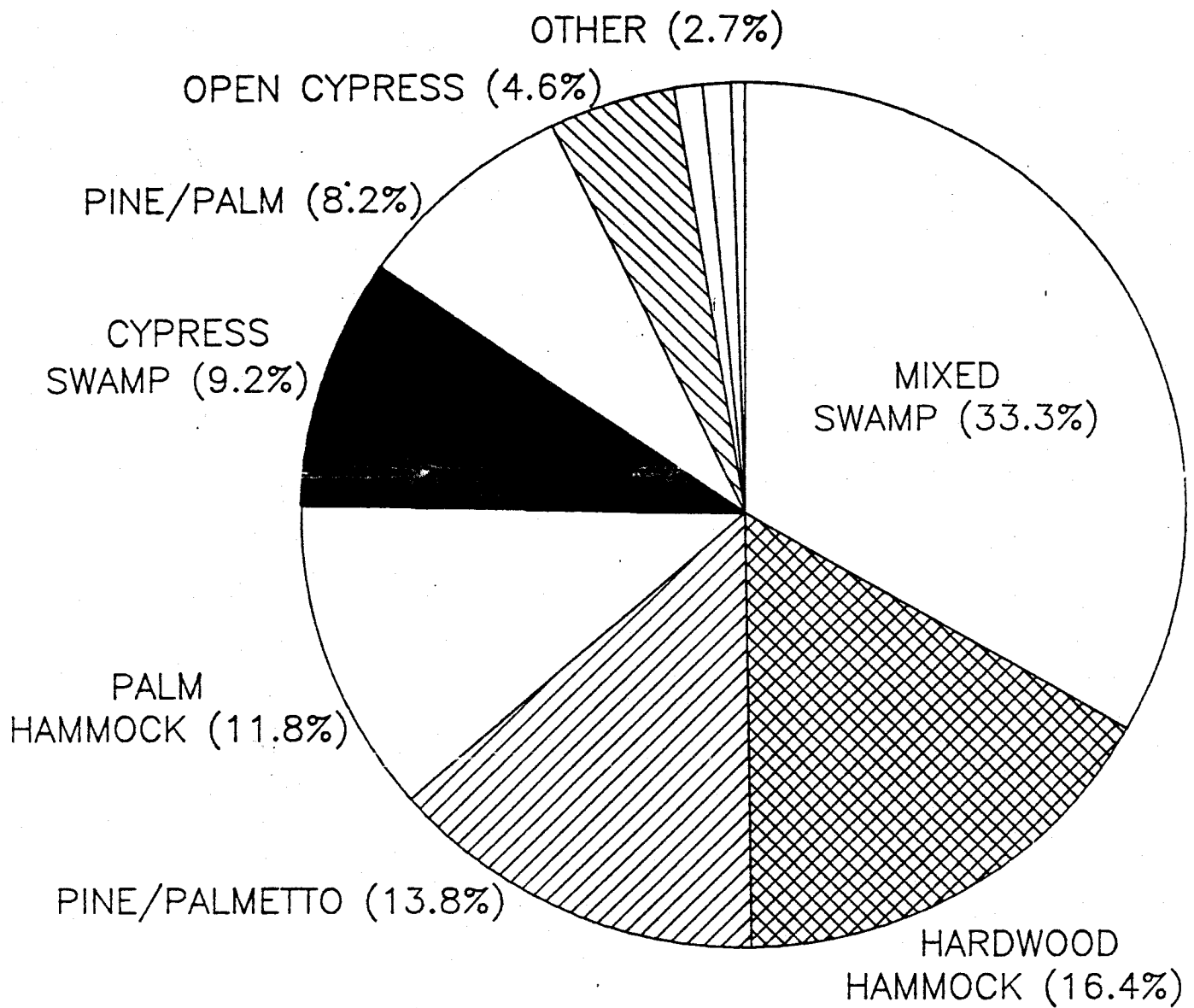


Figure 6

PANTHER #11
(N=433)

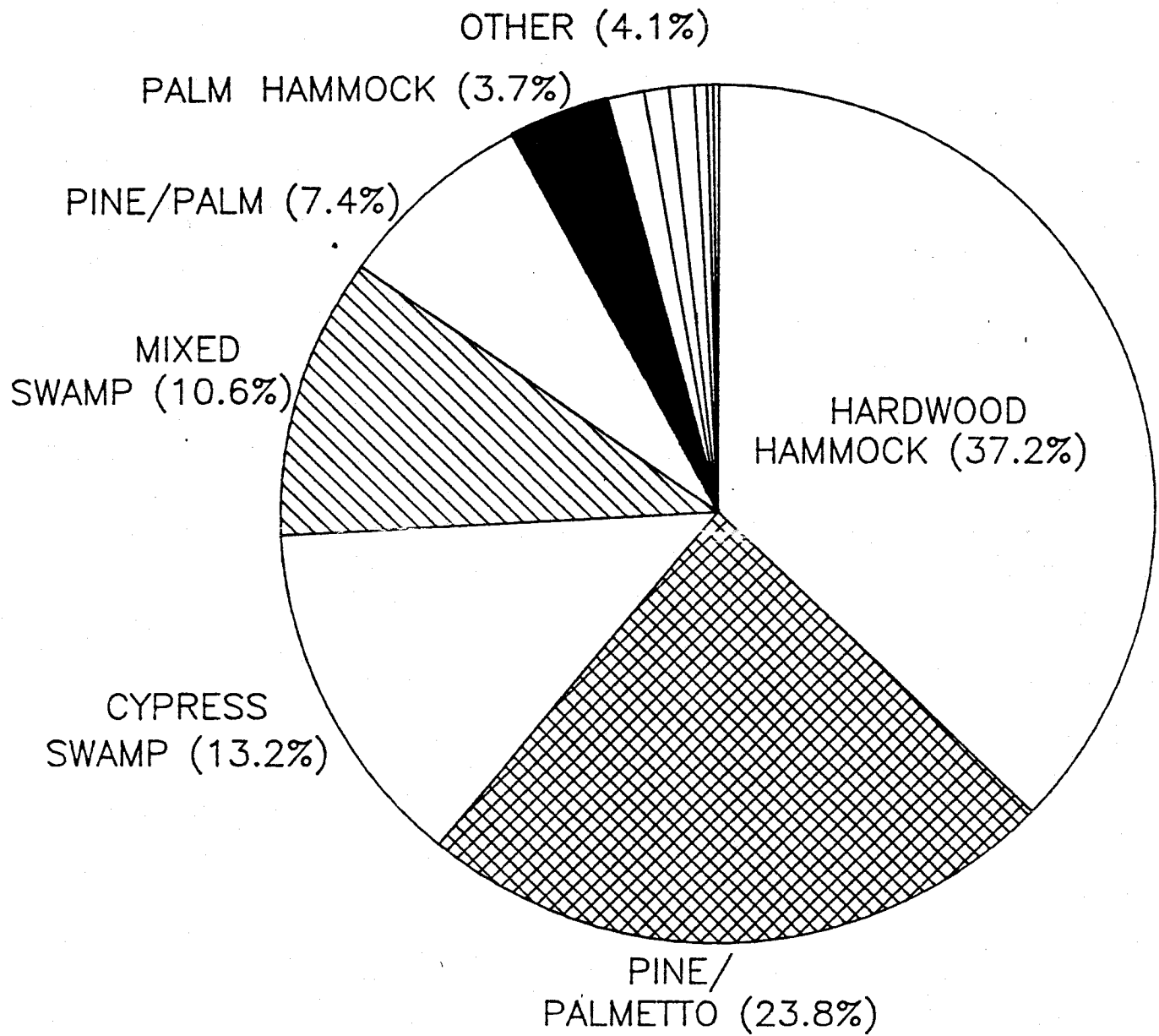


Figure 8

PANTHER #12
(N=421)

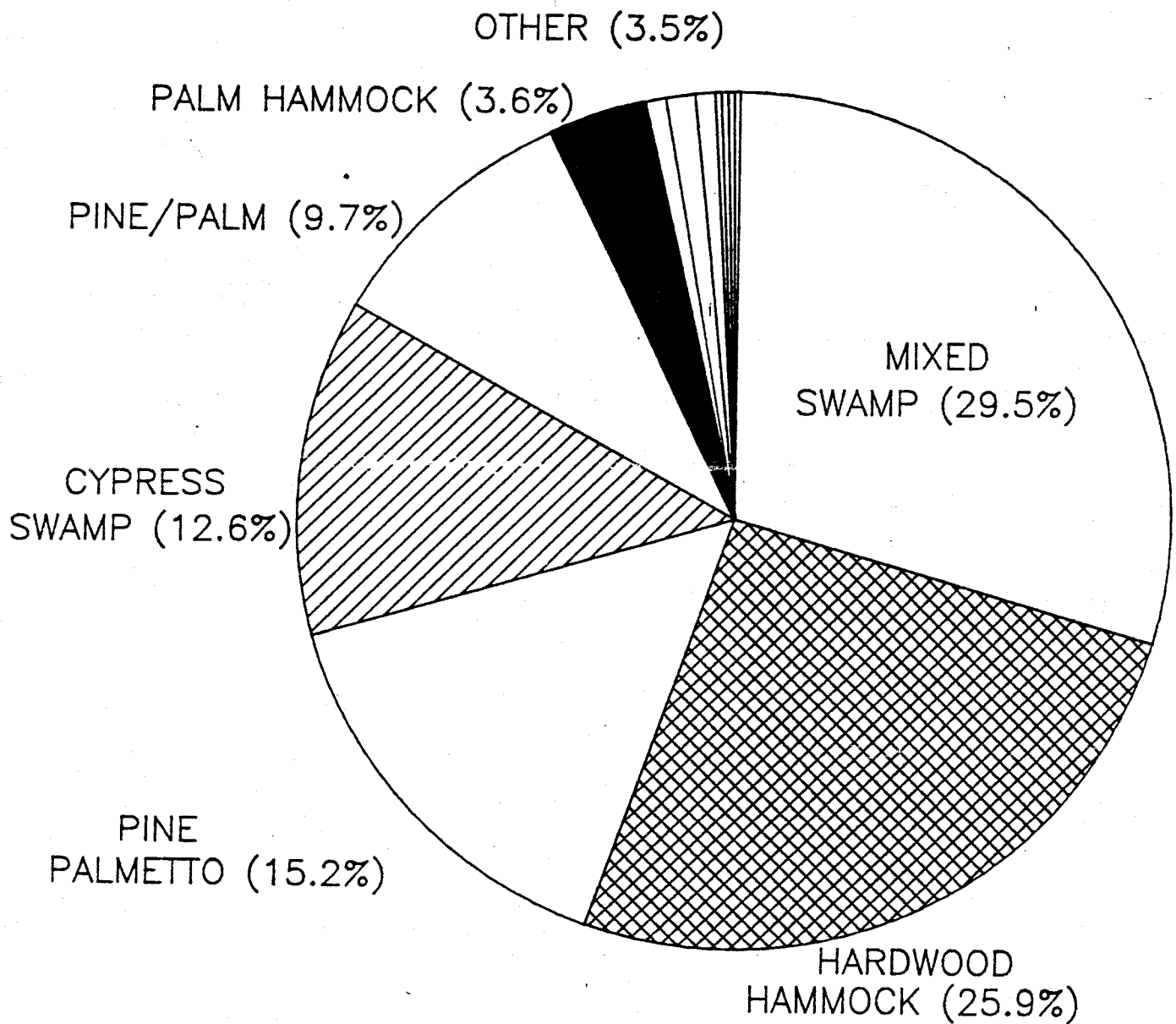


Figure 9

PANTHER #13

(N=308)

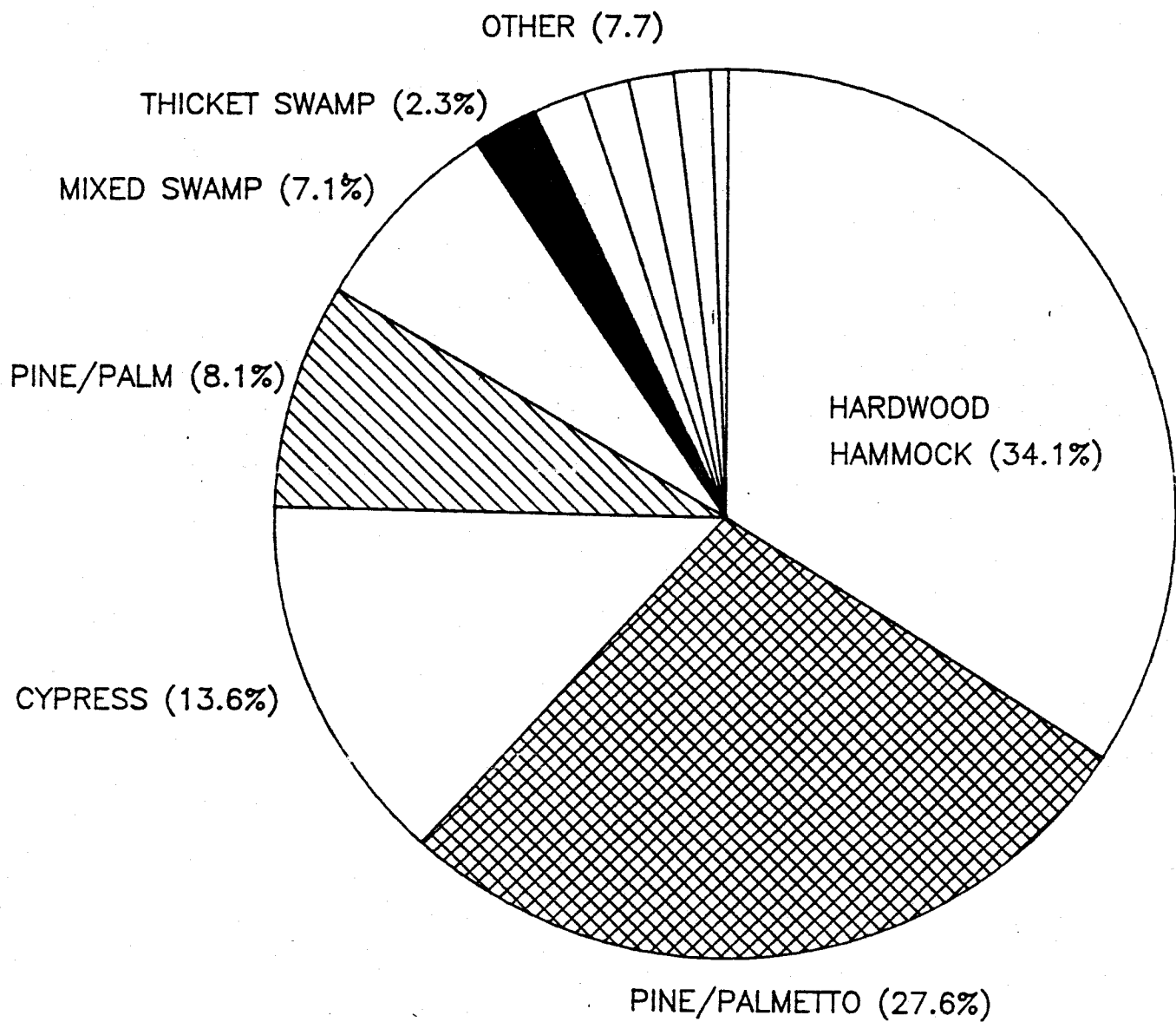


Figure 11

PANTHER #17
(N=237)

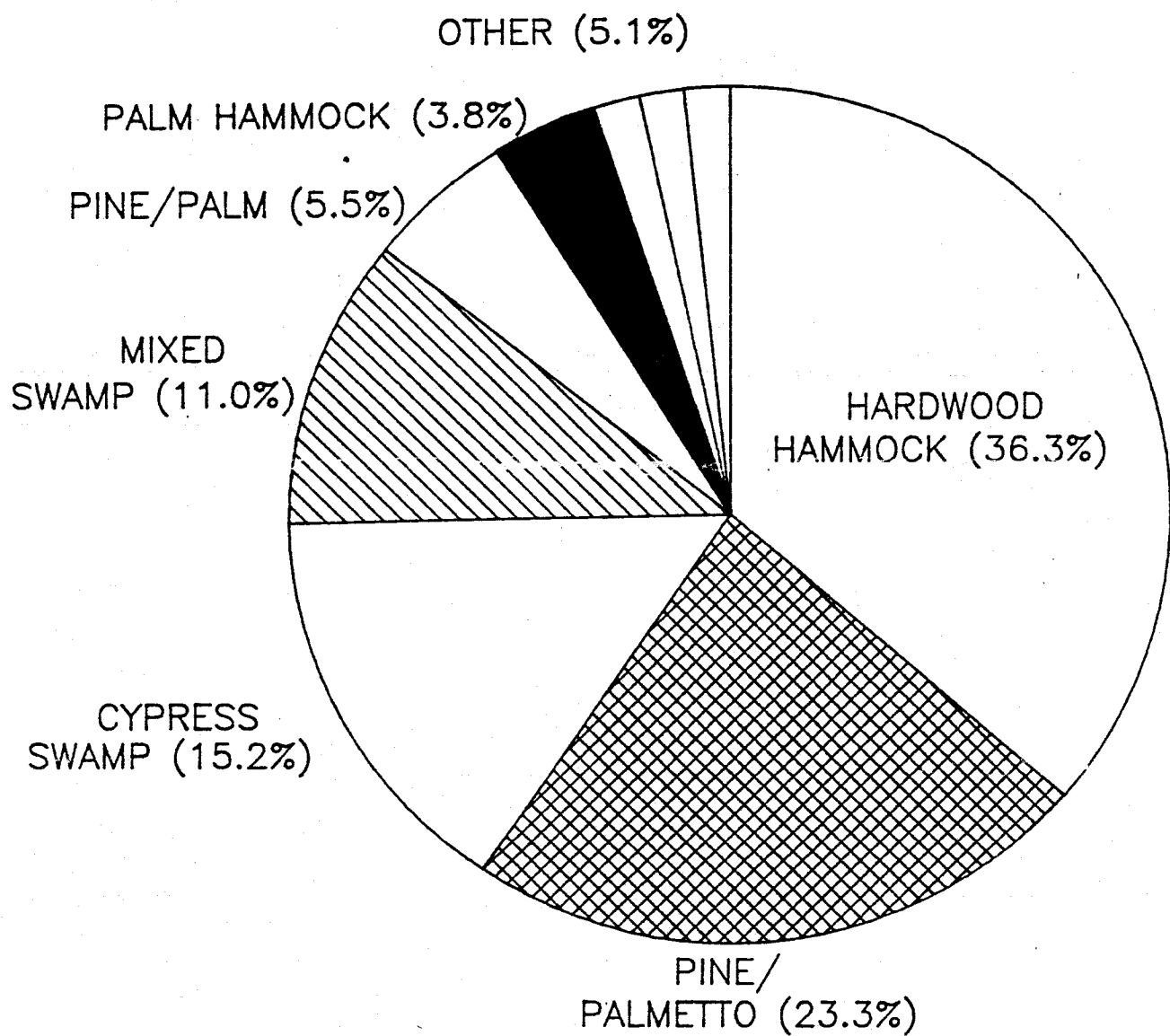


Figure 13

PANTHER #18
(N=233)

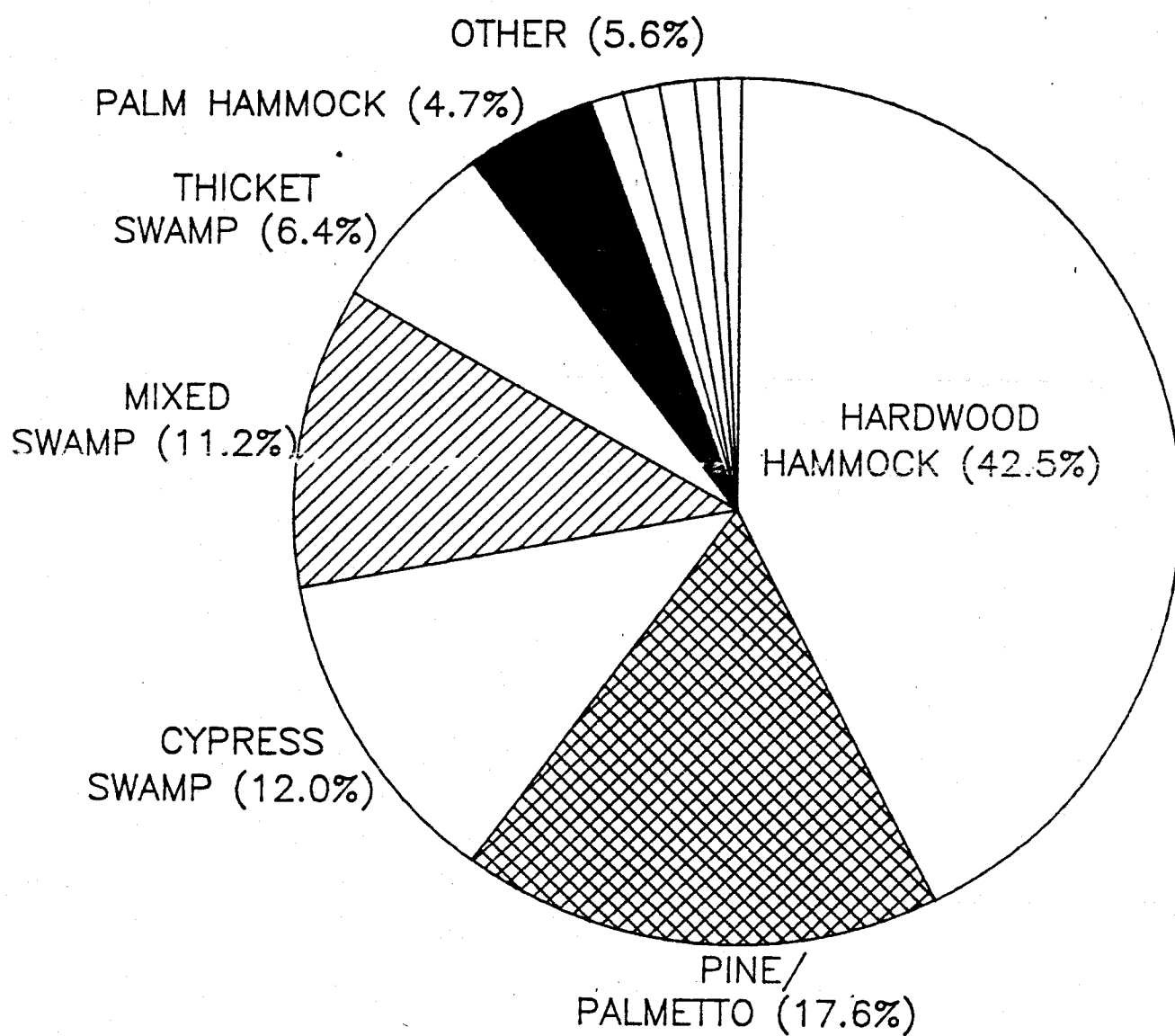


Figure 15

PANTHER #19 (N=230)

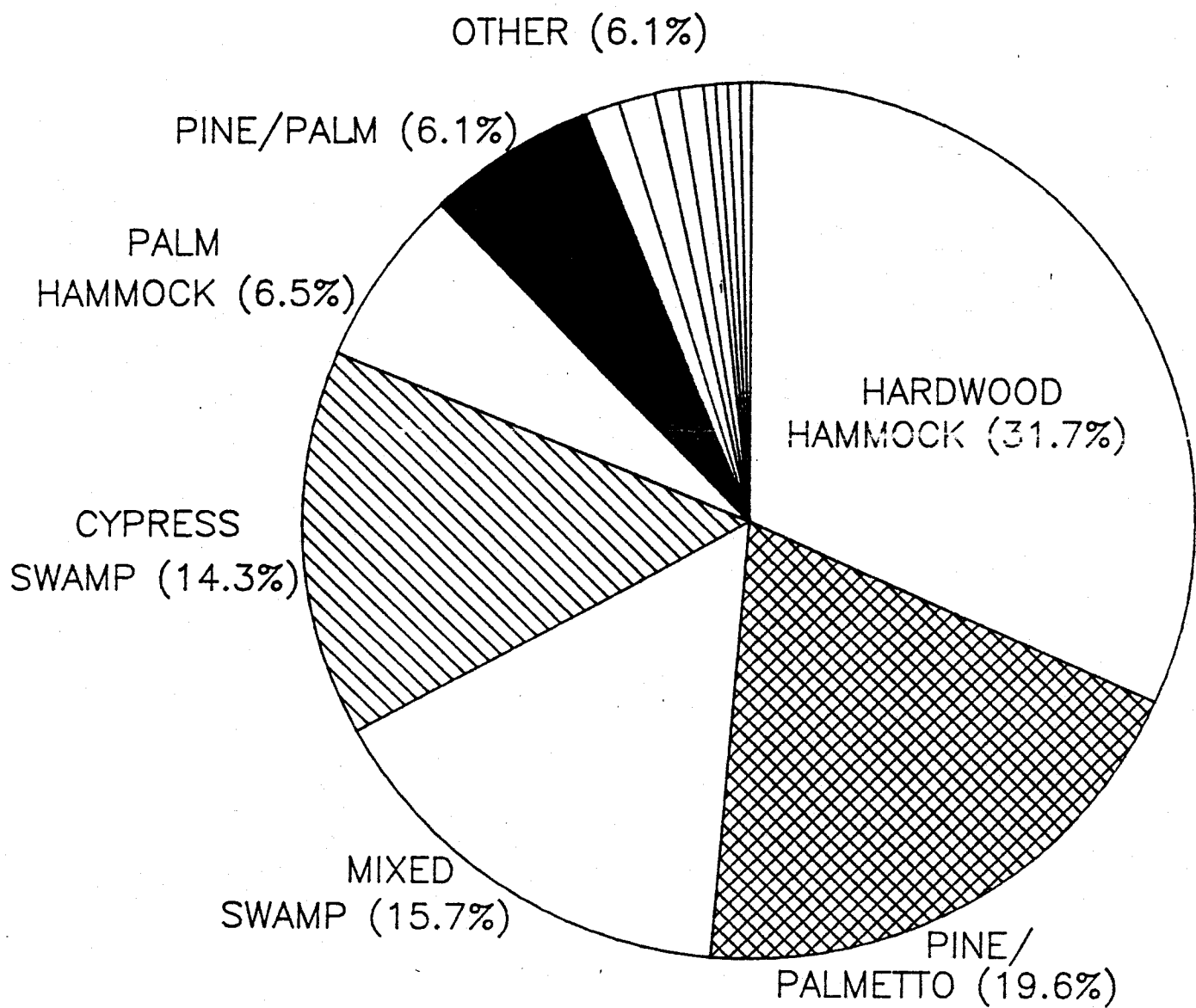


Figure 17

PANTHER #20

N=188

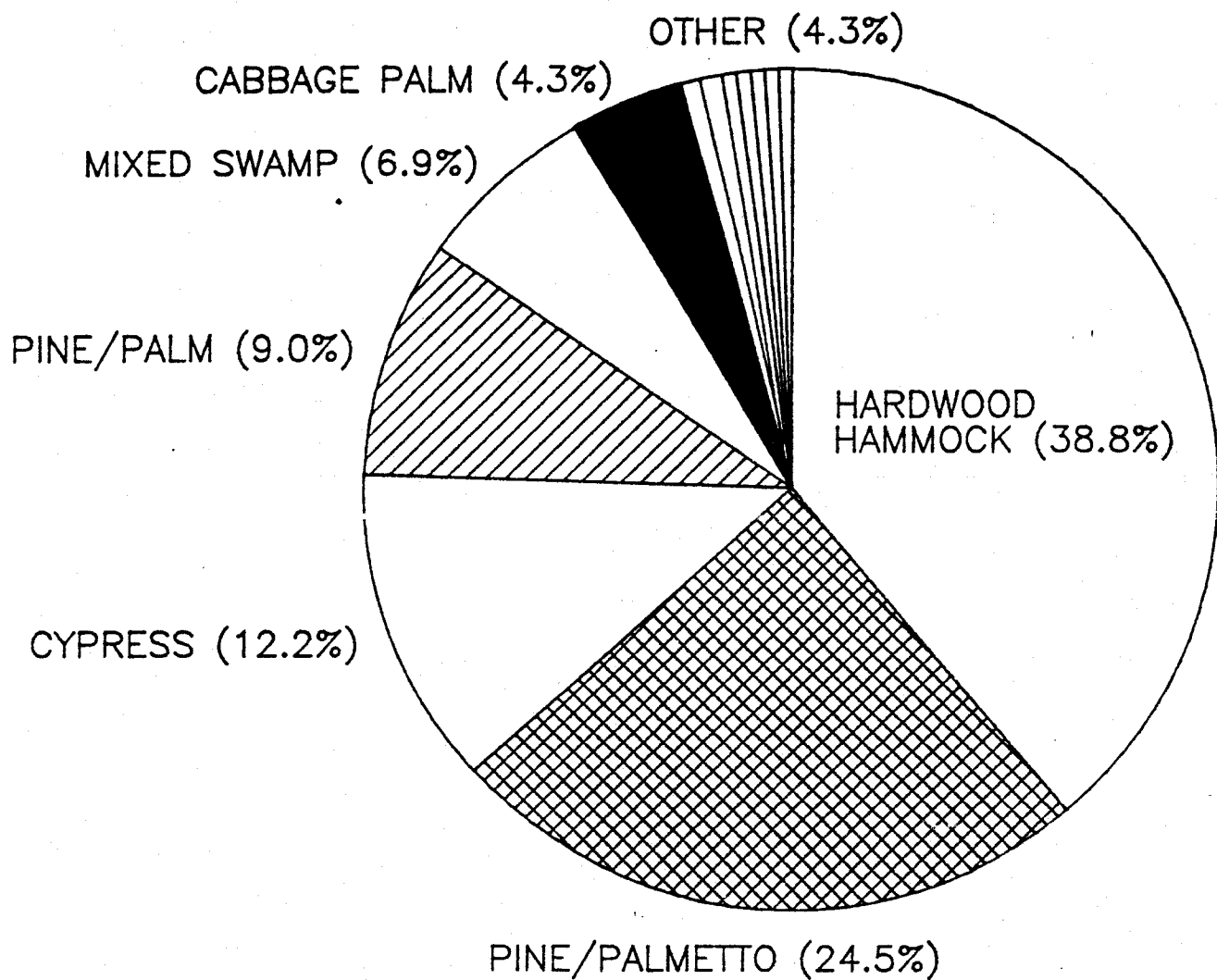


Figure 19

PANTHER #24 (N=52)

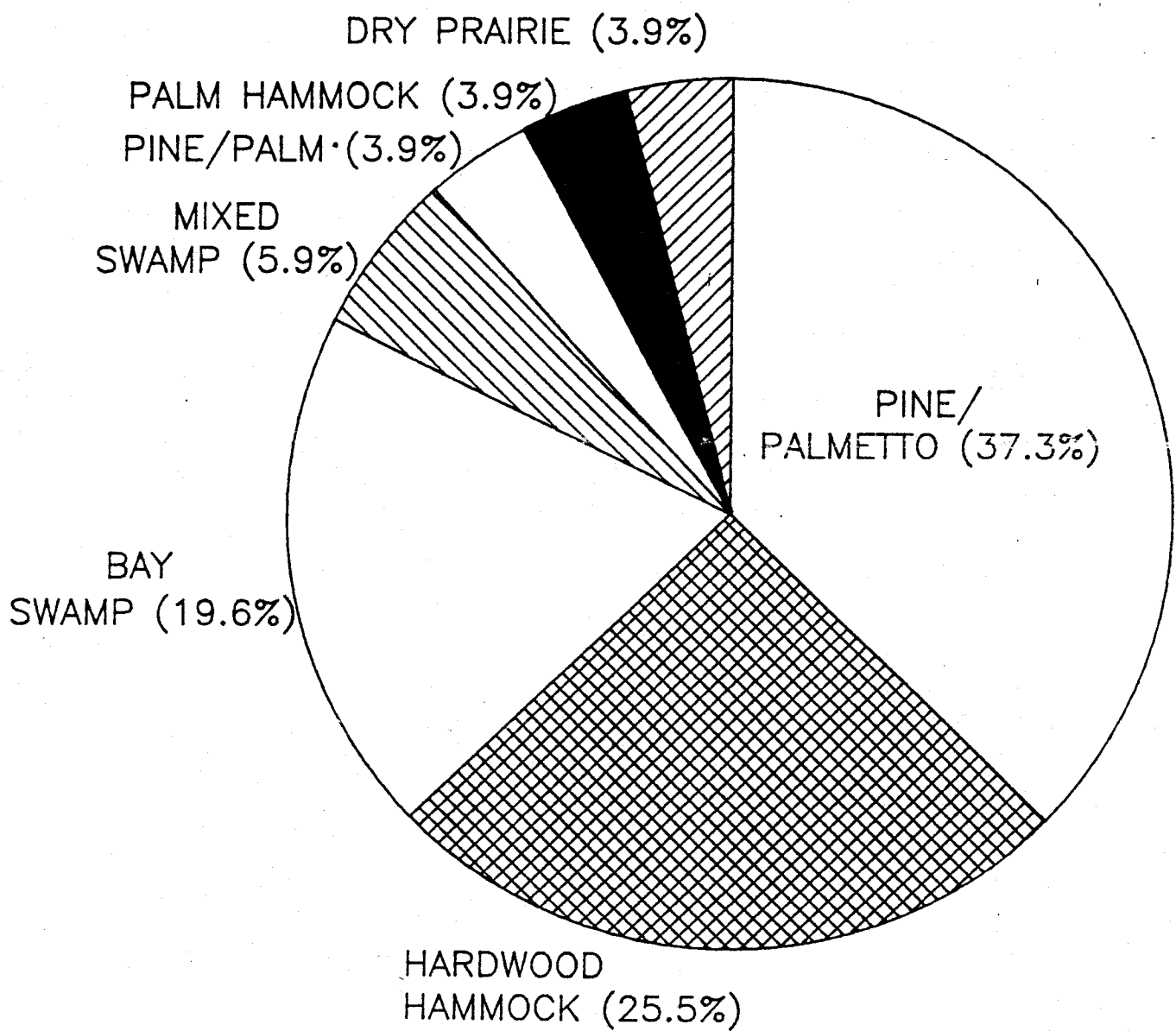


Figure 21

PANTHER # 25
(N=58)

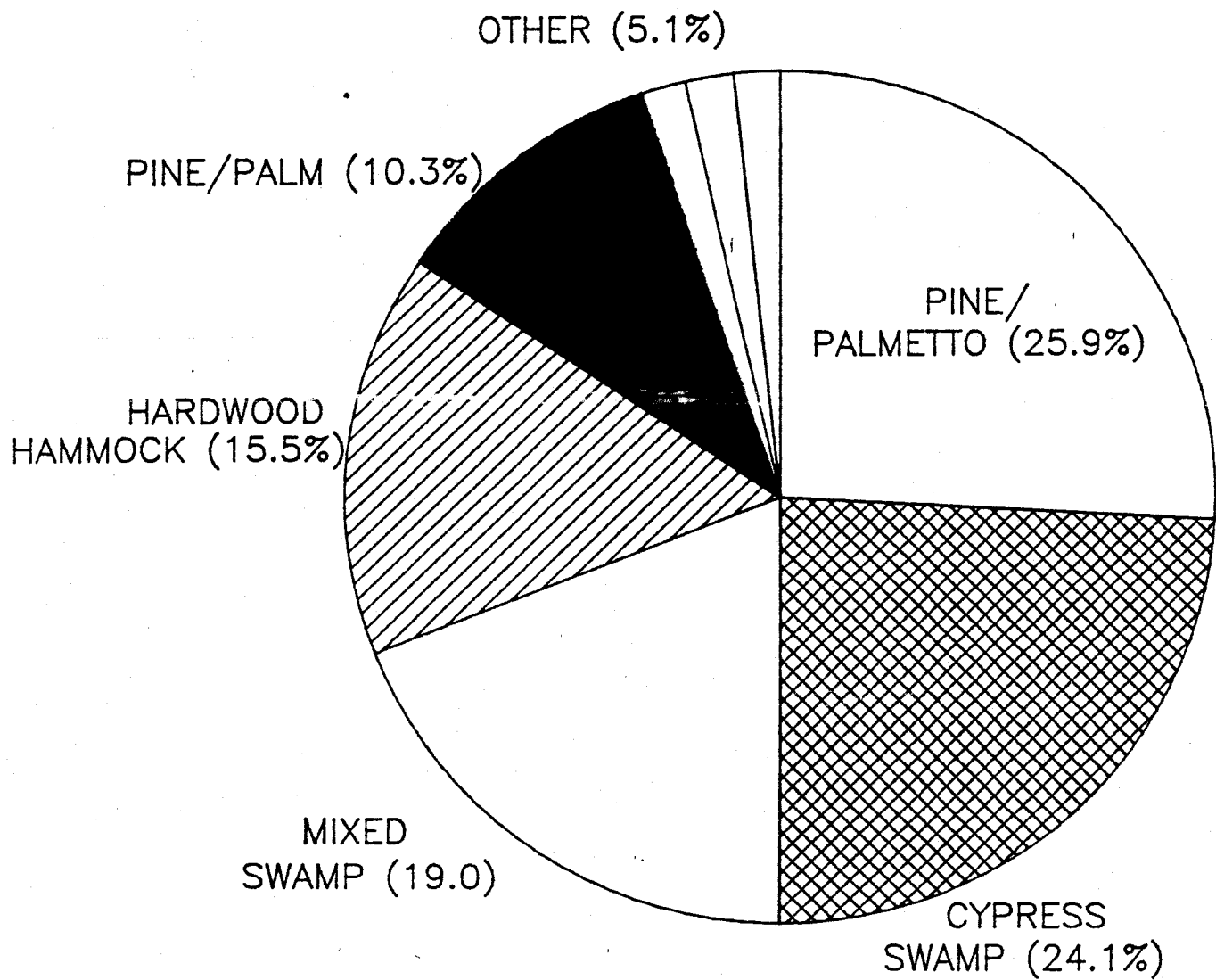


Figure 24

PANTHER # 26
(N=51)

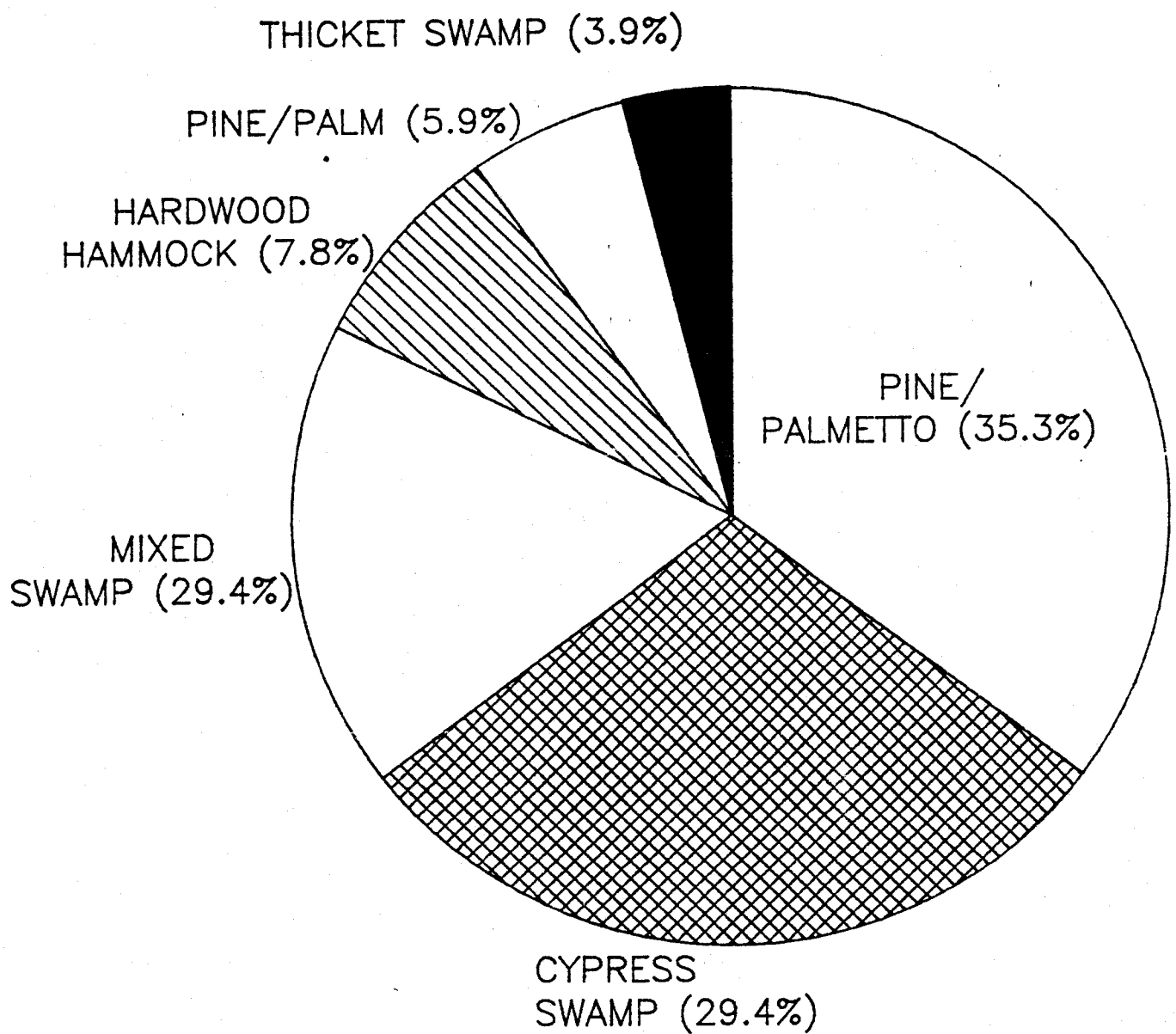


Figure 26

PANTHER HABITAT USE

(N=3,079 LOCATIONS)

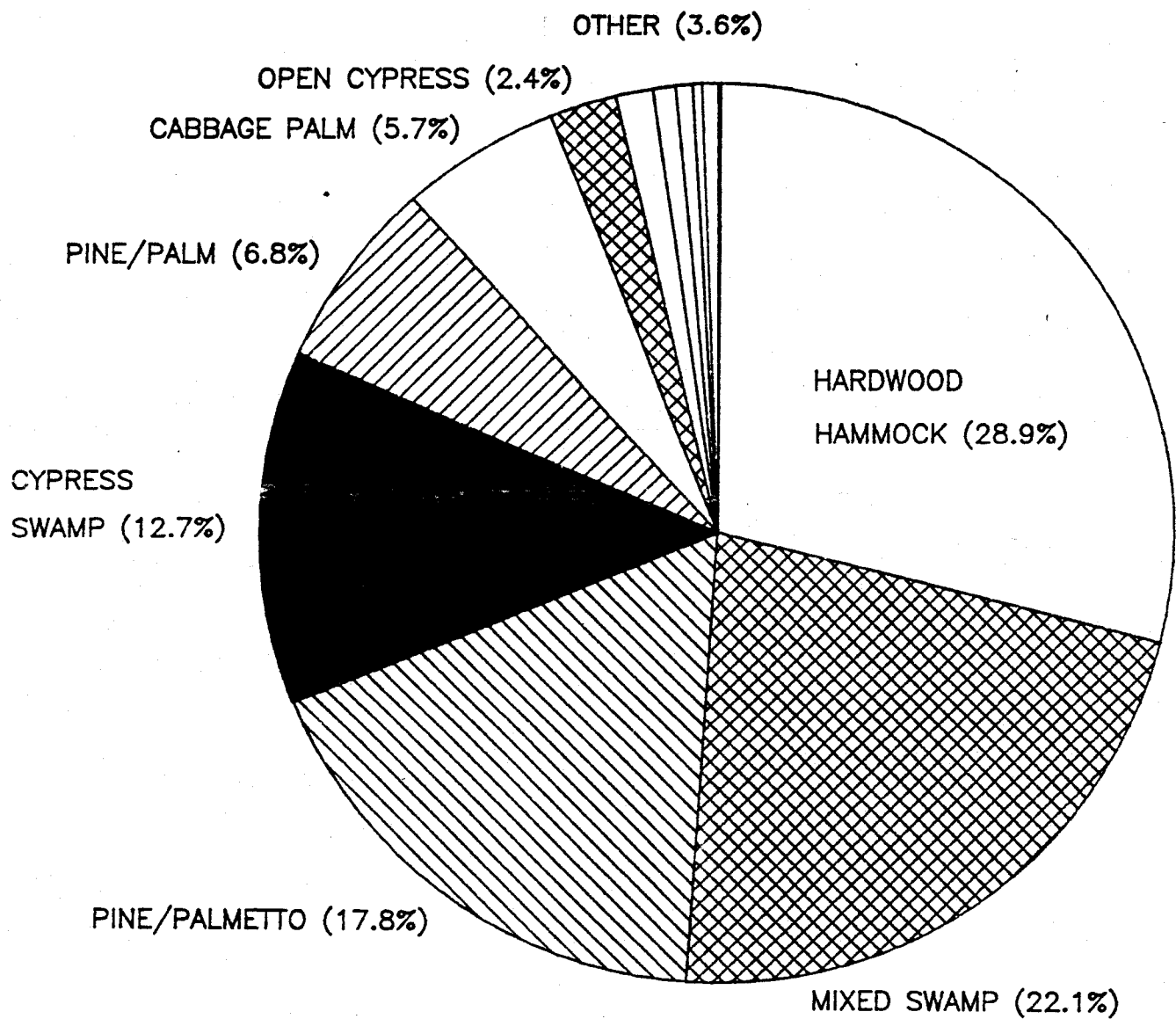


Figure 27

HABITAT USE SOUTH OF UTM 2897

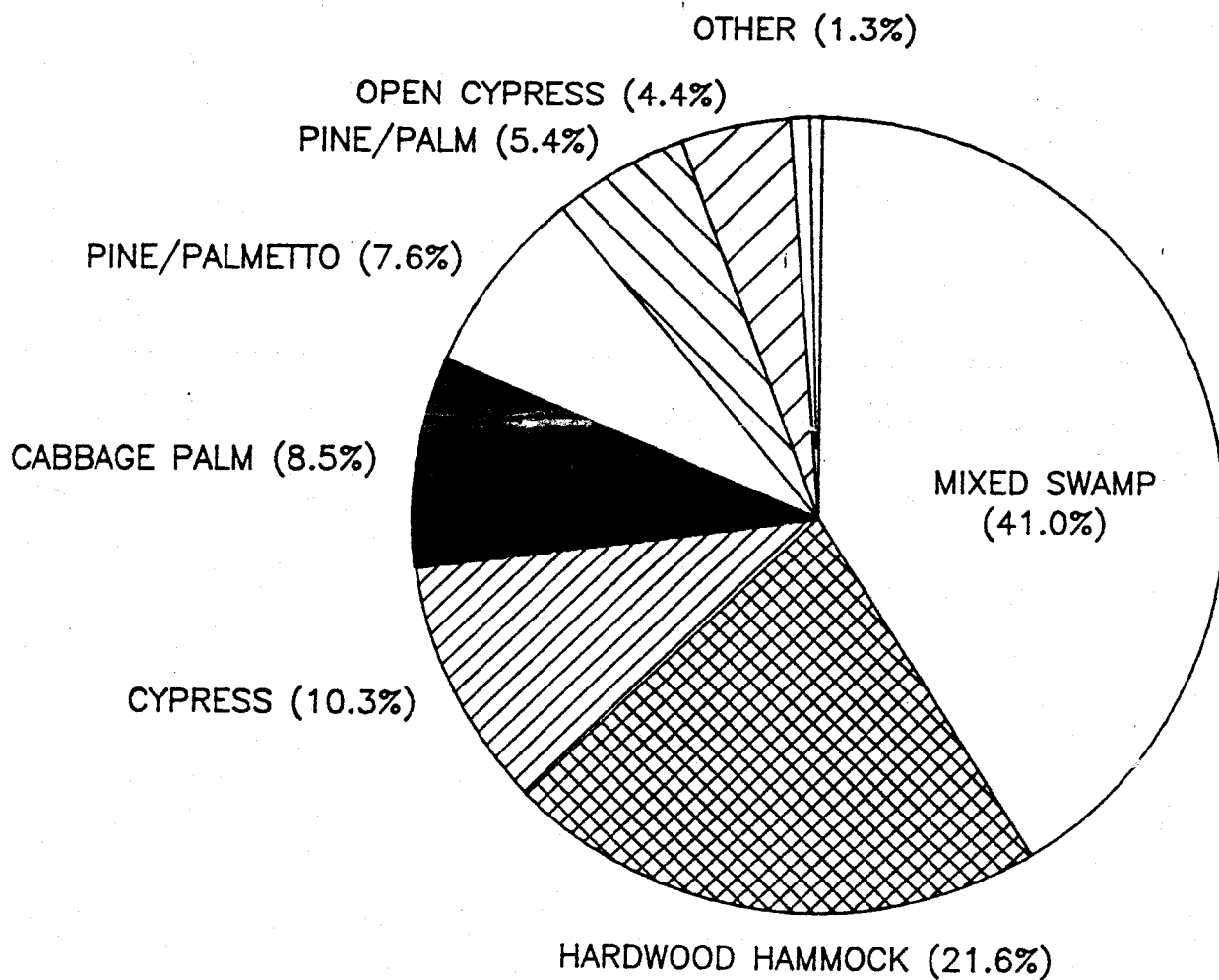


Figure 28

HABITAT USE NORTH OF UTM 2897

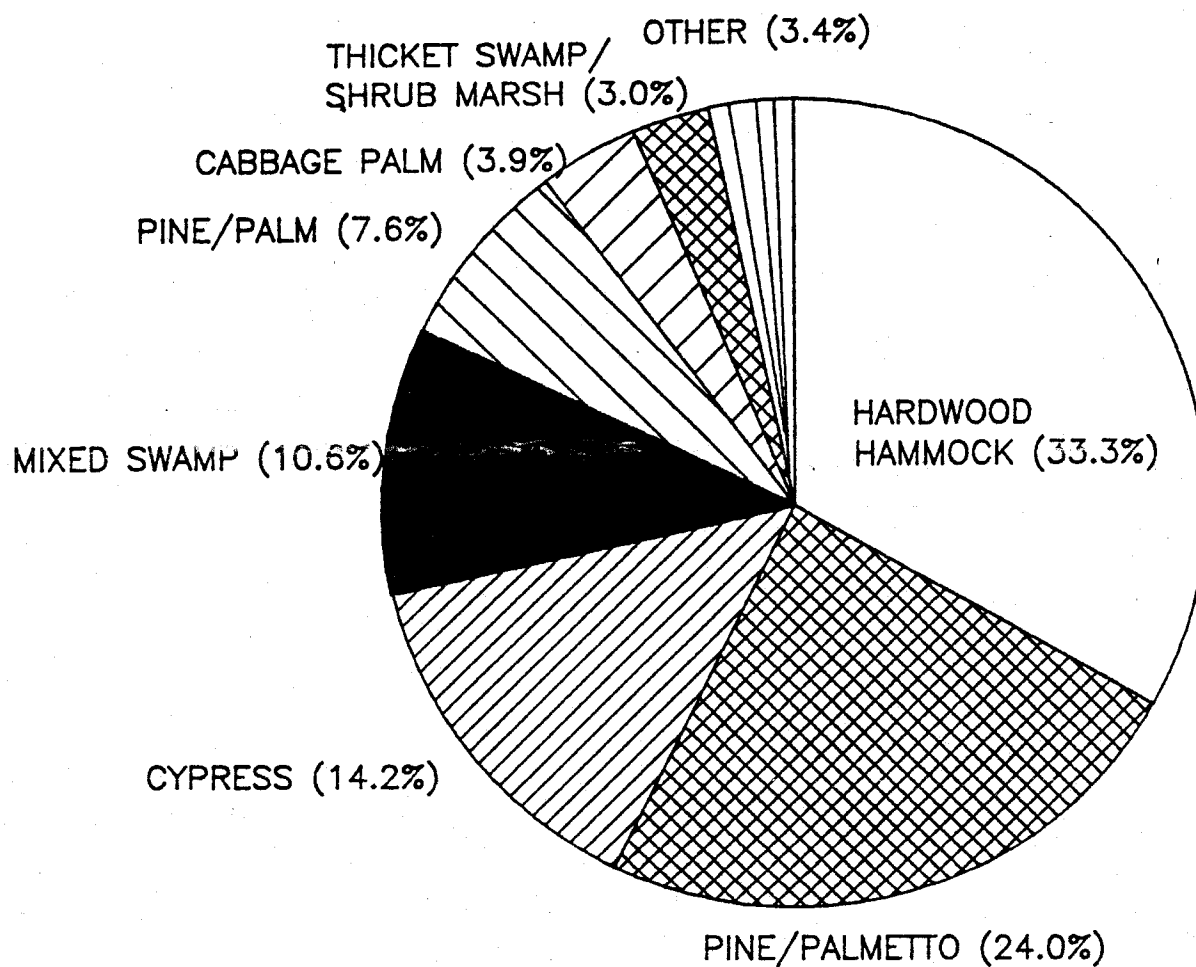


Figure 29

APPENDIX A. Habitat types of the Bear Island Unit, Big Cypress National Preserve, Florida.

I. Pine flatwoods or low pinelands (PP) - Slash pine (Pinus elliottii var. densa) growing as open forests on moderately well drained to poorly drained soils; usually associated with saw-palmetto (Serenoa repens) or wet prairies and contain many ponds and sloughs with marshes.

A. Pine and cabbage palm woods (PC) - Usually small areas where cabbage palm (Sabal palmetto) is scattered among the pines.

II. Hammock forests (HH) - Hardwood and palm forests usually dominated by broad-leaved evergreen trees and limited to small areas, growing on high upland to seasonally flooded soils and containing a great variety of south temperate to tropical species. Often a climax forest.

A. Cabbage palm hammocks (CA) - Dominated by cabbage palm and mostly low hammocks near swamps, in prairies, and pine flatwoods forests.

III. Inland swamps, cypress forests - Many types of forests on seasonally wet to continually flooded soils.

A. Mixed swamps (MS) - Forest of hardwoods with cypress (Taxodium distichum) present but not dominant. May include many low hammocks.

B. Cypress swamps (CS) - Usually seasonally flooded forests composed mainly of tall cypress trees with few to no hardwood trees. Includes cypress domes.

C. Open cypress forests (OC) - Low to medium tall, open forests of cypress often associated with pine forests and wet prairies, covering large areas in the Big Cypress region. Includes strands and scrub cypress.

D. Thicket swamps (TS) - Elderberry (Sambucus canadensis), willow (Salix caroliniana), and pop ash (Fraxinus caroliniana) thickets of low trees and tall herbs often occurring on areas that have been cleared then abandoned.

APPENDIX A cont.

IV. Everglades and fresh water marshes (MA) - Treeless vegetation dominated by sedges, rushes, grasses, reeds, and other herbaceous plants, growing on soils that are seasonally wet or covered by water most of the year.

A. Saw grass marshes (SG) - Usually muck and peat soil areas dominated by saw grass (Cladium jamaicensis), covering the greater part of the Everglades and occurring in many pond and sloughs outside of the Everglades, particularly in some parts of the flatwoods region.

B. Flag marshes (FM) - Mixed marshes dominated by Sagittaria or Pontederia; common in shallow ponds and sloughs.

C. Mixed herb and shrub marshes (SM) - Marshes of many types with Myrica, Cephalanthus (buttonbush), and Baccharis and other shrubs common. Occurring as transitional zones between marshes and bayheads, or between marshes and other swamps.

V. Wet prairies (WP) - Low dominantly grassy vegetation of seasonally wet soils. Usually distinguished from marshes by having less water and shorter herbage. Often marginal between marsh and forest areas in the flatlands regions.

VI. Dry prairies (DP) - Usually seldom flooded dry sand areas with grasses, saw palmetto, and other low shrubs. These treeless areas are often similar to the pine flatwoods but without pines.

A. Cabbage palm hammock prairies (CP) - Seldom flooded treeless grassy prairies in areas where cabbage palm hammocks are common.

VII. Agricultural/Disturbed (AD) - Includes areas formerly occupied by vegetation communities as described above, but now converted to agriculture, improved pasture, rock mines, urban areas, roadsides, etc. Scattered remnants of previous community may still exist.

Adapted from: Davis, J.H. 1943. The natural features of southern Florida. Florida Geol. Surv. Geol. Bull. 25. 311 pp.