MARBLE HILL NUCLEAR GENERATING STATION

UNITS 1 AND 2

REMOTE SENSING AND GROUND TRUTH PROGRAM

FINAL REPORT

Prepared for

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FOREWORD

Texas Instruments Incorporated (TI) is pleased to submit this final report summarizing the methodology applied and results obtained during the third year of the remote sensing and ground truth program conducted within the prescribed area on and near the proposed Marble Hill Nuclear Generating Station, Units 1 and 2, near Paynesville, Jefferson County, Indiana.

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SECTION I

INTRODUCTION

A. PROGRAM OBJECTIVES

The specific objectives of the Marble Hill remote sensing and ground truth program are to ascertain and document the existing vegetation cover types, vegetation stress and soil chemistry in the vicinity of the Marble Hill Nuclear Generating Station and to provide cumulative reference information necessary to monitor the potential effects of cooling tower operation and coincident salt deposition on local vegetation and soil. In addition, the annual aerial color infrared photography and the updated vegetation cover type maps will assist Public Service Company of Indiana, Inc. (PSI) in their evaluation of construction impacts on the local environment.

B. PROGRAM SCHEDULE AND STATUS

The scheduled and actual completion dates for each task are listed in Table I-1.

Table I-1

Schedule for the Marble Hill Remote Sensing and Ground Truth Program by Task and Date

Task	Scheduled Completion Date	Actual Completion Date
Aerial CIR Photography	15-30 May 1979	26 June 1979
Photointerpretation	15 June 1979	11 July 1979
Vegetation, Data Collection	15 September 1978 29 October 1978 31 April 1979 31 June 1979	14 September 1978 19 October 1978 19 April 1979 6 June 1979
Soil, Data Collection	15 September 1978 29 October 1978 31 March 1979 31 May 1979	14 September 1978 19 October 1978 19 March 1979 6 June 1979
Reports		
Draft	31 July 1979	31 July 1979
Final	31 August 1979	9 September 1979

Methods of data collection, reduction and analysis are documented in Section II - Methodology; summarized data are presented in Section III - Results and Discussion.

SECTION II

METHODOLOGY

The objectives of this study have been addressed through application of appropriate methods of data acquisition, handling, analysis, and interpretation. The five major tasks proposed to fulfill the program objectives included:

- Aerial color infrared photography
- Vegetation cover type mapping
- Vegetation stress delineation
- Vegetation sampling and analysis
- Soil chemical sampling and analysis

Methods applied toward completion of each task are discussed in the text that follows.

A. AERIAL COLOR INFRARED PHOTOGRAPHY

Aerial color infrared (CIR) photographs were obtained in June 1979. Five flight lines were required to obtain the June 1979 coverage of the designated area shown in Figure II-1 and maintain a 30-percent side lap. Color infrared photographs were obtained with a 6-inch focal length camera from an altitude of 5000 feet to assure a working scale of 1:10,000 (1 inch = 833 feet). The forward overlap attained was 60 percent and provided the specified stereoscopic viewing conditions.

Film was processed to positive transparencies; these were encased in plastic sleeves for protection during the mapping and ground truth phases of the study.

B. MAPPING VEGETATION COVER TYPES

Vegetation cover type boundaries that were presented in "Vegetation Cover Types in the Vicinity of the Marble Hill Nuclear Generating Station" (Texas Instruments 1978) were refined and redelineated where necessary. This

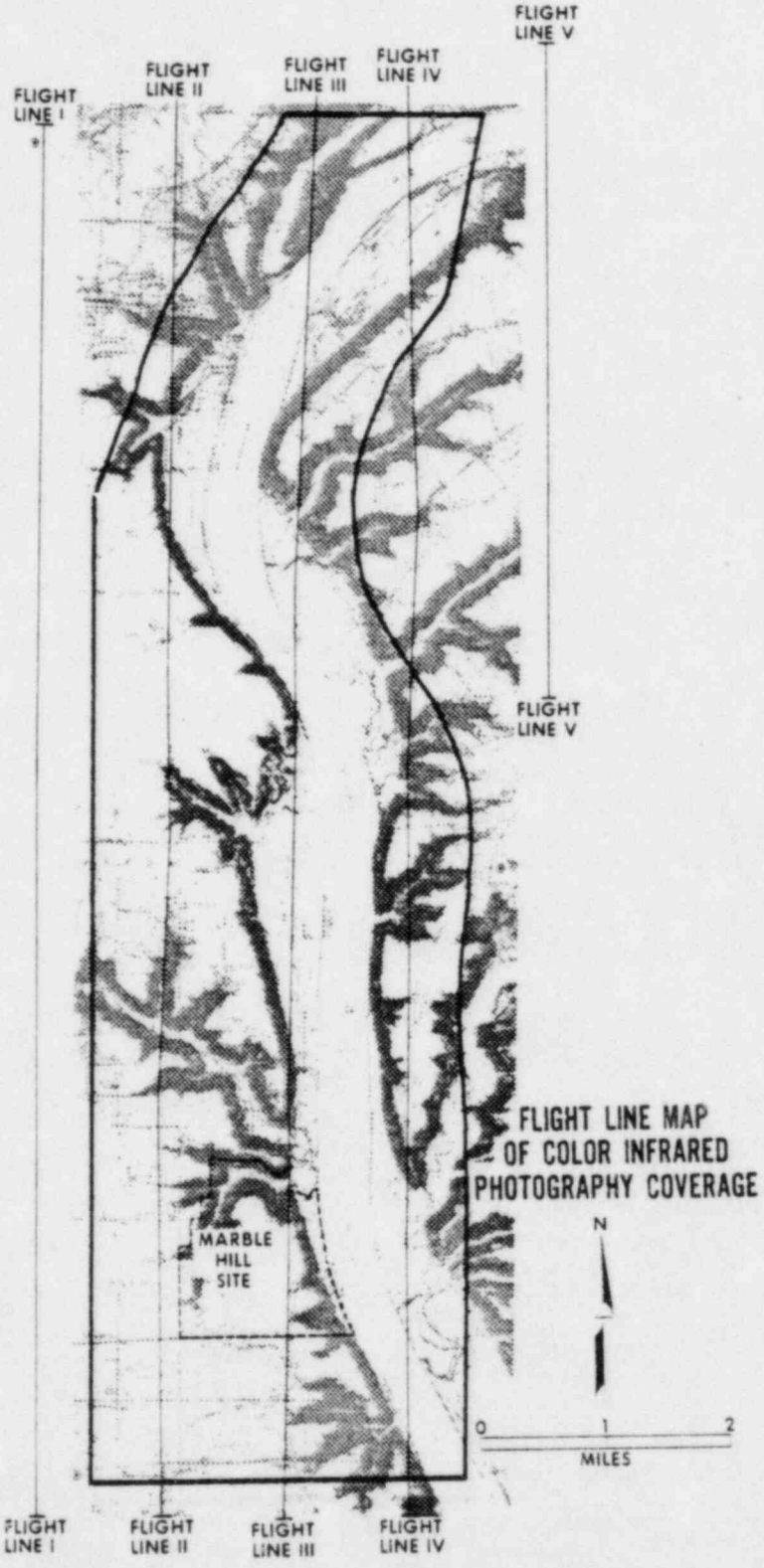

Figure II-1. Flight Line Map of Color Infrared Photography Coverage, June 1979

was accomplished through photointerpretation of the June 1979 CIR photographs, cross-referencing these with the August 1976, May 1977, and May 1978 CIR photographs, and through ground truthing during July 1979.

Cover type nomenclature corresponds with those presented in 1978 and follows the designation and types of the Society of American Foresters (1954) with some modification to allow adequate description of locally important vegetation units. The type name was determined upon the basis of predominant canopy species as indicated by composition of the dominant and codominant canopy species. Where no single species comprised 50 percent or more of a given stand, the stand was typed on the basis of numerical plurality of canopy species (e.g., maple-basswood).

The ground truth examinations were conducted for initial boundary verification and for refinement of vegetation cover type delineations.

Map revisions were incorporated, nomenclature applied, and the vegetation cover type map drafted at a scale of 1:24,000. Sixteen map units were employed to document all important existing features and cover types.

The acreage of each refined map unit was determined from the 1:24,000 scale map by dot sampling with a modified acreage grid (64 dots per square inch).

C. MAPPING VEGETATION STRESS

Areas of apparently stressed vegetation were separately delineated within each cover type. Vegetation under stress from disease, insects or weather was detected on the color infrared photography due to loss of infrared reflectance from affected foliage. The reddish photographic rendition of healthy vegetation grades to magenta, purple, green, and yellow as the loss of infrared progresses due to increased stress. Vegetation stress areas were delineated on the photographs and evaluated by an experienced photointerpreter and independently by an experienced field botanist.

Areas of apparent vegetation stress were noted on photo overlays and each was assigned a reference number. During ground truth reconnaissance, stress areas greater than or equal to 5 acres were field-checked for stress verification and documentation of the causal agent(s). Previously defined stress areas greater than or equal to 5 acres (TI 1978) were examined from CIR photographs and revisited during 1979 ground-truthing to monitor the status of each area.

Stressed areas of less than 5 acres were not field-checked, but locations were plotted on the photo overlays, assigned a reference number for monitoring purposes, and transferred to the vegetation cover type map.

D. VEGETATION SAMPLING AND ANALYSIS

Vegetation cover and condition were sampled by establishing duplicate permanent 100-square-meter quadrats in one characteristic representative unit of each of eight specific cover types delineated from the CIR aerial photographs. Sampling locations for each cover type are shown in Figure II-2. Direction from the cooling towers, proximity to the area of maximum salt deposition, and accessibility were considered in locating the permanent vegetation quadrats.

Duplicate circular nested plots were used to estimate vegetation cover by species in each representative unit. Figure II-3 shows the plot radii and the nesting arrangement of the four plot types used to sample the various vegetation strata. Vegetation stratum sampled in each plot, the size inclusion criteria, and the plot area are presented in Table II-1.

Nested circular plots were easy to establish and relocate since only a single stake was required to permanently mark a center point from which all radii were measured. Plot sizes and nesting arrangement were modified from those of Cox (1972) and Ohman (1973). The center of each subplot within each 100-square-meter plot also was permanently marked.

Figure II-2. General Locations of Permanent Vegetation and Soil Sampling Plots

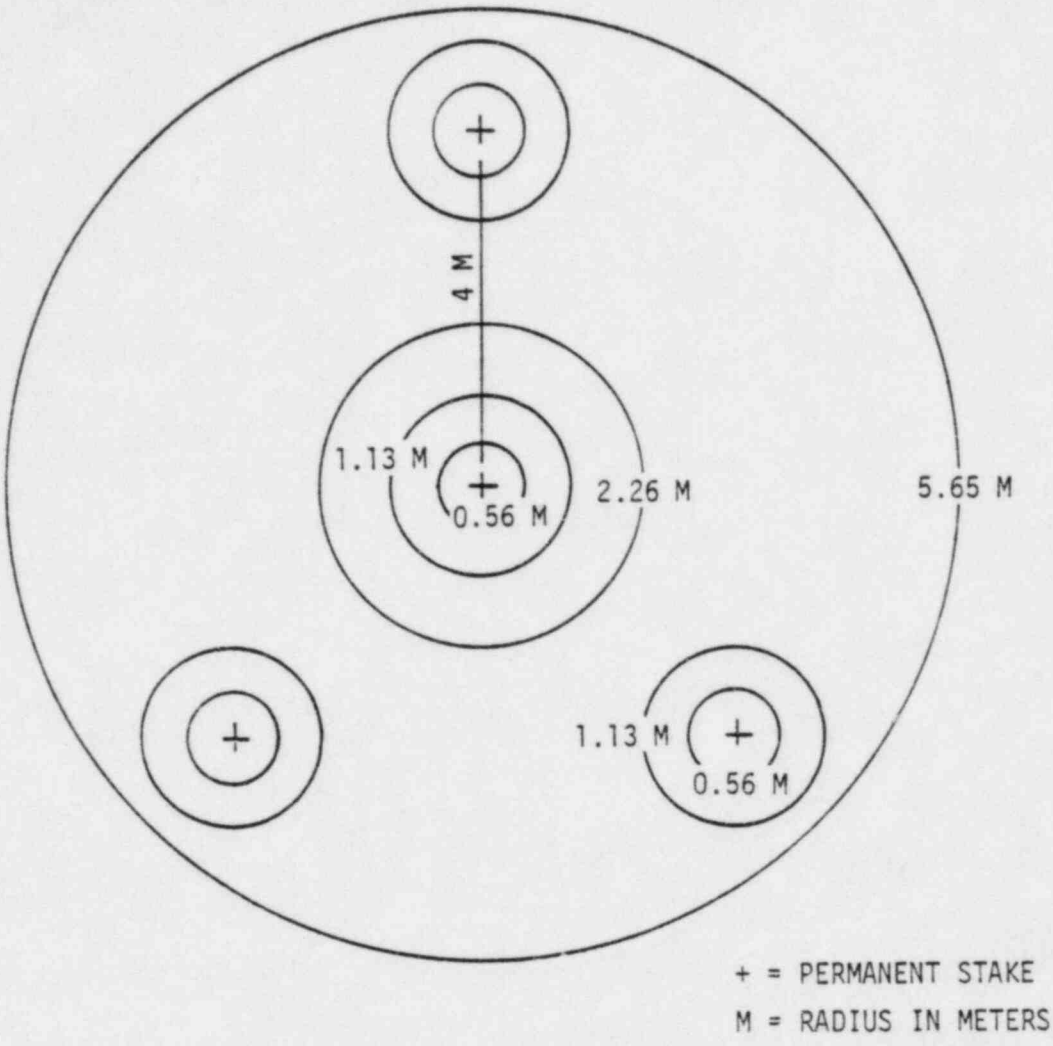

Figure II-3. Nested Circular Plots for Vegetation Sampling

Herbs, grasses, seedlings, shrubs, and vines (plot types 1 and 2) were sampled during September, October 1978 and April, June 1979 in vegetation cover types, 1, 2, 3, 4, 5, 6, 9, and 11. Data recorded within each of eight subplots per cover type included: taxa present, percent cover (percentage of plot area covered by a given taxon), mode condition (most common state of physical or evident physiological condition of a given taxon), and percentage ground cover (percentage of total plot area covered by vegetation and litter). Condition of orchard trees (cover type 10) was recorded during June 1979.

Table II-1

Vegetation Plot Types

Plot Type (Stratum)	Vegetation Included	Stem dbh* (m)	Stem Height (m)	Plot Radius (m)	Plot Area (m^2)
1	Herbs, grasses, low shrubs, and seedlings	<0.025	<1.0	0.56	1.0
2	Shrubs, vines, and seedlings	<0.025	≥1.0	1.13	4.0
3	Saplings	≥0.025 <0.089	≥1.0	2.26	16.0
4	Trees	≥0.089	≥1.0	5.65	100.0

*Diameter at breast height (1.35 meters above the ground surface)

Diameters of saplings and trees (plot types 3 and 4) were individually measured in each of two plots per cover type during September 1978 and April 1979 to determine both species composition and basal area (square meters/hectare). Data recorded for each individual included: taxa, dbh (diameter at breast height) to the nearest 0.1 inch, and condition code (Table II-2). Each individual was numbered with paint to facilitate recognition and identification of temporal change in apparent health or vigor (condition).

Table II-2

Codes Used to Record Apparent Vegetation Condition

Condition Code	Condition Category
1	Healthy
2	Diseased
3	Insect injury
4	Mechanical injury
5	Browsed
6	Dead
7	Dying
8	Dormant

During October 1978 and June 1979 each tree and sapling was inspected for condition; diameter was not remeasured in these months since it was unlikely that this parameter would have changed significantly since the September 1978 and April 1979 measurements, respectively.

Plot data were summarized within cover types and the following standard ecological analyses (Cox 1972) were performed for each taxon according to stratum:

$$\text{Cover (\%)} = \frac{\Sigma \text{ percentage areal cover from plots}}{\text{number of plots}}$$

$$\text{Relative cover} = \frac{\text{cover for a species}}{\text{cover for all species}} \times 100$$

$$\text{Basal area } (m^2/ha) = \frac{\sum_{i}^{n} [(0.5 \text{ dbh in in.})^2 \pi] \, 0.00064516}{\text{area sampled (ha)}}$$

$$\text{Relative Basal area (\%)} = \frac{\text{basal area for a species}}{\text{basal area for all species}} \times 100$$

$$\text{Frequency} = \frac{\text{number of plots in which species occurred}}{\text{number of plots sampled}}$$

$$\text{Relative frequency} = \frac{\text{frequency for a species}}{\text{frequency of all species}} \times 100$$

E. SOIL SAMPLING AND ANALYSIS

Duplicate soil samples (0 to 15 centimeter depth) were collected from each permanent vegetation quadrat during September, October 1978 and April, June 1979. One set of duplicate soil samples was collected from each plot by excavation with a small hand trowel. These samples were placed in appropriately labeled whirlpacs, sealed, and returned to the Dallas laboratory for analysis of pH, conductivity, cation exchange capacity, and percent base saturation.

A second set of duplicate soil samples was collected from each plot for bulk density and soil moisture determinations; sample volume was measured using a sand displacement method (Rice 1968). Percentage moisture in the

oven dry soil was measured in association with bulk density determinations by drying samples at 105°C to constant weight. Results were expressed in appropriate units as determined from the following:

$$\text{Bulk density } (g/cm^3) = \frac{\text{oven dry weight (g) of soil sample}}{\text{sand displacement volume } (cm^3)}$$

$$\text{Moisture } (\%) = \frac{\text{soil wet weight (g) - soil dry weight (g)}}{\text{soil wet weight (g)}} \times 100$$

Soil pH in water was determined by mixing equal portions, by weight, of soil and water in an appropriate container. The mixture was stirred periodically and the solids allowed to settle out. The soil-water suspension was then allowed to settle for a short time, after which the pH was measured using an internal reference glass electrode (Black et al 1965). Results were recorded as soil pH measured in water.

Soil conductivity was determined by mixing each soil sample with distilled water and stirring to form a saturated extract. Either soil or water was added to the extract to form the desired soil-water paste. The paste was allowed to stand for one hour, checked for consistency, allowed to stand for four additional hours, and vacuum-filtered. Conductivity of the filtrate was measured with a cathode-ray conductivity bridge of the Wheatstone type at 85 Hz using a 1.0 constant cell (Black et al 1965). Results were recorded as micromhos/centimeter at 25°C.

Cation exchange capacity of soils was determined using the ammonium saturation method (Black et al 1965). Samples were air-dried and ground to pass through a 2-millimeter mesh sieve. The sized soil sample was mixed with 1N ammonium acetate, shaken thoroughly, and allowed to stand overnight. The wet sample was filtered, the residue washed with ammonium acetate, and the filtrate set aside for determination of total exchangeable bases (required to calculate percentage base saturation). The residue was then washed several times; once with 99 percent isopropyl alcohol, followed by several washings with 5 percent potassium chloride to a measured volume. Ammonium ion

concentration was determined from the washings using an auto analyzer. Results were recorded in milliequivalents per 100 grams of soil.

$$\text{Percent base saturation} = \frac{\text{Total exchangeable bases}}{\text{Cation exchange capacity}} \times 100$$

Total exchangeable bases was determined by forced evaporation of the filtrate (set aside during cation exchange processing) to dryness, ignition of the residue in a furnace, and treatment of the cooled residue with 0.1N hydrochloric acid. The acid-treated residue was heated, stirred, and titrated with 0.1N sodium hydroxide to a bromocresol green end-point (Black et al 1965). Results were recorded as milliequivalents per 100 grams of soil based on milliequivalents of standard acid consumed in the titration.

Replicate data from each of the soil chemical analyses were summarized as mean ($\bar{x}$) and standard error (SE) by cover type and date.

SECTION III

RESULTS AND DISCUSSION

The general botanical history of the Marble Hill study area was described, vegetation and land-use categories were mapped, and distinguishing characteristics of each mapped unit were discussed in the first annual report to PSI (TI 1977). During the 1977-1978 and 1978-1979 sampling periods, quantitative and qualitative data were obtained and analyzed. The data, presented in the following paragraphs, were used to characterize the present floristic and soil conditions. Certain comparisons were made with the 1977-1978 sampling period to better describe community dynamics and to delineate any differences or similarities between sampling periods.

Eight of the fifteen map units (Table III-1) were sampled using permanent vegetation plots (cover types 1, 2, 3, 4, 5, 6, 9, and 11). The estimated horizontal acreages of eight cover types comprising the survey area remained the same as the previous sampling period except that 3 of the 2,115 acres of the oak-maple (02) type were developed for industrial purposes as part of the construction of Marble Hill Units 1 and 2 complex (Figure III-1). Off-site industrial development was restricted to clearings associated with the Louisville Gas and Electric plant (approximately 173 acres) located southeast of the Marble Hill site across tne Ohio River.

The distribution of vegetation cover types over the entire survey area is dipicted in Figure III-2 (1:24,000 scale map located in the plastic pocket). Most of the Ohio River floodplain area remained in cropland (cover type 8), pasture (7) or forest (5); level uplands were generally cropped (8 and 10) with small areas of pasture (7) and forest (2, 4, and 11). Slopes and small drainage ways were forested (1, 2, 3, 6, and 9). During the 1978-1979 sampling period, 135 plant taxa were observed in the sampling plots (Appendix Table A-1). This is an increase of 5 taxa (3.7 percent) over the first year's sampling. The increase can be attributed to natural dispersal.

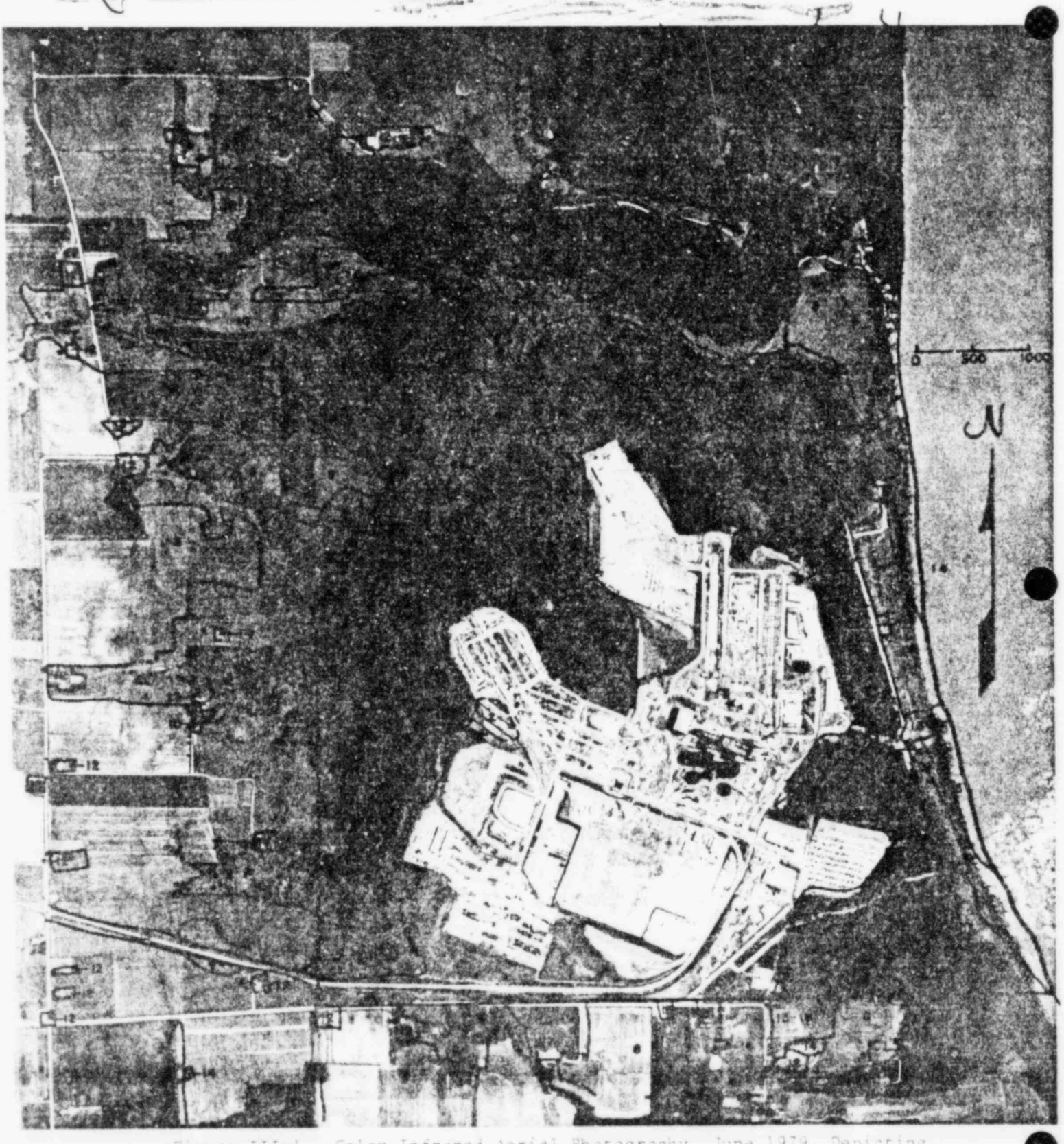

Figure III-1. Color Infrared Aerial Photography, June 1979, Depicting the Marble Hill Site Area and Relationship of Construction Disturbance to May 1978 Vegetation Cover Type

Table III-1

Estimated Horizontal Acreage for Each Vegetation Cover Type (Map Unit) for June 1979 and On-Site Changes Due to Construction of Marble Hill Units 1 and 2

Code	Name	Acreage	Percent of Total	Change from 1978*
1	Maple-Basswood	611	3.6	---
2	Oak-Maple	2,112	12.4	(3)
3	Chestnut oak	528	3.1	---
4	Red pine	16	0.1	---
5	Sycamore-Boxelder	596	3.5	---
6	Oak-Hickory	686	4.0	---
7	Unimproved pasture (includes scrubland)	2,739	15.0	---
8	Cropland	5,162	31.2	---
9	Walnut-Hickory-Buckeye	660	3.9	---
10	Orchards	24	0.1	---
11	Virginia pine	190	1.1	---
12	Residential/farmsteads	353	2.1	---
13	Industrial	513	3.0	3
14	Water	2,883	16.9	---
	Cemetery	1	1.0	---
	Total	17,074	100.0	6

*() = loss, --- = no change

A. COVER TYPE ANALYSIS

1. Vegetation

A comparison of 3-year means for total areal cover, vegetation, and litter areal cover for the four sampling periods (Table III-2) indicates that October and June sampling periods had higher variance in mean cover values (i.e., greater standard error of the means) than variance in mean cover values in the September and March-April sampling periods. This is probably a seasonal phenonemenon related to phenological growth, (e.g., leaf drop in the fall and new leaf growth in the spring) which is greatly influenced by seasonal climatic changes that become most apparent just prior to and during these sampling periods.

The frequency of significant changes (10.0%) in areal cover from the current sampling period as compared to the 1977-1978 sampling period is most notable during the October and June sampling periods. These trends show a general increase in vegetation cover and a general decrease in litter cover for both October and June sampling periods of 1978-1979 as compared to the October and June sampling period of 1977-1978. It is likely that

Table III-2

Mean and Standard Error of Percent Cover for Vegetation, Litter, and Total Cover in PSI Plots, 1976-1979

Code	Cover Type	September Mean*					October Mean*					March-April Mean*					June Mean*				
		1976	1977	1978	3-Yr Mean	SE	1976	1977	1978	3-Yr Mean	SE	1977	1978	1979	3-Yr Mean	SE	1977	1978	1979	3-Yr Mean	SE
01	Maple Basswood																				
	(A) Vegetation	20.6	13.9	22.9	19.1	4.7	17.5	13.5	18.3	16.4	2.6	31.6	36.0	25.7	31.1	5.2	17.8	20.0	32.9**	23.6	8.2
	(B) Litter	53.8	60.5	54.0	56.1	3.8	58.8	83.3	61.3**	67.8	13.5	65.3	63.5	71.6	66.8	4.3	72.0	70.0	45.1**	62.4	15.0
	(C) Total Cover	74.4	74.4	76.9	75.2	1.4	76.3	96.9	79.6	84.3	11.1	96.9	99.5	97.3	97.9	1.4	89.8	90.0	78.0	85.9	6.9
02	Oak-Maple																				
	(A)	25.1	23.4	18.1	22.2	3.7	19.4	7.6	15.1	14.0	6.0	6.5	17.6	16.1	13.4	6.0	30.6	29.5	48.1**	36.1	10.4
	(B)	67.4	73.5	80.4	73.8	6.5	75.9	92.5	80.9**	83.4	8.1	89.1	81.1	83.5	84.6	4.3	65.3	69.1	50.9**	61.8	9.6
	(C)	92.5	96.9	98.5	96.0	3.1	96.3	100.0	96.0	97.4	2.2	95.6	98.7	99.6	98.0	2.1	95.9	98.6	99.0	97.8	1.7
03	Chestnut Oak																				
	(A)	15.9	16.0	21.9	17.9	3.4	12.9	11.1	14.1	12.7	1.5	6.3	8.8	10.1	8.4	1.9	33.1	36.8	40.3	36.7	3.6
	(B)	71.6	79.8	72.3	74.6	4.5	77.1	88.9	82.7	82.9	5.9	84.2	85.4	85.9	84.2	2.6	58.8	59.5	53.0	57.1	3.6
	(C)	87.5	95.8	94.2	92.5	4.4	90.0	100.0	96.8	95.6	5.1	87.5	94.2	96.0	92.6	4.5	91.9	96.3	93.3	93.8	2.2
04	Red Pine																				
	(A)	29.8	37.5	35.1	34.1	3.9	25.8	14.4	42.9**	27.7	14.3	7.0	10.6	5.8	7.8	2.5	41.6	36.8	59.7**	46.0	12.1
	(B)	70.2	62.5	64.9	65.9	3.9	74.2	85.6	57.1**	72.3	14.3	93.0	89.4	94.2	92.2	2.5	58.4	63.2	40.3**	54.0	12.1
	(C)	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	0.0
05	Sycamore-Boxelder																				
	(A)	70.0	66.4	82.5**	73.0	8.5	57.5	19.6	57.4**	44.8	21.9	15.5	20.6	20.4	18.8	2.9	51.3	90.0	74.6**	72.0	19.5
	(B)	21.9	22.5	14.4	19.6	4.5	38.8	80.4	40.4**	53.2	23.6	81.4	79.1	47.0**	69.2	19.2	45.0	10.0	16.2**	23.7	18.7
	(C)	91.9	88.9	96.9	92.6	4.0	96.3	100.0	97.8	98.0	1.9	96.9	99.7	67.4	88.0	17.9	96.3	100.0	90.8	95.7	4.6
06	Oak-Hickory																				
	(A)	12.1	11.4	20.1	14.5	4.8	8.1	2.3	7.6	6.0	3.2	38.6	47.0	40.2	41.9	4.5	15.6	19.4	29.4**	21.5	7.1
	(B)	52.9	55.5	65.8**	58.1	6.8	60.6	95.8	72.3**	76.2	17.9	48.3	47.9	53.1	49.8	2.9	60.7	53.3	41.9**	52.0	9.5
	(C)	65.0	66.9	85.9**	72.6	11.6	68.7	98.1	79.9**	82.2	14.8	86.9	94.9	93.3	91.7	4.2	76.3	72.7	71.3	73.4	2.6
09	Walnut-Hickory-Buckeye																				
	(A)	29.1	33.8	50.6**	37.8	11.3	16.5	13.1	27.6**	19.1	7.6	8.0	30.6	16.4**	18.3	11.4	46.3	72.6	67.2	62.0	13.9
	(B)	61.9	59.3	46.0	55.7	8.5	81.4	86.6	71.5**	79.8	7.7	86.4	67.9	32.1**	78.8	9.7	48.1	26.0	31.7	35.3	11.5
	(C)	91.0	93.1	96.6	93.6	2.8	97.9	99.7	99.1	98.9	0.9	94.4	98.5	98.5	97.1	2.4	94.4	98.6	98.9	97.3	2.5
11	Virginia Pine																				
	(A)	13.8	19.8	17.0	16.9	3.0	12.9	3.4	9.8	8.4	4.8	9.5	2.3	2.3	4.7	4.2	23.0	12.6	19.4	18.3	5.3
	(B)	73.7	76.8	82.4	77.6	4.4	74.6	96.5	90.0	87.0	11.2	89.4	96.6	97.7	94.6	4.5	76.3	72.4	80.0	76.2	3.8
	(C)	87.5	96.6	99.4	94.5	6.2	87.5	99.9	99.0	95.5	6.9	98.9	98.9	100.0	99.3	0.6	99.1	85.0	99.4**	94.5	8.2

*Based on mean of 8 plots per cover type per sample date.

**Significant changes from 1977-1978 sampling period (>10.0).

SE = Standard Error of the Mean.

differences in mean cover values from year to year for any seasonal period (e.g., September, October, March-April, and June) are a result of natural fluctuations. Patterns and trends in these natural fluctuations should become more evident in the future when additional data have been collected.

- Maple - Basswood (01)

The canopy dominants remained sugar maple (Acer saccharum) and basswood (Tilia americana); saplings remained sparsely distributed throughout the type with none occurring in sample plots (Table III-3). One healthy and one dead white ash (Fraxinus americana) were present. A third white ash, present in the 1976-1977 sampling, has died from natural causes and fallen.

As during the previous sampling, plots in the shrub stratum contained only pawpaw (Asimina triloba) (Table III-4).

Late-flowering thoroughout (Eupatorium serotinum), wild ginger (Asarum canadense), and sugar maple remained the more important herbaceous species (based on relative cover values over four samplings) in this type (Table III-5); areal cover values and seasonal floristic patterns were similar to the 1977-1978 sampling. Vegetation cover values in April 1979 again were highest of the year with spring ephemerals, especially cut-leaved toothwort (Dentaria laciniata), contributing to most of the areal cover. Two species recorded during the 1977-1978 sampling were not present, and seven previously unrecorded species were observed during the current sampling. Each of these nine species contributed relatively little to areal cover. Twenty-six taxa were recorded from herbaceous stratum sample plots, seven more than from the previous sampling.

- Oak-Maple (02)

Sugar maple predominated with the importance of the other tree species remaining similar to the previous sampling (Table III-6). One chestnut oak has died since the last sampling. No changes occurred in the sapling class. All of the living trees were healthy during June 1979 sampling.

Table III-3

Species Composition, Frequency, Basal Area, and Condition of Tree and Sapling Strata (Plot Type 4 and 3), Maple-Basswood (01) Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Relative Frequency (%)	Relative Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-1977	1977-1978	1978-1979	Change**
Tree stratum													
Live condition													
Acer saccharum	Sugar maple	100	14.2	33.3	41.0	1	1	8	1	5	5	5	-
Fraxinus americana	White ash	50	1.2	16.7	3.5	1/2	8	8	1	2	1	1	-
Juglans nigra	Black walnut	50	4.1	16.7	11.8	1	8	8	1	1	1	1	-
Tilia americana	Basswood	50	14.4	16.7	41.6	1	2/8	8	2	3	3	3	-
Total Live		250	33.9	83.4	97.9					11	10	10	-
Dead condition													
Fraxinus americana	White ash	50	0.7	16.7	2.0					1	1	1	-
Total Dead		50	0.7	16.7	2.0					1	1	1	-
TOTAL		300	34.6	100.1	99.9					12	11	11	-
Sapling stratum													
No saplings occurred in plots													

*1 - Healthy, 2 - Disease, 8 - Dormant.

**Change in the number of individuals between the sample in 1977-1978 and the sample in 1978-1979.

- Indicates no change.

Table III-4

Species Composition, Frequency, Areal Cover, and Condition of the Shrub Stratum (Plot Type 2) by Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%) 1978 Sep	Frequency (%) 1978 Oct	Areal Cover (%) 1979 Apr	Areal Cover (%) 1979 Jun	Relative Frequency (%) 1978 Oct	Relative Frequency (%) 1979 Apr	Relative Areal Cover (%) 1979 Apr	Relative Areal Cover (%) 1979 Jun	Mode Condition*** 1978 Sep	Mode Condition*** 1978 Oct	Mode Condition*** 1979 Apr	Mode Condition*** 1979 Jun
Maple-Basswood (01)													
Asimina triloba	Pawpaw	38/7.60	38/1.88	26/0.38	32/0.38	100.0/100.0	100.0/105.0	100.0/100.0	100.0/100.0	1	1	8	1
Oak-Maple (02)													
Acer saccharum	Sugar maple	25/2.63	*	25/0.25	26/2.88	24.3/23.7	*	28.4/10.5	16.0/17.8	1	*	8	1
Aesculus octandra	Yellow buckeye	-	-	-	13/0.38	-	-	-	9.4/2.4	-	-	-	1
Celtis occidentalis**	Hackberry	-	-	-	13/0.50	-	-	-	9.4/3.1	-	-	-	1
Cornus florida	Flowering dogwood	25/9.28	*	25/1.25	25/8.00	24.3/41.6	*	28.4/58.0	15.3/49.6	1	*	5	-
Ostrya virginiana**	Ironwood	-	-	-	25/0.63	-	-	-	15.3/3.9	-	-	-	1
Prunus serotina	Black cherry	-	-	*	-	-	-	*	-	-	-	*	-
Rhus radicans**	Poison ivy	13/0.25	-	-	-	12.9/1.7	-	-	-	1	-	-	-
Smilax sp.	Greenbriar	-	-	*	-	-	-	-	*	-	-	-	*
Ulmus rubra	Slippery elm	38/1.63	*	38/0.75	38/3.75	37.7/11.1	*	43.2/31.5	27.3/23.2	1	*	8	1
Chestnut Oak (03)													
Aesculus octandra	Yellow buckeye	-	-	*	-	-	-	*	-	-	-	*	-
Celtis occidentalis	Hackberry	*	*	-	13/0.25	*	*	-	8.4/5.6	*	*	-	1
Cercis canadensis**	Eastern redbud	13/0.75	-	-	13/0.25	7.4/12.9	-	-	8.4/5.5	1	-	-	1
Clematis viorna	Leather flower	*	*	-	13/0.25	*	*	-	8.4/5.5	*	*	-	1
Dioscorea villosa**	Wild yam	13/0.38	-	-	13/0.38	7.6/6.3	-	-	8.4/8.4	1	-	-	1
Diospyros virginiana	Persimmon	-	-	-	-	-	-	-	-	-	-	-	-
Juniperus virginiana	Eastern red cedar	13/2.00	13/3.38	13/1.75	13/0.50	7.6/33.3	17.1/68.3	20.0/55.7	8.4/11.1	1	1	1	1
Lonicera japonica	Japanese honeysuckle	25/0.75	*	*	*	15.1/4.2	*	*	*	2	*	-	*
Passiflora lutea	Yellow passion-flower	*	*	-	-	*	*	-	-	*	*	-	-
Prunus serotina	Black cherry	13/0.13	-	13/0.13	25/Tr	7.6/2.2	-	20.0/4.1	16.2/Tr	1	-	8	2/6
Quercus prinus	Chestnut oak	12/0.50	*	*	-	7.6/8.3	*	*	-	1	*	*	-
Rhus aromatica	Fragrant sumac	13/0.50	13/0.38	13/0.38	13/1.00	7.7/6.3	17.1/6.7	20.0/12.1	8.4/22.2	1	8	8	1
Robinia pseudoacacia	Black locust	13/0.25	*	13/0.25	13/0.38	7.6/4.2	*	20.0/8.0	8.4/8.4	1	*	8	1
Symphoricarpos orbiculatus	Coralberry	-	-	*	-	-	-	*	-	-	-	*	-
Ulmus rubra	Slippery elm	50/1.25	50/1.38	13/0.63	38/1.50	30.1/20.6	65.8/24.5	20.0/20.1	24.7/32.3	4	8	8	1
Viburnum prunifolium	Black haw	-	-	-	*	-	-	-	*	-	-	-	*
Red Pine (04)													
Acer saccharum	Sugar maple	25/3.38	25/3.13	13/Tr	25/2.60	11.0/36.0	22.1/64.2	10.2/Tr	14.0/27.1	1	1	8	1
Cornus florida	Flowering dogwood	13/0.25	*	-	25/0.63	5.7/2.7	*	-	14.0/8.5	1	*	-	1
Fagus grandifolia**	Beech	13/0.50	-	13/0.25	-	5.7/5.3	-	10.2/14.2	-	8	-	8	-
Fraxinus americana	White ash	63/3.25	38/1.00	25/0.38	38/1.88	27.6/34.6	33.6/12.4	19.7/21.6	21.3/25.4	1	8	8	1
Lonicera japonica	Japanese honeysuckle	50/1.75	50/1.63	38/0.50	38/1.25	21.9/8.0	44.2/28.3	29.9/28.4	21.3/16.9	1	1	1	1
Parthenocissus quinquefolia	Virginia creeper	*	-	-	13/1.00	*	-	-	7.3/13.5	*	-	-	1
Prunus serotina**	Black cherry	13/0.13	*	13/0.13	-	5.7/1.4	-	10.2/7.4	-	1	*	1	-
Quercus prinus**	Chestnut oak	13/0.38	-	-	13/0.25	5.7/4.1	-	-	7.3/3.4	1	-	-	1
Quercus velutina**	Black oak	13/0.25	-	-	-	5.7/2.7	-	-	-	1	-	-	-
Rhus radicans**	Poison ivy	-	-	-	13/Tr	-	-	-	7.3/Tr	-	-	-	1
Vitis rotundifolia	Muscadine grape	25/0.50	*	25/0.50	13/0.38	13.0/5.3	*	19.7/28.4	7.3/5.1	1	*	8	1
Sycamore-Boxelder (05)													
Aesculus octandra	Yellow buckeye	-	-	*	*	-	-	*	*	-	-	*	*
Cornus florida	Flowering dogwood	-	-	*	*	-	-	*	*	-	-	*	*
Lindera benzoin	Spicebush	13/1.00	13/0.75	25/1.63	*	100.0/100.0	100.0/100.0	100.0/100.0	*	1	8	8	*
Ulmus rubra	Slippery elm	*	*	-	-	*	*	-	-	*	*	-	-
Oak-Hickory (06)													
Cercis canadensis	Eastern redbud	38/5.88	38/3.13	25/0.38	25/1.38	37.3/36.5	50.0/48.1	50.0/14.4	28.1/17.5	1	8	8	2/1
Cornus florida**	Flowering dogwood	13/1.50	-	-	13/0.50	12.7/9.3	-	-	14.6/5.3	1	-	-	2
Cornus pricear	Miss Price's cornel	13/1.50	*	*	-	12.7/9.3	*	*	*	1	*	*	*
Fraxinus quadrangulata	Blue ash	*	-	-	-	*	-	-	-	*	-	-	-
Gymnocladus dioica	Kentucky coffee-tree	*	-	*	13/0.63	*	-	*	14.6/8.0	*	-	*	1
Juniperus virginiana	Eastern red cedar	*	*	-	-	*	*	-	-	*	*	-	-
Symphoricarpos orbiculatus	Coralberry	-	-	-	25/0.63	-	-	-	28.1/8.0	-	-	-	1
Ulmus rubra	Slippery elm	38/7.25	38/3.38	25/2.25	13/4.75	37.3/44.9	50.0/51.9	50.0/85.6	14.6/60.2	1	8	8	2
Walnut-Hickory-Buckeye (09)													
Acer negundo	Boxelder	13/0.88	13/0.63	13/0.38	*	4.3/5.0	5.4/4.6	6.4/7.6	*	1	8	8	*
Acer saccharum	Sugar maple	38/5.75	36/3.13	*	13/1.63	12.5/32.4	15.8/22.7	*	4.5/10.9	1	8	*	1
Aesculus glabra	Ohio buckeye	*	*	-	*	*	*	-	*	*	*	-	-
Asimina triloba	Pawpaw	38/7.25	75/5.63	25/1.38	25/1.25	12.5/18.3	31.3/40.9	12.3/27.5	8.6/8.4	1	8	8	1
Carya ovata	Shagbark hickory	*	-	-	-	*	-	-	-	*	-	-	-
Cercis canadensis	Eastern redbud	*	*	-	13/0.13	*	*	-	4.5/0.9	*	*	-	1
Fraxinus americana	White ash	13/0.25	*	38/0.75	38/1.00	4.3/1.4	*	18.7/14.9	13.1/6.7	1	*	8	1
Fraxinus quadrangulata	Blue ash	100/2.88	38/0.50	13/Tr	25/1.38	32.9/16.2	15.8/3.6	6.4/Tr	8.6/9.3	1	8	8	1
Lindera benzoin	Spicebush	13/0.25	*	13/0.13	25/1.88	4.3/1.4	*	6.4/2.6	8.6/12.6	1	*	8	1
Lonicera japonica	Japanese honeysuckle	63/2.25	63/2.38	75/1.75	88/4.75	20.7/12.7	26.3/24.9	36.9/34.9	30.3/31.9	1	1	1	*
Prunus virginiana	Choke cherry	-	-	*	-	-	-	*	-	-	-	*	-
Quercus prinus	Chestnut oak	13/2.00	*	*	-	4.3/11.3	*	*	-	*	*	*	-
Rhus radicans	Poison ivy	*	*	-	25/0.50	*	*	-	8.6/3.4	*	*	-	1
Rubus sp.	Blackberry	13/0.25	13/0.50	13/0.38	13/1.38	4.3/1.4	5.4/3.6	6.4/7.6	4.5/9.3	1	1/8	1	1
Symphoricarpos orbiculatus**	Coralberry	-	-	13/0.25	25/1.00	-	-	6.4/5.0	8.6/6.7	-	-	1	1
Shrub A		*	-	-	*	*	-	-	*	*	-	-	*
Virginia Pine (11)													
Cercis canadensis	Eastern redbud	-	-	*	-	-	-	*	-	-	-	*	-
Cornus florida	Flowering dogwood	13/0.13	25/4.62	*	-	33.3/25.0	100.0/100.0	*	-	1	1/8	*	-
Lonicera tatarica	Tartarian honeysuckle	*	*	-	-	*	*	-	-	*	*	-	-
Prunus serotina	Black cherry	*	*	*	-	*	*	*	-	*	*	*	-
Quercus prinus	Chestnut oak	13/0.13	-	-	-	33.3/25.0	-	-	-	1	-	-	-
Quercus sp.**	Oak	13/0.25	-	-	-	33.3/50.0	-	-	-	1	-	-	-

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 2 - Diseased, 4 - Mechanical Injury, 5 - Dead, 8 - Dormant.
Tr - Trace

Table III-5

Species Composition, Frequency, Areal Cover, and Condition of Herbaceous Stratum, Maple-Basswood (01) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency (%) 1978 Sep	Frequency (%) 1978 Oct	Frequency (%) 1979 Apr	Frequency (%) 1979 Jun	Areal Cover (%) 1978 Sep	Areal Cover (%) 1978 Oct	Areal Cover (%) 1979 Apr	Areal Cover (%) 1979 Jun	Relative Frequency (%) 1978 Sep	Relative Frequency (%) 1978 Oct	Relative Frequency (%) 1979 Apr	Relative Frequency (%) 1979 Jun	Relative Areal Cover (%) 1978 Sep	Relative Areal Cover (%) 1978 Oct	Relative Areal Cover (%) 1979 Apr	Relative Areal Cover (%) 1979 Jun	Mode Condition*** 1978 Sep	Mode Condition*** 1978 Oct	Mode Condition*** 1979 Apr	Mode Condition*** 1979 Jun
Acer saccharum	Sugar maple	50/2.88	50/2.38	38/1.25	50/3.38	11.6/12.6	13.2/13.0	6.4/4.9	10.1/10.3	1	1	1	1								
Aesculus octandra	Yellow buckeye	-	-	13/0.25	13/0.13	-	-	2.2/1.0	2.6/0.4	-	-	1	1								
Anemonella thalictroides	Rue anemone	-	-	-	-	-	-	-	-	-	-	-	-								
Ariseama atrorubens	Jack-in-the-pulpit	-	-	13/0.25	13/0.75	-	-	2.2/1.0	2.6/2.3	-	-	1	1								
Asarum canadense	Wild ginger	50/8.63	50/7.25	50/6.00	50/10.00	11.6/37.7	13.2/39.7	8.5/23.4	10.1/30.4	1	1	1	1								
Asimina triloba	Pawpaw	13/0.50	-	*	-	3.0/2.2	-	*	-	1	-	*	-								
Boehmeria cylindrica**	False nettle	-	-	-	13/0.88	-	-	-	2.6/2.7	-	-	-	1								
Carya cordiformis	Yellow-bud hickory	-	-	-	*	-	-	-	*	-	-	-	*								
Circaea alpina**	Small enchanter's nightshade	25/Tr	-	-	-	5.8/Tr	-	-	-	1	-	-	-								
Claytonia virginica	Spring beauty	-	-	100/3.50	-	-	-	16.9/13.7	-	-	-	1	-								
Dentaria laciniata	Cut-leaved toothwort	*	*	100/11.38	-	*	*	16.9/44.4	-	*	*	1	-								
Erigenia bulbosa	Harbinger-of-spring	-	-	100/1.00	-	-	-	16.9/3.9	-	-	-	1	-								
Eupatorium serotinum	Late-flowering thoroughwort	50/8.00	50/6.63	25/0.25	50/12.38	11.6/34.9	13.2/36.3	4.2/1.0	10.1/37.6	1	1	1	1								
Fraxinus americana	White ash	25/0.75	38/0.88	*	25/1.25	5.8/3.3	10.1/4.8	*	5.1/3.8	1	1	*	1								
Galium boreale	Northern bedstraw	-	-	50/0.50	13/0.13	-	-	8.5/2.0	2.6/0.4	-	-	1	1								
Glechoma hederacea**	Gill-over-the-ground	13/Tr	25/Tr	-	-	3.0/Tr	6.6/Tr	-	-	1	1	-	-								
Geum canadense	Canadian avens	-	-	-	*	-	-	-	*	-	-	-	*								
Impatiens pallida**	Yellow jewelweed	-	-	-	13/0.25	-	-	-	2.6/0.8	-	-	-	1								
Lindera benzoin**	Spice bush	-	-	-	13/0.25	-	-	-	2.6/0.8	-	-	-	1								
Maianthemum canadense	Canada mayflower	50/0.50	50/0.38	-	*	11.6/2.2	13.2/2.1	-	*	1	1	-	*								
Parthenocissus quinquefolia	Virginia creeper	25/0.50	13/0.13	-	13/0.63	5.8/2.2	3.4/0.7	-	2.6/1.9	1	1	-	1								
Phryma leptostachya	Lopseed	-	-	-	-	-	-	-	-	-	-	-	-								
Pilea pumila	Clearweed	40/0.75	38/0.63	13/Tr	50/1.50	9.3/3.3	10.1/3.4	2.2/Tr	10.1/4.6	1	1	1	1								
Pinus strobus	White pine	-	-	-	-	-	-	-	-	-	-	-	-								
Ranunculus abortivus**	Small-flowered buttercup	-	-	0.25/0.38	-	-	-	4.2/1.5	-	-	-	1	-								
Rhus radicans	Poison ivy	13/Tr	-	13/Tr	13/Tr	3.0/Tr	-	2.2/Tr	2.6/Tr	1	-	1	1								
Sanicula trifoliata	Snakeroot	-	-	-	25/Tr	-	-	-	5.1/Tr	-	-	-	1								
Sassafras albidum**	Sassafras	13/0.25	-	-	-	3.0/1.1	-	-	-	1	-	-	-								
Tilia americana	Basswood	-	-	-	-	-	-	-	-	-	-	-	-								
Ulmus rubra	Slippery elm	50/Tr	38/Tr	13/Tr	*	11.6/Tr	10.1/Tr	2.2/Tr	*	1	1	1	*								
Viola sororia	Wooly-blue violet	13/0.13	13/Tr	13/0.38	*	3.0/0.6	3.4/Tr	2.2/1.5	*	1	1	1	*								
Viola sp.	Violet	-	-	25/0.50	*	-	-	4.2/2.0	*	-	-	1	*								
Vitis aestivalis	Summer grape	-	-	-	-	-	-	-	-	-	-	-	-								

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy.
Tr - Trace

Table III-6

Species Composition, Frequency, Basal Area, and Condition of Tree and Sapling Strata (Plot Type 4 and 3), Oak-Maple (02) Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Relative Frequency (%)	Relative Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-1977	1977-1978	1978-1979	Change**
Tree stratum													
Live condition													
Acer saccharum	Sugar maple	100	12.2	22.2	35.4	1	1	8	1	6	7	7	-
Cornus florida	Flowering dogwood	50	0.8	11.1	2.3	1	1/8	8	1	2	1	2	1
Fraxinus americana	White ash	50	5.9	11.1	17.1	1	8	8	1	3	3	3	-
Juniperus virginiana	Eastern red cedar	50	0.4	11.1	1.1	7	1	1	1	1	1	1	-
Prunus serotina	Black cherry	100	3.0	22.2	8.7	1/8	8	8	1/7	2	2	2	-
Quercus prinus	Chestnut oak					1	1	6	6	1	1	0	(1)
Quercus velutina	Black oak	50	6.3	11.1	18.3	1	1	1	1	1	1	1	-
Total Live		400	28.6	88.8	82.9					16	16	16	-
Dead condition													
Acer saccharum	Sugar maple		0.0							1	1	0	(1)
Quercus prinus	Chestnut oak	50	5.9	11.1	17.1					0	0	1	1
Total Dead		50	5.9	11.1	17.1					1	1	1	-
TOTAL		450	34.5	99.9	100.0					17	17	17	-
Sapling stratum													
Live condition													
Acer saccharum	Sugar maple	100	1.3	100.0	100.0	8	8	8	1	5	4	4	-
Total Live		100	1.3	100.0	100.0					5	4	4	-
Dead condition													
None													
Total Dead		0	0	0	0					0	0	0	-
TOTAL		100	1.3	100.0	100.0					5	4	4	-

*1 - Healthy, 2 - Diseased, 6 - Dead, 7 - Dying, 8 - Dormant.

**Change in the number of individuals between the sample in 1977-1978 and the sample in 1978-1979.

- Indicates no change.

(n) Indicates loss of "n" individuals.

In the shrub stratum, flowering dogwood remained the most important taxa (Table III-4). Yellow buckeye (Aesculus octandra), hackberry (Celtis occidentalis), and Ironwood (Ostrya virginiana), were first recorded as minor components in this class during June 1979. Poison ivy (Rhus radicans) was first recorded as a minor component in this class during September 1978.

Areal cover of important taxa in the herbaceous stratum was variable between samples in the current sampling period as well as between the previous samplings. Snakeroot was the most consistently important species during the current sampling, while slippery elm, an important species during the previous sampling, contributed considerably less to the areal cover than it did previously (Table III-7). During the current sampling, fifteen previously unrecorded taxa were observed and two taxa, which were observed during the previous sampling were not present. Forty-five taxa were recorded from the herbaceous stratum sample plots, twelve more than in the 1977-1978 sampling.

- Chestnut Oak (03)

Chestnut oak (Quercus prinus) remained dominant in the tree class (Table III-8). Two white ash (Fraxinus americana) died during the 1977-1978 sampling, and two dead chestnut oaks fell during the winter of 1979. As indicated by the stand basal area, little change has occurred in this stratum. Two eastern red cedar (Juniperus virginiana) were again the only saplings present. They appeared healtny.

Eleven taxa were recorded for the shrub stratum during the current sampling; eastern red cedar (Juniperus virginiana), slippery elm (Ulmus rubra), and fragrant sumac (Rhus aromatica) provided the greatest areal cover (Table III-4). Woody shrub and vine species were most important in the herbaceous stratum, (Table III-9).

Japanese honeysuckle (Lonicera japonica), an introduced, weedy, twining vine, remained the most important herbaceous class species and continues to increase throughout the plots. This type contained the greatest

Table III-7

Species Composition, Frequency, Areal Cover, and Condition of Herbaceous Stratum (Plot Type 1), Oak-Maple (02) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Relative frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Mode Condition 1978 Sep	1978 Oct	1979 Apr	1979 Jun
Acer saccharum	Sugar maple	75/2.38	75/2.88	50/0.25	50/3.25	9.9/13.1	10.8/18.7	5.5/1.6	5.4/6.6	1	1	1	1
Actea rubra**	Red baneberry	-	13/0.13	-	-	-	1.9/0.8	-	-	-	1	-	-
Allium canadense	Wild garlic	-	38/0.13	38/0.88	-	-	5.5/0.8	4.2/5.5	-	-	1	1	-
Anemone quinquefolia	Wood anemone	-	-	38/0.63	-	-	-	4.2/5.9	-	-	-	1	-
Anemonella thalictroides	Rue anemone	-	-	13/Tr	-	-	-	1.4/Tr	-	-	-	1	-
Arabis sp.	Rock-cress	-	-	13/0.25	13/0.25	-	-	1.4/1.6	1.4/0.5	-	-	1	1
Arisaema atrorubens**	Jack-in-the-pulpit	-	13/0.25	-	-	-	1.9/1.6	-	-	-	1	-	-
Aster azureus	Azure aster	-	-	-	-	-	-	-	-	-	-	-	-
Aster divaricatus	White wood aster	25/0.25	13/0.25	-	25/4.88	3.5/1.4	1.9/1.6	-	2.7/10.2	1	1	-	1
Boehmeria cylindrica**	False nettle	-	-	-	25/0.25	-	-	-	2.7/1.6	-	-	-	1
Botrychium virginianum	Virginia grape-fern	-	-	-	-	-	-	-	-	-	-	-	-
Carex sp.**	Sedge	-	-	-	13/0.13	-	-	-	1.4/0.5	-	-	-	1
Carya cordiformis	Yellowbud hickory	-	-	-	-	-	-	-	-	-	-	-	-
Caryophyllaceae**	Chickweed	-	-	25/2.13	-	-	-	2.8/13.5	-	-	-	1	-
Cercis canadensis	Eastern redbud	38/0.38	25/Tr	-	13/0.13	5.0/2.1	3.6/Tr	-	1.4/0.5	1	1	-	1
Circea alpina**	Small enchanter's nightshade	-	-	-	13/0.25	-	-	-	1.4/0.5	-	-	-	1
Clematis virona**	Leather leaf	38/0.38	-	-	-	5.0/2.1	-	-	-	1	-	-	-
Cornus florida	Flowering dogwood	63/0.88	75/0.75	13/Tr	50/1.00	8.3/4.8	10.8/4.9	1.4/Tr	5.4/2.1	1	1	1	1
Delphinium tricorne	Dwarf larkspur	-	-	38/3.25	-	-	-	4.2/20.3	-	-	-	1	-
Dentaria laciniata	Cut-leaved toothwort	13/0.13	-	100/2.75	-	1.7/0.7	-	11.1/17.1	-	1	-	1	-
Desmodium glutinosum**	Pointed-leaved tick-trefoil	-	13/0.25	-	-	-	1.9/1.6	-	-	-	8	-	-
Dicentra cucullaria	Dutchman's breeches	-	-	*	-	-	-	*	-	-	-	*	-
Dicotyledonae	Dicot	25/0.50	*	*	13/0.13	3.5/2.7	*	*	1.4/0.5	1	*	*	1
Dioscorea villosa**	Wild yam	38/1.63	38/1.50	-	-	5.0/9.0	5.5/9.7	-	-	1	1	-	-
Elymus virginicus	Virginia wild rye	13/Tr	-	25/0.50	38/0.63	1.7/Tr	-	2.8/5.1	4.1/1.5	1	-	1	1
Erigenia bulbosa	Harbinger-of-spring	-	-	25/0.13	-	-	-	2.8/0.8	-	-	-	1	-
Eupatorium sp.**	Thoroughwort	13/0.25	13/0.13	-	13/0.50	1.7/1.4	1.9/0.8	-	1.4/1.0	1	1	-	1
Fagus grandifolia**	Beech	-	-	-	13/0.13	-	-	-	1.4/0.5	-	-	-	1
Fraxinus americana	White ash	-	-	-	50/1.88	-	-	-	5.4/5.9	-	-	-	1
Fraxinus quadrangulata	Blue ash	38/1.88	13/0.75	13/6.13	25/0.50	5.0/10.5	1.9/4.9	1.4/0.8	2.7/1.0	1	1	1	1
Galium boreale	Northern bedstraw	88/0.38	75/0.25	25/Tr	25/0.25	11.6/2.1	10.8/1.6	2.8/Tr	2.7/0.5	1	1	1	1
Galium circaezans	White wild licorice	-	-	88/0.75	38/0.38	-	-	9.7/4.2	4.1/0.8	-	-	1	1
Galium triflorum	Fragrant bedstraw	13/0.38	-	-	-	1.7/2.1	-	-	-	1	-	-	-
Geum canadense	Canadian avens	38/0.63	-	38/0.38	25/0.88	5.0/5.5	-	4.2/2.4	2.7/1.8	1	-	1	1
Hydrophyllum appendiculatum	Appendaged water leaf	*	-	-	-	*	-	-	-	*	-	-	-
Hystrix patula**	Bottlebrush	13/0.13	25/Tr	-	-	1.7/0.7	3.6/Tr	-	-	1	1	-	-
Jeffersonia diphylla	Twin leaf	-	-	50/0.38	50/0.88	-	-	5.5/2.4	5.4/1.8	-	-	1	1
Liliaceae**	Lily	-	13/0.25	-	-	-	1.9/1.6	-	-	-	1	-	-
Lindera benzoin	Spicebush	-	-	-	-	-	-	-	-	-	-	-	-
Monocotyledonae**	Monocot	13/0.25	-	-	-	1.7/1.4	-	-	-	1	-	-	-
Osmorhiza claytonii	White snakeroot	-	-	-	-	-	-	-	-	-	-	-	-
Ostrya virginiana	Ironwood	-	-	*	25/0.50	-	-	*	2.7/1.0	-	-	*	1
Parthenocissus quinquefolia	Virginia creeper	13/0.25	-	50/Tr	75/5.63	1.7/1.4	-	5.5/Tr	8.1/7.6	1	-	1	1
Phryma leptostachya	Lopseed	13/0.13	-	-	13/0.50	1.7/0.7	-	-	1.4/1.0	1	-	-	1
Pilea pumila**	Clearweed	-	-	-	25/Tr	-	-	-	2.7/Tr	-	-	-	1
Prunus serotina	Black cherry	13/0.13	13/0.25	50/0.38	*	1.7/0.7	1.9/1.6	5.5/2.4	*	1	1	1	*
Quercus prinus	Chestnut oak	*	13/Tr	-	-	*	1.9/Tr	-	-	*	1	-	-
Rhus radicans	Poison ivy	25/2.50	13/0.75	38/Tr	13/1.63	3.5/13.2	1.9/4.9	4.2/Tr	1.4/3.4	1	8	8	1
Sanicula trifoliata	Snakeroot	63/3.25	25/0.88	75/2.38	100/11.75	8.5/11.9	3.6/5.7	8.5/14.8	10.7/36.9	1	1	1	1
Smilax herbacea	Carrion-flower	*	-	-	50/1.25	*	-	-	5.4/2.6	*	-	-	1
Symphoricarpos orbiculatus	Coralberry	-	-	-	-	-	-	-	-	-	-	-	-
Ulmus rubra	Slippery elm	63/1.50	63/2.00	25/0.38	38/5.00	8.5/8.2	9.1/13.6	2.8/2.4	4.1/10.4	1	1	1	1
Viburnum prunifolium	Black-haw	-	-	-	-	-	-	-	-	-	-	-	-
Viola sororia	Hooty-blue violet	25/Tr	25/0.25	75/0.50	100/1.00	3.5/Tr	5.6/1.6	8.5/3.1	10.7/2.1	1	1	1	1

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 5 - Insect Damage, 8 - Dormant.
Tr - Trace.

Table III-8

Species Composition, Frequency, Basal Area, and Condition of the Tree and Sapling Strata (Plot Type 4 and 3), Chestnut Oak (03) Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Relative Frequency (%)	Relative Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-1977	1977-1978	1978-1979	Change**
Tree stratum													
Live condition													
Acer saccharum	Sugar maple	50	0.4	9.1	1.8	1	2/8	8	1	1	1	1	
Fraxinus americana	White ash	100	4.3	18.2	19.6	1	2/8	1	1	7	7	5	(2)
Fraxinus quadrangulata	Blue ash	50	1.0	9.1	4.6	8	8	8	1	1	2	2	
Juniperus virginiana	Eastern red cedar	100	3.0	18.2	13.7	1	1	1	1	5	5	5	
Quercus prinus	Chestnut oak	100	11.6	18.2	53.0	1	1	8	1	11	11	11	
Quercus rubra	Red oak	50	0.6	9.1	2.7	1	1	8	1	1	1	1	
Ulmus rubra	Slippery elm	50	0.5	9.1	2.3	1	8	8	1	1	1	1	
Total Live		500	21.4	91.0	97.7					27	28	26	(2)
Dead condition													
Fraxinus americana	White ash	50	0.5	9.1	2.3					0	0	1	1
Fraxinus quadrangulata	Blue ash	0	0.0							1	0	0	-
Quercus prinus	Chestnut oak	0	0.0							2	2	0	(2)
Total Dead		50	0.5	9.1	2.3					3	2	1	(1)
TOTAL		550	21.9	100.1	100.0					30	30	28	(2)
Sapling stratum													
Live condition													
Juniperus virginiana	Eastern red cedar	50	0.5	100.0	100.0	1	1	1	1	1	2	2	-
Total Live		50	0.5	100.0	100.0					1	2	2	-
Dead condition													
None													
Total Dead		0	0	0	0					0	0	0	
TOTAL		50	0.5	100.0	100.0					1	2	2	-

*1 - Healthy, 2 - Disease, 8 - Dormant.

**Change in the number of individuals between the sample in 1977-1978 and the sample in 1978-1979.

- indicates no change.

(n) Indicates loss of "n" individuals.

Table III-9

Species Composition, Frequency, Areal Cover, and Condition of Herbaceous Stratum, Chestnut-Oak (03) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Relative Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Mode Condition 1978 Sep	1978 Oct	1979 Apr	1979 Jun
Acer saccharum	Sugar maple	-	-	-	*	-	-	-	*	-	-	-	*
Actea rubra*	Red Baneberry	-	-	13/0.25	-	-	-	1.7/2.5	-	-	-	1	-
Actinomeris alternifolia	Wingstem	-	-	-	*	-	-	-	*	-	-	-	*
Allium canadense	Wild garlic	-	-	63/0.13	-	-	-	8.0/1.3	-	-	-	1	-
Anemone quinquefolia	Wood anemone	-	-	-	-	-	-	-	-	-	-	-	-
Anemone virginica	Thimbleweed	63/0.63	25/0.13	-	13/0.38	7.0/2.9	4.2/1.0	-	1.1/0.9	1	1/8	-	1
Anemonella thalictroides	Rue anemone	-	-	-	*	-	-	-	*	-	-	-	*
Arabis laevigata	Smooth rock-cress	-	-	*	-	-	-	*	-	-	-	*	-
Aster azureus	Azure aster	-	-	25/0.25	*	-	-	3.2/2.5	*	-	-	1	*
Carex sp.	Sedge	13/0.13	-	-	25/Tr	1.4/0.6	-	-	2.1/Tr	1	-	-	1
Celtis occidentalis	Hackberry	*	*	-	25/2.13	*	*	-	2.1/5.3	*	*	-	1
Cercis canadensis	Eastern redbud	13/Tr	-	-	13/0.13	1.4/Tr	-	-	1.1/0.3	1	-	-	1
Clematis viorna	Leather flower	25/0.50	-	*	63/1.50	2.8/2.3	-	*	5.4/3.7	8	-	*	1
Cornus florida	Flowering dogwood	*	13/Tr	13/Tr	-	*	2.2/Tr	1.7/Tr	-	*	1	1	-
Delphinium tricorne	Dwarf larkspur	-	-	25/0.25	-	-	-	3.2/2.5	-	-	-	1	-
Dentaria laciniata	Cut-leaved toothwort	-	-	13/Tr	-	-	-	1.7/Tr	-	-	-	1	-
Dicotyledonae	Dicot	63/0.38	-	-	*	7.0/1.7	-	-	*	1	-	-	*
Dioscorea villosa	Wild yam	88/4.00	13/0.25	-	38/2.88	9.6/18.2	2.2/1.9	-	3.2/7.1	1	8	-	1
Diospyros virginiana	Persimmon	-	-	-	-	-	-	-	-	-	-	-	-
Elymus virginicus	Virginia wild rye	*	25/Tr	-	38/0.25	*	4.2/Tr	-	3.2/0.6	*	1	-	1
Eupatorium maculatum	Spotted joe-pye-weed	-	13/0.13	25/0.25	38/0.50	-	2.2/1.0	3.2/2.5	3.2/1.2	-	1	1	1
Fraxinus americana	White ash	13/0.25	25/0.13	*	25/0.38	1.4/1.1	4.2/1.0	*	2.1/0.9	1	8	*	1
Fraxinus quadrangulata	Blue ash	-	-	*	-	-	-	*	-	-	-	*	-
Galium circaezans	White wild licorice	75/0.50	63/0.25	38/Tr	88/0.50	8.4/2.3	10.6/1.9	4.8/Tr	7.5/1.2	1	1	1	1
Geum canadense	Canadian avens	*	-	-	-	*	-	-	-	*	-	-	-
Helianthus sp.	Sunflower	13/0.38	-	13/0.25	38/1.88	1.4/1.7	-	1.7/2.5	3.2/4.7	1	-	1	1
Hystrix patula	Bottlebrush	-	-	-	-	-	-	-	-	-	-	-	-
Jeffersonia diphylla	Twinleaf	13/Tr	-	3/2.50	25/1.13	1.4/Tr	-	3.2/2.5	2.1/2.8	7	-	1	1
Juniperus virginiana	Eastern red cedar	-	-	-	-	-	-	-	-	-	-	-	-
Krigia sp.**	Dwarf dandelion	25/0.50	13/0.13	13/Tr	-	2.8/2.3	2.2/1.0	1.7/Tr	-	1	7	1	-
Leptostachya sp.	Mint	-	-	13/0.13	-	-	-	1.7/1.3	-	-	-	1	-
Lactuca sp.	Wild lettuce	-	*	*	-	-	*	*	-	-	*	*	-
Lonicera japonica	Japanese honeysuckle	75/6.38	88/7.38	50/3.25	50/5.88	8.4/29.0	14.8/56.0	6.4/32.3	4.3/14.6	1	1	1	1
Mainanthemum canadense	Canada mayflower	-	-	-	-	-	-	-	-	-	-	-	-
Monocotyledonae	Monocot	-	-	25/0.25	-	-	-	3.2/2.5	-	-	-	1	-
Muhlenbergia sobolifera	Muhly grass	-	-	25/0.13	*	-	-	3.2/1.3	*	-	-	1	*
Oenothera sp.	Evening primrose	-	-	-	-	-	-	-	-	-	-	-	-
Ostrya virginiana	Ironwood	13/0.63	-	-	-	1.4/2.9	-	-	-	-	-	-	-
Panicum boscii	Bosc's panicum	25/0.25	25/0.38	13/Tr	13/1.13	2.8/1.1	4.2/2.9	1.7/Tr	1.1/2.8	1	1	1	1
Panicum clandestinum**	Corn grass	13/0.75	13/0.13	-	-	1.4/3.4	2.2/1.0	-	-	1	1	-	-
Parthenocissus quinquefolia	Virginia creeper	38/1.00	*	*	25/1.38	4.2/4.6	*	*	2.1/3.4	1	*	*	1
Pinus virginiana	Virginia pine	13/0.13	13/0.13	13/0.13	13/0.13	1.4/0.6	2.2/1.0	1.7/1.3	1.1/0.3	1	1	1	1
Polygonatum biflorum	Solomon's seal	-	-	-	*	-	-	-	*	-	-	-	*
Prunus serotina	Black cherry	63/0.75	63/0.88	63/0.75	38/0.75	7.0/3.4	10.6/6.7	8.0/7.5	5.2/1.9	1	1	1	1
Quercus prinus	Chestnut oak	*	38/0.38	-	25/2.25	*	6.4/2.9	-	2.1/5.6	*	8	-	1
Quercus velutina	Black oak	*	*	-	*	*	*	-	*	*	*	-	*
Rhus aromatica	Fragrant sumac	25/0.38	-	13/Tr	13/0.13	2.8/1.7	-	1.7/Tr	1.1/0.3	1	-	8	1
Rhus radicans	Poison ivy	13/0.38	-	25/Tr	13/0.25	1.4/1.7	-	3.2/Tr	1.1/0.6	1	-	8	1
Robinia pseudoacacia	Black locust	38/1.13	13/0.25	-	25/1.13	4.2/5.2	2.2/1.9	-	2.1/2.8	1	8	-	1
Rosa sp.	Rose	13/0.13	*	*	13/0.13	1.4/0.6	*	*	1.1/0.3	1	*	*	1
Ruellia caroliniensis	Hairy ruellia	-	-	-	75/1.00	-	-	-	5.4/2.5	-	-	-	1
Sanguinaria canadensis	Blood root	-	-	-	-	-	-	-	-	-	-	-	-
Sanicula trifoliata	Snakeroot	*	-	50/0.13	88/1.00	*	-	6.4/1.3	7.5/2.5	*	-	1	1
Smilacina racemosa	False solomon's seal	-	-	38/0.50	63/1.25	-	-	4.8/5.0	5.4/3.1	-	-	1	1
Smilax herbacea	Carrion-flower	*	-	-	-	*	-	-	-	*	-	*	-
Solidago ulmifolia	Goldenrod	50/1.38	63/1.38	25/0.25	38/1.00	5.6/6.3	10.6/10.5	3.2/2.5	3.2/2.5	1	1	1	1
Solidago sp.	Goldenrod	*	13/Tr	*	*	*	2.2/Tr	*	*	*	8	*	*
Symphoricarpos orbiculatus	Coralberry	-	*	13/0.13	13/0.38	-	*	1.7/1.3	1.1/0.9	-	*	1	1
Taraxacum officinale	Dandelion	25/Tr	-	13/0.38	*	2.8/Tr	-	1.7/3.8	*	1	-	1	*
Thalictrum dioicum	Early meadow-rue	13/0.13	13/0.13	63/0.75	63/3.25	1.4/0.6	2.2/1.0	8.0/7.5	5.4/8.1	1	1	1	1
Ulmus rubra	Slippery elm	50/0.75	63/1.13	13/Tr	13/0.25	5.6/3.4	10.6/8.6	1.7/Tr	1.1/0.6	1	8	8	1
Veratrum sp.	Veratrum	-	-	63/1.63	63/3.38	-	-	8.0/16.2	5.4/8.4	-	-	1	1
Viola sororia	Hooly-blue violet	*	-	*	-	*	-	*	-	*	-	*	-
Vitis aestivalis	Summer grape	25/0.50	-	-	13/0.25	2.8/2.3	-	-	1.1/0.6	1	-	-	1

*Tentative identification; taxa observed in plots for first time during the current sampling period.
#Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 7 - Dying, 8 - Dormant.
Tr - Trace

number (46) of taxa in the herb class. Two new species were recorded, and 11 taxa which were recorded during the 1976-1977 sampling were not observed. None of the 46 taxa contributed significantly to the areal cover.

- Red Pine (04)

Red pine remained the predominant species during the current sampling period (Table III-10). Two red pine (Pinus resinosa) died during the sampling period of 1978-1979. During September and October 1978 sampling and the April 1979 sampling, all surviving red pine trees appeared to be healthy. Some diseased trees were observed in the June 1979 sampling. All white pines in the plots appeared healthy (Table III-11). Red pine is not tolerant to competition from its natural successors such as white pine, especially in the southern portion of its range (Fowells 1965). The continued trend toward decline of red pine indicates a successional trend toward a mixed white pine-deciduous tree dominated stand.

The sapling, shrub, and herbaceous strata remained similar to the 1977-1978 sampling. Five previously unrecorded species were encountered in the shrub stratum sampling plots and 12 previously unrecorded species were encountered in the herb stratum sampling plots (Table III-12). Forty-one taxa in the herbaceous stratum were observed in the 1977-1978 sampling.

- Sycamore - Boxelder (05)

Little change occurred in the tree stratum. All trees appeared healthy during June 1978 sampling (Table III-13).

The single slippery elm tree in the tree stratum showed evidence of insect damage, although the tree was in a dormant condition. Slippery elm was not observed in the shrub stratum during the current sampling; however, three other understory tree species were present and contributed only minor areal cover.

Fifteen previously unrecorded species were observed in the herbaceous stratum (Table III-14). With the exception of wood nettle (Laportea canadensis), all 15 previously unrecorded species contributed only minor

Table III-10

Species Composition, Frequency, Basal Area, and Condition of the Tree and Sampling Strata (Plot Type 4 and 3), Red Pine (04) Cover Type for September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Relative Frequency (%)	Relative Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-1977	1977-1978	1978-1979	Change**
Tree stratum													
Live condition													
Fraxinus americana	White ash	50	2.7	12.5	6.8	1	8	1/3	1	2	2	2	-
Liriodendron tulipifera	Yellow poplar	50	4.6	12.5	11.6	1	8	8	1	1	2	2	-
Pinus resinosa	Red pine	100	16.7	25.0	42.0	1	1	1	1/2	14	15	13	(2)
Pinus strobus	White pine	100	6.5	25.0	16.3	1	1	1	1	5	4	4	-
Total Live		300	30.5	75.0	76.7					22	23	21	(2)
Dead condition													
Pinus resinosa	Red pine	100	9.3	25.0	23.4					8	6	7	1
Total Dead		100	9.3	25.0	23.4					8	6	7	1
TOTAL		400	39.8	100.0	100.1					30	29	28	(1)
Sapling stratum													
No saplings occurred in plots													

*1 - Healthy, 2 - Diseased, 8 - Dormant.

**Change in the number of individuals between the sample in 1977-1978 and the sample in 1978-1979.

- Indicates no change.

(n) Indicates loss of "n" individuals.

Table III-11

Change in Condition of Trees in the Red Pine (04) Cover Type between September 1976 and June 1979

Scientific Name	Common Name	Tree No.	Canopy Position*** 1976-1977	Canopy Position*** 1978-1979	dbh (in.) Apr 1979	dbh (in.) Change from Mar 1978	Condition* 1977 Sep	Condition* 1977 Oct	Condition* 1978 Apr	Condition* 1978 Jun
Pinus resinosa	Red pine	41-1	3	**	**	(5.6)	1	1	**	**
		41-2	3	**	**	(6.2)	6	6	**	**
		41-3	3	**	**	-	**	**	**	**
		41-4	1	1	6.0	-	6	6	6	6
		41-5	3	1	5.7	-	6	6	6	6
		41-6	1	1	9.3+	0.5+	1	1	2	2
		41-7	4	**	**	-	**	**	**	**
		41-10	1	2	8.9	0.3	6	6	6	6
		41-12	1	2	8.3	0.3	6	6	6	6
		41-13	1	1	8.0	-	1	1	1	7
		41-14	1	1	9.7	-	1	1	1	1
		41-16		3	4.5	4.5		1	1	1
		42-1	3	3	3.6	-	1	1	1	1
		42-3	1	1	9.0	-	5	5	6	6
		42-4	1	3	6.0	-	7	1	6	6
		42-5	1	2	6.8	0.1	7	1	1	1
		42-8	1	1	8.4	0.1	1	1	1	1
		42-9	1	3	5.5	(0.3)	7	1	2	6
		42-10	2	3	5.2	0.1	1	1	1	1
		42-11	2	3	5.0	(0.1)	1	1	1	1
		42-12	2	3	5.4	0.1	1	1	1	2
		42-13	1	1	8.7	-	1	1	2	1
		42-14	1	1	9.6	0.1	1	1	1	1
		42-15	3	4	4.1	0.1	7	1	7	1
Pinus strobus	White pine	41-8	2	2	6.7	-	1	1	1	1
		41-11	3	3	5.7	-	1	1	1	1
		42-2	3	3	12.3	-	1	1	1	1
		42-6	1	4	5.1	0.1	1	1	1	1
Fraxinus americana	White ash	42-7	1	2	6.6	0.1	1	8	1	1
		42-16	1	1	7.9	0.3	1	8	8	1
Liriodendron tulipifera	Tulip tree	41-9	1	1	12.8	0.5	1	8	1	1
		41-15		3	4.3	0.5	1	8	1	1

*1 - Healthy, 2 - Diseased, 6 - Dead, 7 - Dying, 8 - Dormant.

**Individual has fallen.

***1 - Dominant, 2 - Codominant, 3 - Intermediate, 4 - Suppressed

+dbh for 41-6 should read 8.8 in TI, 1978.

- Indicates no change.

() Indicates a reduction.

Table III-12

Species Composition, Frequency, Areal Cover, and Condition of Herbaceous Stratum, Red Pine (04) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Relative Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Mode Condition 1978 Sep	1978 Oct	1979 Apr	1979 Jun
Acer saccharum**	Sugar maple	13/0.38	25/0.50	-	13/0.50	1.4/1.0	3.6/1.2	-	1.2/0.8	1	1	-	1
Actea rubra**	Baneberry	-	-	13/0.13	-	-	-	2.3/2.3	-	-	-	1	-
Ambrosia artemisiifolia**	Common ragweed	-	-	-	13/0.13	-	-	-	1.2/0.2	-	-	-	1
Aster sp.**	Aster	-	-	-	13/0.13	-	-	-	1.2/0.2	-	-	-	1
Boehmeria cylindrica**	False nettle	-	-	-	50/1.25	-	-	-	4.6/2.1	-	-	-	1
Carex sp.**	Sedge	25/0.13	-	13/Tr	25/0.13	2.8/0.3	-	2.3/Tr	2.3/0.2	1	-	1	1
Cercis canadensis	Eastern redbud	75/2.63	63/1.38	-	50/4.25	8.3/7.0	9.1/3.2	-	4.6/7.1	1	8/1	-	1
Circea alpina**	Small enchanter's nightshade	-	-	-	25/1.63	-	-	-	2.3/2.7	-	-	-	1
Cornus florida	Flowering dogwood	50/6.25	63/7.63	38/0.13	63/14.38	5.5/16.6	9.1/17.8	6.8/2.3	5.8/24.1	1	1	8	1
Cruciferae**	Mustard	-	13/0.38	13/0.25	-	-	1.9/0.9	2.3/4.3	-	-	1	1	-
Dentaria laciniata	Cut-leaved toothwort	-	-	25/0.25	-	-	-	4.5/4.3	-	-	-	1	-
Dicotyledonae	Dicot	*	-	-	-	*	-	-	-	*	-	-	-
Erigeron sp.**	Daisy fleabane	-	-	-	13/0.13	-	-	-	1.2/0.2	-	-	-	1
Eupatorium serotinum	Late-flowering thoroughwort	25/1.00	25/0.88	*	25/0.88	2.8/2.7	3.6/2.0	*	2.3/1.5	1	1	*	1
Fagus grandifolia	Beech	25/Tr	13/Tr	*	25/0.25	2.8/Tr	1.9/Tr	*	2.3/0.4	1	1	*	1
Fragaria virginiana	Wild strawberry	*	25/0.25	*	25/0.13	*	3.6/0.6	*	2.3/0.2	*	1	*	1
Fraxinus americana	White ash	50/1.63	50/3.13	13/Tr	50/4.00	5.5/4.3	7.2/7.3	2.3/Tr	4.6/6.7	1	8/1	8	1
Fraxinus quadrangulata	Blue ash	-	*	*	38/2.01	-	*	*	3.5/3.3	-	*	*	1
Gallium asprellum	Rough bedstraw	50/0.75	38/0.13	-	*	5.5/2.0	5.5/0.3	-	*	1	1	-	*
Gallium circaezans	White wild licorice	25/0.25	13/0.38	13/0.13	50/1.63	2.8/0.7	1.9/0.9	2.3/2.3	4.6/2.7	1	1	1	1
Gallium triflorum	Fragrant bedstraw	-	-	38/0.63	13/Tr	-	-	6.8/10.9	1.2/Tr	-	-	1	1
Geum canadense	Canadian avens	63/1.38	13/0.25	*	*	6.9/3.7	1.9/0.6	*	*	1	1	*	*
Liriodendron tulipifera	Yellow poplar	13/0.63	13/0.50	-	13/Tr	1.4/1.7	1.9/1.2	-	1.2/Tr	1	2	-	1
Lonicera japonica	Japanese honeysuckle	63/12.88	63/19.75	63/1.38	63/7.50	6.9/34.2	9.1/46.0	11.3/23.8	5.8/12.6	1	1	1	1
Muhlenbergia sobolifera	Muhly grass	-	-	13/Tr	*	-	-	2.3/Tr	*	-	-	1	*
Panicum boscii**	Bosc's panicum	13/Tr	13/Tr	13/0.13	-	1.4/Tr	1.9/Tr	23./2.3	-	1	1	1	-
Parthenocissus quinquefolia	Virginia creeper	50/2.38	-	25/Tr	88/5.25	5.5/6.3	-	4.5/Tr	8.1/8.8	1	-	8	1
Phryma leptostachya	Lopseed	25/1.00	13/0.50	-	13/0.25	2.8/2.6	1.9/1.2	-	1.2/0.4	1	1	-	1
Pilea pumila	Clearweed	-	-	-	*	-	-	-	*	-	-	-	*
Pinus strobus	White pine	25/0.13	13/0.13	25/0.25	13/Tr	2.8/0.3	1.9/0.3	4.5/4.3	1.2/Tr	1	1	1	1
Prunus serotina	Black cherry	75/1.75	75/2.63	63/0.75	38/0.75	8.3/4.6	10.8/6.1	11.3/13.0	3.5/1.3	1	1	1	1
Quercus prinus	Chestnut oak	25/1.00	25/1.38	-	25/1.88	2.8/2.7	3.6/3.2	-	2.3/3.2	1	1	-	1
Quercus velutina	Black oak	13/0.38	25/0.50	-	13/1.00	1.4/1.0	3.6/1.2	-	1.2/1.7	1	1	-	1
Rhus radicans	Poison ivy	38/0.50	13/0.50	25/Tr	75/1.75	4.2/1.3	1.9/1.2	4.5/Tr	6.9/2.9	1	1	8/1	1
Rosa sp.	Rose	13/0.25	13/0.25	13/0.25	13/0.38	1.4/0.7	1.9/0.6	2.3/4.3	1.2/0.6	1	1	1	1
Rubus sp.	Blackberry	13/0.50	25/0.75	25/0.25	38/2.13	1.4/1.3	3.6/1.7	4.5/4.3	3.5/3.6	1	1	1	1
Sanicula trifoliata	Snakeroot	63/1.00	38/0.50	100/1.13	100/5.63	6.9/2.7	5.5/1.2	18.0/19.5	9.2/9.4	1	1	1	1
Sassafras albidum	Sassafras	25/0.13	25/0.63	-	38/0.88	2.8/0.3	3.6/1.5	-	3.5/1.5	1	8/1	-	1
Smilax herbacea	Carrion-flower	*	-	-	-	*	-	-	-	*	-	-	-
Solidago sp.**	Goldenrod	-	-	-	13/0.13	-	-	-	1.2/0.2	-	-	-	1
Symphoricarpos orbiculatus	Coralberry	-	-	-	-	-	-	-	-	-	-	-	-
Taraxacum officinale**	Dandelion	-	-	-	13/Tr	-	-	-	1.2/Tr	-	-	-	1
Ulmus rubra	Slippery elm	13/0.38	-	25/0.13	25/0.63	1.4/1.0	-	4.5/2.3	2.3/1.1	1	-	1	1
Viola sororia	Wooly-blue violet	13/0.13	-	-	-	1.4/0.3	-	-	-	1	-	-	-
Vitis rotundifolia	Muscadine grape	-	-	-	13/0.13	-	-	-	1.2/0.2	-	-	-	1

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 2 - Diseased, 8 - Dormant
Tr - Trace

Table III-13

Species Composition, Frequency, Basal Area, and Condition of Tree and Sapling Strata
(Plot Type 4 and 3), Sycamore-Boxelder (05) Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Relative Frequency (%)	Relative Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-1977	1977-1978	1978-1979	Change**
Tree stratum													
Live condition													
Acer negundo	Boxelder	50	0.5	14.3	1.0	1	1	8	1	1	1	1	-
Cornus florida	Flowering dogwood	50	1.2	14.3	2.5	1	1	8	1	2	2	2	-
Juglans nigra	Black walnut	50	4.5	14.3	9.3	1	1/8	8	1	2	2	2	-
Platnus occidentalis	Sycamore	50	36.6	14.3	75.5	1	2	8	1	4	4	4	-
Prunus serotina	Black cherry	50	0.4	14.3	0.8	1	8	8	1	1	1	1	-
Tilia americana	Basswood	50	1.0	14.3	2.1	1	1	8	1	1	1	1	-
Ulmus rubra	Slippery elm	50	4.3	14.3	8.9	1	1	8	3	1	1	1	-
Total Live		350	48.5	100.2	100.1					12	12	12	-
Dead condition													
None		0	0	0	0					0	0	0	-
Total Dead		0	0	0	0					0	0	0	-
TOTAL		350	48.5	100.2	100.1					12	12	12	-
Sapling stratum													
Live condition													
Acer negundo	Boxelder	50	1.3	50.0	72.2	1	8	2	1	2	2	2	-
Celtis occidentalis	Hackberry	0	0	0	0					1	0	0	-
Total Live		50	1.3	50.0	72.2					3	2	2	-
Dead condition													
Celtis occidentalis	Hackberry	50	0.5	50.0	27.8					0	1	1	-
Ulmus rubra	Slippery elm	0	0							1	0	0	-
Total Dead		50	0.5	50.0	27.8					1	1	1	-
TOTAL		100	1.8	100.0	110.0					4	3	3	-

*1 - Healthy, 2 - Diseased, 3 - Insect, 8 - Dormant

**Change in the number of individuals between the sample in 1977-1978 and the sample in 1978-1979.

- Indicates no change.

(n) Indicates loss of "n" individuals.

Table III-14

Species Composition, Frequency, Areal Cover, and Condition of the Herbaceous Stratum, Sycamore Boxelder (05) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Relative Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Mode Condition 1978 Sep	1978 Oct	1979 Apr	1979 Jun
Acer negundo	Boxelder	-	25/0.50	38/0.25	-	-	3.1/0.9	5.5/1.2	-	-	1	1	-
Acer saccharum**	Maple	-	63/0.63	-	-	-	7.7/1.1	-	-	-	1	-	-
Actinomeris alternifolia	Wingstem	38/4.25	38/3.50	*	50/4.63	6.4/5.1	4.6/6.1	*	7.2/6.2	1	1	*	1
Amaranthus sp.	Pigweed	-	-	-	-	-	-	-	-	-	-	-	-
Arisaema atrorubens**	Jack-in-the-pulpit	-	-	-	13/0.38	-	-	-	1.9/0.5	-	-	-	1
Aster divaricatus	White wood aster	-	25/0.75	13/0.13	-	-	3.1/1.3	1.9/0.6	-	-	1	1	-
Bidens sp.	Beggar's ticks	*	-	-	-	*	-	-	-	*	-	-	-
Carex sp.	Sedge	25/2.63	50/5.75	38/4.75	63/5.13	4.2/3.2	6.1/10.0	5.5/23.3	9.1/4.2	1	1	1	1
Circaea alpina	Small enchanter's nightshade	-	50/1.50	-	*	-	6.1/2.6	-	*	-	1/2	-	*
Claytonia virginica	Spring beauty	-	-	50/1.25	-	-	-	7.2/6.1	-	-	-	1	-
Commelina virginica	Virginia dayflower	13/0.25	13/0.38	-	13/0.63	2.2/0.3	1.6/0.7	-	1.9/0.8	1	1	-	1
Cornus florida	Flowering dogwood	13/1.25	*	25/0.38	13/1.13	2.2/1.5	*	3.6/1.9	1.9/1.5	1	*	8	1
Cryptotaenia canadensis	Honewort	-	-	-	*	-	-	-	0	-	-	-	*
Dentaria laciniata	Cut-leaved toothwort	*	*	50/3.50	-	*	*	7.2/17.1	-	*	*	1	-
Dicentra cucullaria**	Squirrel corn	-	-	13/0.50	-	-	-	1.9/2.4	-	-	-	1	-
Dicotyledoneae**	Dicot	25/1.38	-	-	-	4.2/1.7	-	-	-	1	-	-	-
Elymus virginicus	Virginia wild rye	25/1.00	25/0.13	50/4.25	25/0.38	4.2/1.2	3.1/0.2	7.2/23.3	3.6/0.5	1	1/6	1	1
Erigenia bulbosa**	Harbinger-of-spring	-	-	13/Tr	-	-	-	1.9/Tr	-	-	-	1	-
Eupatorium serotinum	Late-flowering thoroughwort	88/16.38	100/17.38	38/0.38		14.8/19.8	12.2/30.3	5.5/1.9		1	1	1	1
Fragaria virginiana**	Wild strawberry	-	-	13/0.13	-	-	-	1.9/0.6	-	-	-	1	-
Galium circaezans	White wild licorice	*	*	25/Tr	13/Tr	*	*	3.6/Tr	1.9/Tr	*	*	1	1
Galium triflorum	Fragrant bedstraw	-	-	25/0.25		-	-	3.6/1.2		-	-	1	
Geum canadense	Canadian avens	38/0.75	63/1.00	*	13/0.25	6.4/0.9	7.7/1.7	*	1.9/0.3	1	1	*	1
Glechoma hederacea**	Gill-over-the-ground	-	13/Tr	-	-	-	1.6/Tr	-	-	-	1	-	-
Hydrophyllum appendiculatum**	Appendaged waterleaf	-	-	50/1.00	-	-	-	7.2/4.9	-	-	-	1	-
Impatiens biflora**	Jewelweed	13/0.38	-	-	-	2.2/0.5	-	-	-	1	-	-	-
Impatiens pallida	Yellow jewelweed	50/12.13	38/0.63	75/1.25	100/28.75	8.4/14.7	4.6/1.1	10.8/6.1	14.4/38.6	1	7	1	1
Jeffersonia diphylla	Twinleaf	-	-	-	-	-	-	-	-	-	-	-	-
Laportea canadensis	Wood nettle	25/3.13	25/2.88	-	88/14.25	4.2/3.8	3.1/5.0	-	12.7/19.1	1	1/7	-	1
Lindera benzoin	Spicebush	*	-	-	13/0.63	*	-	-	1.9/0.8	*	-	-	1
Osmorhiza claytonii	White snakeroot	-	-	*	13/0.63	-	-	*	1.9/0.8	-	-	*	1
Parthenocissus quinquefolia	Virginia creeper	38/0.75	13/0.13	13/Tr	25/0.25	6.4/0.9	1.6/0.2	1.9/Tr	3.6/0.3	1	8	1	1
Pilea pumila	Clearweed	75/35.13	88/18.63	25/0.13	75/11.13	12.6/42.4	10.7/32.4	3.6/0.6	10.8/14.9	1	1	1	1
Polygonum cespitosum	Long-bristled smartweed	25/0.25	38/0.50	-	25/0.75	4.2/0.3	4.6/0.9	-	3.6/1.0	1	1	-	1
Prunus serotina**	Black cherry	-	25/0.63	-	-	-	3.1/1.1	-	-	-	1	-	-
Quercus prinus**	Chestnut oak	-	50/0.50	-	-	-	6.1/0.9	-	-	-	1	-	-
Rhus radicans	Poison ivy	13/0.50	13/Tr	13/Tr	25/0.75	2.2/0.6	1.6/Tr	1.9/Tr	3.6/1.0	1	1	1	1
Rosa sp.**	Rose	-	-	13/0.25	-	-	-	1.9/1.2	-	-	-	1	-
Ruellia caroliniensis**	Hairy ruellia	-	-	-	13/0.63	-	-	-	1.9/0.8	-	-	-	1
Sanicula trifoliata	Snakeroot	13/0.13	13/0.75	50/0.38	63/4.38	2.2/0.2	1.6/1.3	7.2/1.9	9.1/5.9	1	1	1	1
Smilax herbacea	Carrion-flower	*	*	-	-	*	*	-	-	*	*	-	-
Solidago sp.	Goldenrod	*	-	*	*	*	-	*	*	*	-	*	*
Ulmus rubra**	Slippery elm	-	-	13/Tr	-	-	-	1.9/Tr	-	-	-	1	-
Umbelliferae sp.	Umbel	-	-	*	-	-	-	*	-	-	-	*	-
Urtica dioca**	Stinging nettle	25/1.50	-	-	-	4.2/1.8	-	-	-	1	-	-	-
Viola eriocarpa	Smoothish-yellow violet	13/0.25	*	25/0.38	13/0.88	2.2/0.3	*	3.6/1.9	1.9/1.2	1	*	1	1
Viola sororia	Wooly-blue violet	38/0.75	50/1.25	25/0.75	38/1.00	6.4/0.9	6.1/2.2	3.6/3.7	5.5/1.3	1	1	1	1

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 2 - Diseased, 6 - Dead, 8 - Dormant.
Tr - Trace

areal cover. Yellow jewelweed (Impatiens pallida), late-flowering thoroughwort (Eupatorium serotinum), clearweed (Pilea pumila), and sedge (Carex sp.) were consistently important taxa throughout the type during the current sampling period. Flooding and deposition of silt as previously mentioned in the 1977-1978 report (TI 1978) have probably been responsible for introduction of several of the new taxa. Annual flooding, which is a natural occurrence in this cover type during spring runoff, will undoubtedly continue to influence species composition of these plots. Five taxa which were recorded during the 1977-1978 sampling were not observed.

- Oak-Hickory (06)

Little change occurred in the tree and sapling stratum; one Ohio buckeye (Aesculus glabra) and one Blue ash (Fraxinus quadrangulata) died but remained standing (Table III-15). All trees except Ohio buckeye and slippery elm appeared healthy. Ohio buckeye was diseased and slippery elm had insect damage. One previously unrecorded shrub was identified during the current sampling. Slippery elm and eastern redbud (Cercis canadensis) remained the more important shrub species (Table III-14).

Forty herbaceous class species were observed during the current sampling; of these, 9 were previously unrecorded. Five species observed during the 1977-1978 sampling (Table III-16) were not present. The highest ground cover was again observed in the early spring sampling (April 1979) and was attributed to the development of spring ephemerals, which contributed most of the vegetation ground cover. Bluebells (Mertensia virginica) was most important of these, with 42.9 percent of the gound cover. The location of this cover type on steep slopes makes it especially susceptible to water scouring; this is attributed in part to the low ground cover in September and October 1978.

- Walnut - Hickory - Buckeye (09)

One Ohio buckeye reached tree class, and one blue ash died, but remained standing (Table III-17). All species appeared healthy during June 1979 sampling. This type contained the greatest number of shrub species; 15 including 1 previously unrecorded taxa (Table III-4). Jananese honeysuckle,

Table III-15

Species Composition, Frequency, Basal Area, and Condition of Tree and Sapling Strata (Plot Type 4 and 3), Oak-Hickory (06) Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Relative Frequency (%)	Relative Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-77	1977-78	1978-79	Change**
Tree stratum													
Live condition													
Aesculus glabra	Ohio buckeye	100	3.2	22.2	8.3	2	8	1	2	5	4	5	1
Catalpa speciosa	Northern catalpa	50	3.6	11.1	9.4	1	8	8	1	1	1	1	-
Fraxinus americana	White ash	50	1.0	11.1	2.6	1	8	8	1	1	1	1	-
Fraxinus quadrangulata	Blue ash	100	15.0	22.2	39.1	1	8	8	1	7	7	8	1
Quercus rubra	Red oak	50	12.6	11.1	32.8	1	8	8	1	2	2	2	-
Ulmus rubra	Slippery elm	50	0.9	11.1	2.3	1	8	8	3	1	1	1	-
Total Live		400	36.3	88.8	94.5					17	16	18	2
Dead condition													
Aesculus glabra	Ohio buckeye	0	0	0	0					0	1	0	(1)
Fraxinus quadrangulata	Blue ash	50	2.1	11.1	5.5					3	3	2	(1)
Total Dead		50	2.1	11.1	5.5					3	4	2	(2)
TOTAL		450	38.4	99.9	100.0					20	20	20	-
Sapling stratum													
No saplings occurred in plots													

*1 - Healthy, 2 - Disease, 3 - Insect, 8 - Dormant.

**Change in the number of individuals between the sample in 1977-78 and the sample in 1978-79.

- Indicates no change.

(n) Indicates loss of "n" individuals.

Table III-16

Species Composition, Frequency, Areal Cover, and Condition of Herbaceous Stratum, Oak-Hickory (06) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Relative Frequency (%)/Areal Cover (%) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Node Condition 1978 Sep	1978 Oct	1979 Apr	1979 Jun
Acer saccharum	Sugar maple	-	-	-	*	-	-	-	*	-	-	-	*
Actea rubra**	Baneberry	-	-	13/Tr	-	-	-	1.5/Tr	-	-	-	1	-
Actinomeris alternifolia**	Wingstem	-	-	-	13/0.63	-	-	-	2.1/2.1	-	-	-	1
Aesculus glabra**	Ohio buckeye	-	-	-	13/0.13	-	-	-	2.1/0.4	-	-	-	2
Allium canadense	Wild garlic	-	-	38/0.13	-	-	-	4.4/0.3	-	-	-	1	-
Amaranthus sp.	Pigweed	-	-	-	-	-	-	-	-	-	-	-	-
Anemone canadensis	Wood anemone	-	-	-	-	-	-	-	-	-	-	-	-
Anemone quinquefolia**	Wood anemone	-	13/Tr	-	-	-	3.7/Tr	-	-	-	8	-	-
Anemonella thalictroides	Rue anemone	-	-	-	-	-	-	-	-	-	-	-	-
Asarum canadense	Wild ginger	13/0.25	-	25/2.38	13/Tr	5.0/1.2	-	2.9/5.9	2.1/Tr	1	-	1	1
Aster azureus	Azure aster	-	13/0.13	13/Tr	13/0.38	-	3.7/1.7	1.5/Tr	2.1/1.5	-	1	1	1
Cardamine douglassii	Purple cress	*	-	25/0.13	-	*	-	2.9/0.3	-	*	-	1	-
Carex sp.	Sedge	25/0.13	25/0.13	13/0.25	25/0.25	5.0/0.6	7.0/1.7	1.5/0.6	4.1/0.9	1	1	1	1
Carya cordiformes	Yellowbud hickory	-	-	-	-	-	-	-	-	-	-	-	-
Cercis canadensis	Eastern redbud	38/1.38	38/0.13	13/0.13	25/1.25	8.9/6.8	10.7/1.7	1.5/0.3	4.1/4.3	8	8	1	2/1
Circaea alpina	Small enchanter's nightshade	13/Tr	13/0.13	-	-	5.0/Tr	3.7/1.7	-	-	1	1	-	-
Commelina sp.	Dayflower	-	-	25/0.25	13/0.25	-	-	2.9/0.6	2.1/0.9	-	-	1	1
Compositae	Sunflower	*	13/Tr	13/0.25	*	*	3.7/Tr	1.5/0.6	*	*	1	1	*
Cornus pricean	Miss price's cornel	-	-	-	-	-	-	-	-	-	-	-	-
Delphinium tricorne	Dwarf larkspur	-	-	100/5.75	-	-	-	11.5/14.3	-	-	-	1	-
Dentaria laciniata	Cut-leaved toothwort	13/Tr	-	100/6.00	-	5.0/Tr	-	11.5/14.9	-	8	-	1	-
Dicentra cucullaria**	Squirrel corn	-	-	25/0.75	-	-	-	2.9/1.9	-	-	-	1	-
Erythronium albidum	White trout-lily	-	-	38/3.63	-	-	-	4.4/9.0	-	-	-	1	-
Eupatorium serotinum	Late-flowering thoroughwort	75/3.00	75/3.63	13/Tr	75/7.25	17.5/14.9	21.1/47.5	1.5/Tr	12.3/24.6	1	1	1	1
Fraxinus americana	White ash	-	-	-	-	-	-	-	-	-	-	-	-
Fraxinus quadrangulata	Blue ash	25/0.50	13/0.13	13/Tr	25/0.63	5.0/2.5	3.7/1.7	1.5/Tr	4.1/2.1	1	8	1	2/1
Gallium circaezans	White wild licorice	-	-	50/0.13	-	-	-	5.8/0.3	-	-	-	1	-
Geum canadense	Canadian avens	*	25/0.50	*	*	*	7.0/6.5	*	*	*	1	*	*
Glechoma hederacea	Gill-over-the-ground	*	-	-	-	*	-	-	-	*	-	-	-
Heuchera (americana)**	Heuchera	25/0.38	-	-	-	5.8/1.9	-	-	-	1	-	-	-
Hydrophyllum appendiculatum	Appendaged waterleaf	-	-	-	-	-	-	-	-	-	-	-	-
Hystrix patula	Bottlebrush	-	25/Tr	25/0.25	38/0.50	-	7.0/Tr	2.9/0.6	6.3/1.7	-	1	1	1
Lonicera japonica	Japanese honeysuckle	25/2.25	25/1.38	38/0.75	38/3.25	5.8/11.2	7.0/18.0	4.4/1.9	6.3/11.0	1	1	1	1
Mertensia virginica	Bluebells	-	-	100/17.25	-	-	-	11.5/42.9	-	-	-	1	-
Muhlenbergia sobolifera	Muhly grass	-	-	-	-	-	-	-	-	-	-	-	-
Nepeta cataria	Catnip	*	13/Tr	-	-	*	3.7/Tr	-	-	*	1	-	-
Panicum clandestinum**	Deergrass	13/Tr	-	-	-	5.0/Tr	-	-	-	1	-	-	-
Parthenocissus quinquefolia	Virginia creeper	100/10.38	25/0.25	50/Tr	100/10.63	23.5/51.5	7.0/3.3	5.8/Tr	16.5/36.1	1	1/8	8	1
Pilea pumila**	Clearweed	-	-	-	13/Tr	-	-	-	2.1/Tr	-	-	-	1
Polygonatum biflorum	Solomon's seal	-	-	*	-	-	-	*	-	-	-	*	-
Prunus serotina**	Black cherry	-	-	-	13/0.13	-	-	-	2.1/0.4	-	-	-	1
Quercus prinus	Oak	13/0.13	13/0.13	-	13/0.13	5.0/0.6	3.7/1.7	-	2.1/0.4	1	1	-	1
Rhus radicans	Poison ivy	*	-	-	*	*	-	-	*	*	-	-	*
Robinia pseudoacacia	Black locust	-	-	-	-	-	-	-	-	-	-	-	-
Rubus sp.	Blackberry	*	-	-	13/0.13	*	-	-	2.1/0.4	*	-	-	1
Sanguinaria canadensis	Bloodroot	-	-	-	13/0.25	-	-	*	2.1/0.9	-	-	*	1
Sanicula trifoliata	Snakeroot	*	-	13/0.13	38/0.88	*	-	1.5/0.3	6.3/3.0	*	-	1	1
Smilacina racemosa	False solomon's seal	-	-	38/0.63	38/0.75	-	-	4.4/1.6	6.3/2.6	-	-	1	1
Solidago sp.	Goldenrod	*	*	-	-	*	*	-	-	*	*	-	-
Symphoricarpos orbiculatus	Coralberry	-	-	13/0.13	13/Tr	-	-	1.5/0.3	2.1/Tr	-	-	1	1
Trillium sessile	Toadshade	-	-	50/1.13	25/0.75	-	-	5.8/2.8	4.1/2.6	-	-	1	1
Ulmus rubra	Slippery elm	25/0.63	13/0.13	25/0.13	25/0.38	5.8/3.1	3.7/1.7	2.9/0.3	4.1/1.3	1	8	8/1	1
Viola sororia	Wooly-blue violet	13/Tr	-	-	-	5.0/Tr	-	-	-	1	-	-	-
Vitis aestivalis	Summer grape	13/1.13	13/1.00	-	13/0.88	5.0/5.6	3.7/13.0	-	2.1/5.0	1	1	-	1

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 2 - Diseased, 8 - Dormant
Tr - Trace
( ) - Indicates tentative identification of species.

Table III-17

Species Composition, Frequency, Basal Area, and Condition of Tree and Sapling Strata (Plot Type 4 and 3), Walnut-Hickory-Buckeye (09) Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Frequency (%)	Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-1977	1977-1978	1978-1979	Change**
Tree stratum													
Live condition													
Aesculus glabra	Ohio buckeye	50	7.3	9.1	21.7	1/4	8	1/8	1	8	7	8	1
Carya ovata	Shagbark hickory	50	9.5	9.1	28.5	2	8	8	1	2	2	2	-
Cercis canadensis	Eastern redbud	50	0.9	9.1	2.3	2/1	8	8	1	2	2	2	-
Fraxinus americana	White ash	50	3.5	9.1	10.4	1	1/8	8	1	2	1	1	-
Fraxinus quadrangulata	Blue ash	50	0.4	9.1	1.2	1	8	8	1	1	2	1	(1)
Juglans nigra	Black walnut	50	8.8	9.1	26.1	7	8	7	1	1	1	1	-
Ulmus rubra	Slippery elm	50	0.8	9.1	2.4	8/1	8	8	1	2	2	2	-
Total Live		350	31.3	63.7	92.6					18	17	17	-
Dead condition													
Aesculus glabra	Ohio buckeye	50	1.0	9.1	3.0					0	1	1	-
Fraxinus americana	White ash	50	0.5	9.1	1.5					0	1	1	-
Fraxinus quadrangulata	Blue ash	50	0.3	9.1	0.9					0	0	1	1
Ulmus rubra	Slippery elm	50	0.6	9.1	1.8					1	1	1	-
Total Dead		200	2.4	36.4	7.2					3	4	1	1
TOTAL		550	33.7	100.1	99.8					19	20	21	1
Sapling stratum													
No saplings occurred in plots													

*1 - Healthy, 2 - Diseased, 4 - Mechanical injury, 7 - Dying, 8 - Dormant.

**Change in the number of individuals between the sample in 1977-1978 and the sample in 1978-1979.

- Indicates no change.

(n) Indicates loss of "n" individuals.

blue ash, and sugar maple remained the most important, although pawpaw (Asimina triloba) increased in importance. Four species observed during the 1977-1978 sampling were not present.

The Herbaceous stratum contained 38 species, 7 of which were not previously observed (Table III-18). Japanese honeysuckle remained the most important herbaceous species and appeared to be increasing in the study plots. In general, the herbaceous strata followed similar patterns as during the 1977-1978 sampling.

- Virginia Pine (11)

Little change occurred in the tree stratum between the 1977-1978 and current samplings, and all trees appeared healthy. One flowering dogwood (Cornus florida) died in the sapling strata. Other saplings appeared healthy. In April 1979, Virginia pine (Pinus virginiana) comprised 77 percent of the basal area and eastern redbud comprised nearly 14 percent (Table III-19).

The shrub class still had a low ground cover. Flowering dogwood, chestnut oak (Quercus prinus), and Oak (Quercus sp.) were the only species observed in the shrub stratum. Areal ground cover in the herbaceous class remained the lowest of all cover types (Table III-20). Flowering dogwood and Virginia creeper (Parthenocissus quinquefolia) comprised 57 percent of the vegetative ground cover in June 1978. Thirty-four taxa, including 5 previously unrecorded species, were observed during the current sampling. Nine species observed during the 1977-1978 sampling were not present.

- Orchard (10)

The CIR photo overlay (Figure III-3) shows current status of individual apple and peach sets (plantings) on the Reed Orchard Company property; Table III-21 lists the type, age, and condition of the individual sets. All sets except P8 were healthy. Fruit yield in P8 probably will be reduced compared to yield with completely healthy trees. Also shown (Table III-21) are the number of trees removed due to orchard maintenance since the previous sampling (1977-1978).

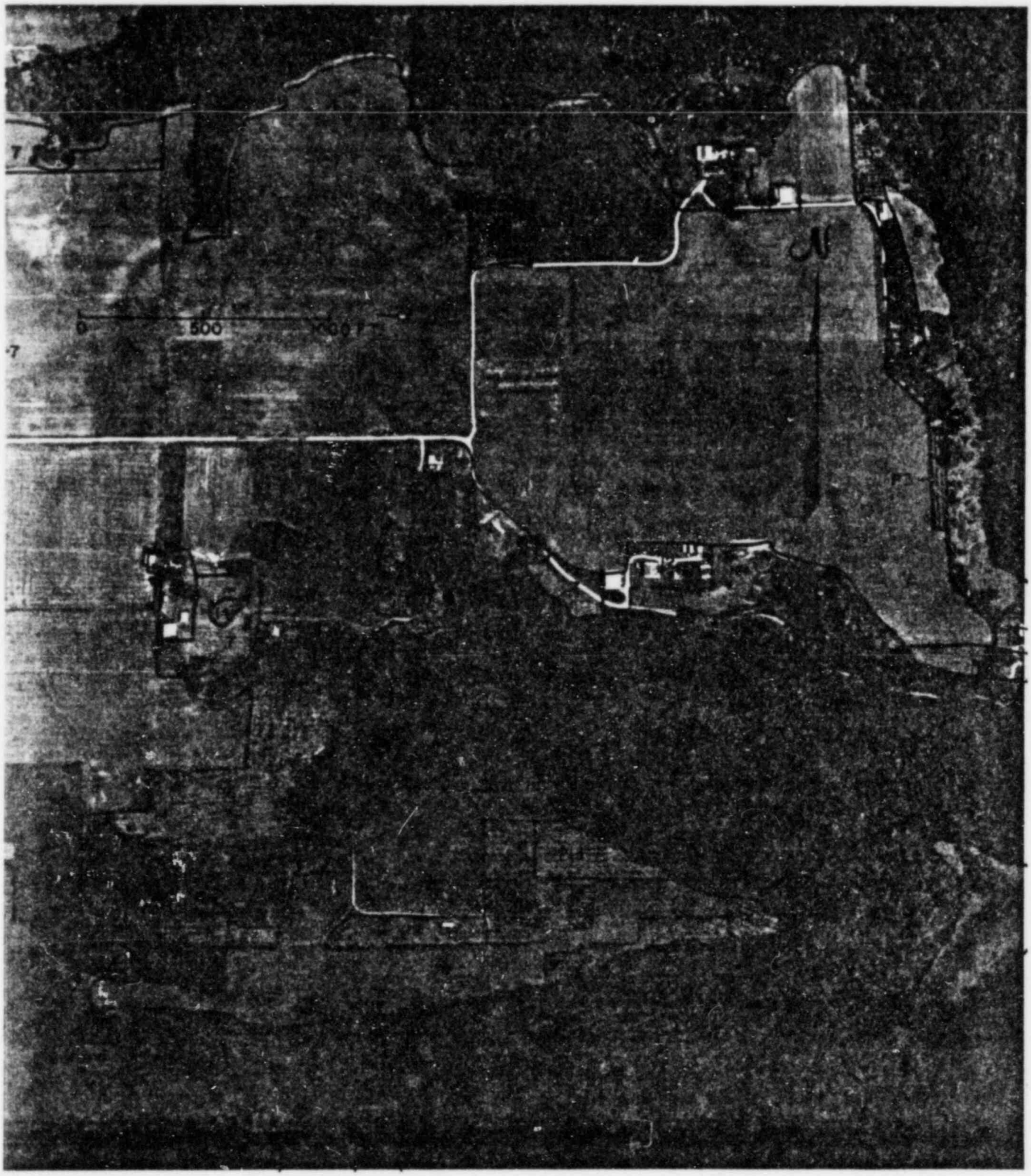

Figure III-3. Color Infrared Aerial Photograph of Reed Orchard Company Property with Overlay Depicting Vegetation Cover Types and Location of Orchard Sets, June 1979

Table III-18

Species Composition, Frequency, Areal Cover, and Condition of Herbaceous Stratum, Walnut-Hickory-Buckeye (09) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency ($)/Areal Cover ($) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Relative Frequency ($)/Areal Cover ($) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Mode Condition 1978 Sep	1978 Oct	1979 Apr	1979 Jun
Acer negundo	Boxelder	13/0.50	13/0.50	13/0.13	25/1.13	1.5/1.0	2.9/1.4	1.9/0.8	2.8/1.7	1	2	1	1
Acer saccharum	Sugar maple	38/Tr	-	*	*	4.2/Tr	-	*	*	1	-	*	*
Actinomeris alternifolia	Wingstem	38/1.13	13/0.25	-	25/3.13	4.2/2.2	2.9/0.7	-	2.8/4.7	1	6	-	3
Allium canadense	Wild garlic	-	-	-	-	-	-	-	-	-	-	-	-
Anemone canadensis	Canada anemone	13/0.38	13/Tr	-	*	1.5/0.7	2.9/Tr	-	*	1	7	-	*
Arabis laevigata	Smooth rock-cress	*	-	-	*	*	-	-	*	*	-	-	*
Asimina triloba	Paw paw	25/1.25	25/4.00	-	38/2.63	2.8/2.5	5.5/11.4	-	4.2/3.9	1	1	-	1
Aster divaricatus**	White wood aster	13/0.25	-	-	-	1.5/0.5	-	-	-	1	-	-	-
Boehmeria cylindrica**	False nettle	-	-	-	13/0.50	-	-	-	1.4/0.7	-	-	-	1
Cardamine douglassii	Purple cress	-	-	-	-	-	-	-	-	-	-	-	-
Carex sp.	Sedge	13/Tr	13/Tr	13/0.13	25/Tr	1.5/Tr	2.9/Tr	1.9/0.8	2.8/Tr	1	1	1	1
Carya cordiformis	Yellowbud hickory	38/0.38	-	-	-	4.2/0.7	-	-	-	1	-	-	-
Carya ovata	Shagbark hickory	-	-	-	25/0.88	-	-	-	2.8/1.3	-	-	-	1
Cercis canadensis	Eastern redbud	25/0.13	13/Tr	-	25/0.25	2.8/0.3	2.9/Tr	-	2.8/0.4	1	1	-	1
Circaea alpina	Small enchanters nightshade	13/Tr	-	-	38/0.75	1.5/Tr	-	-	4.2/1.1	1	-	-	1
Compositae**	Sunflower	13/0.13	-	-	-	1.5/0.3	-	-	-	1	-	-	-
Convolvulus sp.	Bindweed	-	-	-	-	-	-	-	-	-	-	-	-
Dentaria laciniata	Cut-leaved toothwort	13/0.13	-	100/5.25	-	1.5/0.3	-	15.0/32.0	-	1	-	1	-
Dicotyledonae	Dicot	*	-	13/Tr	13/0.13	*	-	1.9/Tr	1.4/0.2	*	-	1	1
Erigenia bulbosa	Harbinger-of-spring	-	-	88/1.25	-	-	-	13.2/7.6	-	-	-	1	-
Eupatorium serotinum	Late-flowering thoroughwort	100/3.63	100/2.75	-	50/3.63	11.2/7.2	22.0/7.8	-	5.6/5.4	1	1	-	1
Fraxinus americana	White ash	13/0.75	13/0.25	13/Tr	63/2.63	1.5/1.5	2.9/0.7	1.9/Tr	4.5/3.9	1	3	8	1
Fraxinus quadrangulata	Blue ash	50/2.63	25/0.63	-	-	5.6/5.2	5.5/1.8	-	-	1	8/1	-	-
Galium triflorum	Bedstraw	-	-	38/Tr	13/Tr	-	-	5.7/Tr	1.4/Tr	-	-	1	1
Geum canadense	Canadian avens	63/1.13	50/0.63	*	13/0.13	7.0/2.2	11.0/1.8	*	1.4/0.2	1	1	*	1
Glechoma hederacea	Gill-over-the-ground	*	*	-	13/Tr	*	*	-	1.4/Tr	*	*	-	1
Helianthus sp.	Sunflower	-	-	-	-	-	-	-	-	-	-	-	-
Heuchera sp.**	Heuchera	-	-	13/Tr	-	-	-	1.9/Tr	-	-	-	1	-
Hydrophyllum appendiculatum	Appendaged waterleaf	-	-	-	-	-	-	-	-	-	-	-	-
Lindera benzoin	Spice bush	25/0.63	*	-	*	2.8/1.2	*	-	*	1	*	-	*
Lonicera japonica	Japanese honeysuckle	88/19.25	100/25.75	100/7.13	100/25.50	9.8/38.0	22.0/73.3	15.0/43.5	11.1/35.0	1	1	1	1
Parthenocissus quinquefolia	Virginia creeper	88/3.13	-	50/Tr	100/10.63	9.8/6.2	-	7.5/Tr	11.1/15.8	1	-	1	1
Prunus serotina**	Black cherry	13/0.13	-	-	25/0.13	1.5/0.3	-	-	2.8/0.2	1	-	-	1
Ranunculus sp.	Buttercup	-	-	*	-	-	-	*	-	-	-	*	-
Ruellia carolinensis**	Hairy ruellia	-	-	-	-	-	-	-	-	-	-	-	-
Rhus radicans	Poison ivy	75/14.13	38/0.25	25/Tr	63/11.13	8.4/27.9	8.4/0.7	5.7/Tr	7.0/16.6	1	1	1	1
Rosa sp.	Rose	25/0.38	-	13/0.25	25/0.38	2.8/0.7	-	1.9/1.5	2.8/0.6	1	-	1	1
Rubus sp.	Blackberry	13/0.13	13/0.13	13/0.13	13/0.75	1.5/0.3	2.9/0.4	1.9/0.8	1.4/1.1	1	1	1	1
Sanicula trifoliata	Snakeroot	-	-	63/0.63	75/1.38	-	-	9.4/3.8	8.4/2.1	-	-	1	1
Saxifragaceae	Saxifrage	*	*	-	-	*	*	-	-	*	*	-	-
Symphoricarpos orbiculatus	Coralberry	25/0.38	*	75/1.00	63/2.00	2.8/0.7	*	11.2/6.1	7.0/3.0	1	*	1	1
Taraxacum officinale	Dandelion	-	-	13/0.13	13/0.50	-	-	1.9/0.8	1.4/0.7	-	-	1	1
Trillium sessile	Toadshade	-	-	13/0.25	-	-	-	1.9/1.5	-	-	-	1	-
Ulmus rubra	Slippery elm	25/Tr	13/Tr	*	13/0.13	2.8/Tr	2.9/Tr	*	1.4/0.2	1	8	*	1
Viola sororia	Hooty-blue violet	25/0.13	13/Tr	25/0.13	13/0.25	2.8/0.3	2.9/Tr	5.7/0.8	1.4/0.4	1	1	1	1
Umbelliferae	Umbel	-	-	*	-	-	-	*	-	-	-	*	-
Vitis aestivalis	Summer grape	13/Tr	*	-	13/Tr	1.5/Tr	*	-	1.4/Tr	1	*	-	1
Vitis rotundifolia**	Muscadine grape	-	-	-	13/0.25	-	-	-	1.4/0.4	-	-	-	1

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 2 - Diseased, 3 - Insect Damage, 6 - Dead, 7 - Dying, 8 - Dormant.
Tr - Trace

Table III-19

Species Composition, Frequency, Basal Area, and Condition of the Tree and Sapling Strata (Plot Type 4 and 3), Virginia Pine (11) Cover Type, September, October 1978 and April, June 1979

Scientific Name	Common Name	Frequency (%)	Basal Area (m^2/ha)	Relative Frequency (%)	Relative Basal Area (%)	Mode Condition* 1978 Sep	1978 Oct	1979 Apr	1979 Jun	No. Individuals in Sample 1976-1977	1977-1978	1978-1979	Change**
Tree stratum													
Live condition													
Cercis canadensis	Eastern redbud†	50	0.6	14.3	2.1	1	8	1	1	2	1	1	-
Cornus florida	Flowering dogwood†	100	4.0	28.6	14.3	1	1	8	1	3	8	8	-
Diospyros virginiana	Persimmon	0	0.0	0.0	0.0					1	0	0	-
Juniperus virginiana	Eastern red cedar	50	1.4	14.3	5.0	1	1	1	1	2	1	1	-
Liriodendron tulipifera	Yellow poplar	50	0.3	14.3	1.1	1	8	1	1	1	1	1	-
Pinus virginiana	Virginia pine	100	21.7	28.6	77.5	1	1	1	1	12	11	11	-
Total Live		350	28.0	100.1	100.0					21	22	22	-
Dead condition													
Juniperus virginiana	Eastern red cedar	0	0.0	0.0	0.0					0	0	0	-
Total Dead		0	0.0	0.0	0.0					1	0	0	-
TOTAL		350	28.0	100.1	100.0					22	22	22	-
Sapling stratum													
Live condition													
Cercis canadensis	Eastern redbud	50	0.6	50.0	66.6	1	8	8	1	1	1	1	-
Cornus florida	Flowering dogwood	0	0.0	0.0	0.0					2	1	0	(1)
Juniperus virginiana	Eastern red cedar	0	0.0	0.0	0.0					1	0	0	-
Liriodendron tulipifera	Yellow poplar	0	0.0	0.0	0.0					0	0	0	-
Pinus virginiana	Black cherry	0	0.0	0.0	0.0					1	0	0	-
Total Live		50	0.6	50.0	66.6					5	2	1	(1)
Dead condition													
Cercis canadensis	Eastern redbud	0	0.0	0.0	0.0					1	0	0	-
Cornus florida	Flowering dogwood	50	0.3	50.0	33.3					0	1	1	-
Total Dead		50	0.3	50.0	33.3					1	1	1	-
TOTAL		100	0.9	100.0	99.9					6	3	2	(1)

*1 - Healthy, 8 - Dormant.

**Change in the number of individuals between the sample in 1977-1978 and the sample in 1978-1979.

†Values for these taxa transposed in 1977-1978 annual report.

- Indicates no change.

(n) Indicates loss of "n" individuals.

Table III-20

Species Composition, Frequency Areal Cover, and Condition of Herbaceous Stratum, Virginia Pine (11) Cover Type, 1978 and 1979

Scientific Name	Common Name	Frequency ($)/Areal Cover ($) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Relative Frequency ($)/Areal Cover ($) 1978 Sep	1978 Oct	1979 Apr	1979 Jun	Mode Condition 1978 Sep	1978 Oct	1979 Apr	1979 Jun
Acer saccharum	Sugar maple	13/0.13	13/Tr	-	13/Tr	2.4/0.8	2.5/Tr	-	1.8/Tr	1	1	-	1
Actinomeris alternifolia**	Wing stem	13/0.63	-	-	-	2.4/3.7	-	-	-	1	-	-	-
Allium canadense	Wild garlic	-	*	63/0.13	-	-	*	11.3/5.7	-	-	*	1	-
Aspleniun platyneuron	Ebony spleenwort	*	-	-	-	*	-	-	-	*	-	-	-
Botrychium virginianum	Virginia grape-fern	-	-	-	-	-	-	-	-	-	-	-	-
Bryophyta	Moss	-	-	-	-	-	-	-	-	-	-	-	-
Campsis radicans	Trumpet vine	-	-	-	-	-	-	-	-	-	-	-	-
Carex laeviculmis	Little prickly sedge	*	25/0.50	*	*	*	4.8/5.5	*	*	*	1	*	*
Carex swanii	Swan's sedge	-	-	38/0.25	25/Tr	-	-	6.8/11.0	3.5/Tr	-	-	1	1
Carya cordiformis	Yellowbud hickory	-	13/Tr	-	-	-	2.5/Tr	-	-	-	1	-	-
Cercis canadensis	Eastern redbud	50/0.13	25/Tr	-	50/0.25	9.2/0.8	4.8/Tr	-	6.9/1.3	1	1	-	1
Compositae	Sunflower	-	-	*	13/Tr	-	-	*	1.8/Tr	-	-	*	-
Cornus florida	Flowering dogwood	100/5.63	1.0/5.00	100/0.38	100/6.38	18.5/32.8	19.3/55.4	18.0/16.6	13.9/32.9	1	1	8	1
Desmodium paniculatum	Panicled tick-trefoil	-	-	-	*	-	-	-	*	-	-	-	*
Dioscorea villosa	Wild yam	*	-	-	-	*	-	-	-	*	-	-	-
Elymus virginicus	Virginia wild rye	38/0.13	13/Tr	13/Tr	-	7.0/0.8	2.5/Tr	2.3/Tr	-	1	1	1	-
Eupatorium serotinum	Late-flowering thoroughwort	-	-	-	-	-	-	-	-	-	-	-	-
Fagus grandifolia	Beach	13/0.13	-	-	38/0.63	2.4/0.8	-	-	5.3/3.2	1	-	-	-
Fragaria virginiana	Wild strawberry	13/0.13	25/0.13	13/0.13	13/0.13	2.4/0.8	4.8/1.4	2.3/5.7	1.8/0.7	1	1	1	1
Fraxinus americana	White ash	*	-	*	25/1.25	*	-	*	5.5/6.4	*	-	*	1
Fraxinus quadrangulata	Blue ash	38/0.75	-	-	13/0.25	7.0/4.4	-	-	1.8/1.5	1	-	-	1
Gallum circaezans	White wild licorice	50/0.13	38/0.25	38/Tr	50/0.13	9.2/9.8	7.3/2.8	6.8/Tr	6.9/0.7	1	1	1	1
Gallum triflorum**	Fragrant bedstraw	-	-	-	13/Tr	-	-	-	1.8/Tr	-	-	-	1
Geum canadense	Canadian avens	-	-	-	13/Tr	-	-	-	1.8/Tr	-	-	-	1
Hamamelis virginiana	Witch-hazel	-	*	*	-	-	*	*	-	-	*	*	-
Jeffersonia diphyla	Twin leaf	-	-	13/0.13	13/0.13	-	-	2.3/5.7	1.8/0.7	-	-	1	1
Juniperus virginiana**	Eastern red cedar	-	-	13/Tr	-	-	-	2.3/Tr	-	-	-	1	-
Lonicera japonica	Japanese honeysuckle	13/0.25	13/0.25	13/0.13	13/0.25	2.4/1.5	2.5/2.8	2.3/5.7	1.8/1.3	1	1	1	1
Luzula multiflora**	Cyperus	-	-	13/0.13	38/0.75	-	-	2.3/5.7	5.3/5.9	-	-	1	1
Osmorhiza claytonii	White snakeroot	*	-	-	-	*	-	-	-	*	-	-	-
Panicum boscii**	Bosc's panicum	25/Tr	13/Tr	-	-	4.6/Tr	2.5/Tr	-	-	1	1	-	-
Parthenocissus quinquefolia	Virginia creeper	25/7.13	25/Tr	13/Tr	63/4.63	4.6/41.5	4.8/Tr	2.3/Tr	8.7/23.8	1	8	8	1
Phyrma leptostachya	Lopseed	-	25/0.75	-	13/Tr	-	4.8/8.5	-	1.8/Tr	-	1	-	1
Pinus virginiana	Virginia pine	-	13/Tr	-	-	-	2.5/Tr	-	-	-	1	-	-
Podophyllum peltatum	May apple	-	-	13/Tr	13/0.25	-	-	2.3/Tr	1.8/1.3	-	-	1	1
Prunus serotina	Black cherry	50/0.63	63/0.63	75/0.63	75/1.25	9.2/3.7	12.2/7.0	13.5/27.5	10.4/6.4	1	1	1	1
Quercus rubra	Red oak	25/0.75	25/0.63	*	*	4.6/4.4	4.8/7.0	*	*	1	1	*	*
Rhus radicans	Poison ivy	13/0.25	-	38/Tr	13/0.50	2.4/1.5	-	6.8/Tr	1.8/2.6	1	-	1	1
Robinia pseudoacacia	Black locust	*	-	-	-	*	-	-	-	*	-	-	-
Rosaceae	Rose	*	-	-	-	*	-	-	-	*	-	-	-
Rubus sp.	Blackberry	-	-	-	-	-	-	-	-	-	-	-	-
Sanicula trifoliata	Snakeroot	63/0.38	63/0.63	75/0.25	75/1.50	11.6/2.2	12.2/7.0	13.5/11.0	10.4/7.7	1	1	1	1
Smilax sp.	Greenbrier	-	-	-	13/0.13	-	-	-	1.8/0.7	-	-	-	1
Smilax herbacea	Carrion-flower	*	13/0.13	-	-	*	2.5/1.4	-	-	*	1	1	-
Solidago sp.	Goldenrod	-	13/0.13	13/0.13	-	*	2.5/1.4	2.3/5.7	-	*	1	1	-
Taraxacum officinale	Dandelion	-	-	-	*	-	-	-	*	-	-	-	*
Ulmus rubra	Slippery elm	-	-	-	13/0.13	-	-	-	1.8/0.7	-	-	-	1
Viola sororia	Wooly-blue violet	*	-	13/Tr	13/Tr	*	-	2.3/Tr	1.8/Tr	*	-	1	1

*Taxa was observed in plots during indicated previous sampling period (1977-1978), but not during the current sampling period.
-Taxa was not observed in plots during indicated sampling period previously nor during the current sampling period.
**Taxa observed in plots for the first time during 1978-1979 sampling period.
***1 - Healthy, 8 - Dormant.
Tr - Trace.

Table III-21

Fruit Tree Type, Condition and Age of Sets for the Orchard Type (10), Reed Orchard Company Property, June 1979

Code*	Set Type	Age of Set (yr)**	Vegetative	Fruit	Trees Removed Since 1977-1978 Sampling	Remarks
P1	Peach	7	Healthy	Healthy	1	
P2	Peach	14	Healthy	Healthy	1	
P3	Peach	5	Healthy	Healthy	1	
P4	Peach	12	Healthy	Healthy	0	
P5	Peach	12	Healthy	Healthy	0	
P6	Peach	17	Healthy	Healthy	0	
P7	Peach	15	Healthy	Healthy	2	
P8	Peach	7	Diseased	Reduced yield	0	Peach borer
P9	Peach	20	Healthy	Healthy	13	
P10	Peach	33	Healthy	Healthy	13	
P11	Peach	33	Healthy	Healthy	3	
P12	Peach/Apple	15	Healthy	Healthy	2	
P13	Peach	5	Healthy	Healthy	15	
P14	Peach	7	Healthy	Healthy	2	
P15	Peach	Mixed	Healthy	Healthy	0	
A1	Apple	7	Healthy	Healthy	0	
A2	Apple	7	Healthy	Healthy	0	
A3	Apple	13	Healthy	Healthy	0	
A4	Apple	13	Healthy	Healthy	0	
A5	Apple	13	Healthy	Healthy	0	
A6	Apple	7	Healthy	Healthy	0	

*Code identifies location of individual sets on photo overlay (Figure III-3).

**Personal Communication – Mr. Reed, Reed Orchard Company, R.R. 1, Hanover, Indiana 47243

2. Soils

- Moisture

Soil moisture values for the current sampling period (Table III-22) were generally lower for September and October 1978 and about the same for April and June 1979 as compared to the previous sampling period of 1977-1978. These fluctuations reflect the differences in rainfall for these months during the monitoring period. The maple-basswood, walnut-hickory-buckeye, and oak-maple cover types generally had high soil moisture values while the red pine, Virginia pine sycamore-boxelder, and orchard types had low soil moisture values.

- Bulk Density

Soil bulk density values (Table III-23) were slightly higher during the 1978-1979 sampling period as compared to the 1977-1978 sampling period. Differences in soil bulk density between the two periods is probably due to differences in soil moisture. In general, increases in soil moisture tend to promote conditions that decrease bulk density thereby increasing the porespace of the soil. Vegetation cover types with low soil moisture (e.g., red pine, sycamore-boxelder, and the orchard types) also had high bulk density soils.

- pH

Soil pH values (Table III-24) were slightly lower in September and October 1978 than in April and June 1979 for all cover types except the orchard, red, and virginia pine types. Red pine, Virginia pine, sycamore-boxelder, and orchard cover types generally had lower soil pH, while walnut-hickory-buckeye, oak-hickory, oak-maple, and maple-basswood had higher soil pH.

Comparison of soil pH for the current 1978-1979 sampling period with soil pH for the 1977-1978 sampling period shows that soil pH was generally higher in September and October 1977 than soil pH in September and October 1978. However, soil pH for April and June 1978 was generally lower than soil pH for April and June 1979. Soil pH fluctuations usually reflect changes in soil moisture preceding the pH measurement and are caused primarily by chemical changes in sulfate and carbonate compounds upon drying. Cover types with low soil moisture types continued to exhibit the lowest soil pH values. Lower pH values may also be related to greater soil leaching in these types.

- Conductivity

Electrical conductivity (soil salinity) values (Table III-25) were generally higher during the 1978-1979 sampling period than electrical conductivity values for the 1977-1978 sampling period. The exception to this pattern was in June 1979 when electrical conductivity was generally lower than in June 1978.

Table III-22

Mean ($\bar{x}$) and Standard Error (SE) Values* for Soil Moisture (%) from Each Vegetation Cover Type for September, October 1978 and April, June 1979

		1978				1979			
		Sep		Oct		Apr		Jun	
Code	Cover Type	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
01	Maple-Basswood	31.9	3.7	36.3	2.4	40.3	4.0	35.6	2.9
02	Oak-Maple	28.1	3.3	28.5	3.0	34.8	5.5	30.5	3.7
03	Chestnut oak	22.3	5.8	29.1	3.9	35.2	4.0	26.2	1.9
04	Red pine	20.0	1.0	21.7	2.7	29.4	2.0	23.6	3.0
05	Sycamore-Boxelder	21.5	1.0	25.9	2.8	28.5	3.5	25.1	2.3
06	Oak-Hickory	18.6	2.4	23.6	1.9	27.2	2.7	20.4	1.4
09	Walnut-Hickory-Buckeye	30.6	5.8	34.2	1.7	35.5	2.9	32.5	2.2
10	Orchard	14.7	5.4	23.4	6.5	24.4	1.9	21.9	1.3
11	Virginia pine	19.1	2.3	22.0	1.2	25.9	4.1	19.0	1.0

*Based on 4 replicates per cover type per date sampled

Table III-23

Mean ($\bar{x}$) and Standard Error (SE) Values* for Soil Bulk Density (g/cm^3) from Each Vegetation Type for September, October 1978 and April, June 1979

		1978				1979			
		Sep		Oct		Apr		Jun	
Code	Cover Type	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
01	Maple-Basswood	1.01	0.15	0.98	0.06	0.87	0.08	0.86	0.08
02	Oak-Maple	0.91	0.03	1.07	0.11	0.99	0.13	1.02	0.07
03	Chestnut oak	0.79	0.10	0.90	0.14	0.87	0.06	0.93	0.05
04	Red pine	1.06	0.06	1.18	0.13	1.22	0.16	1.19	0.13
05	Sycamore-Boxelder	0.76	0.44	1.11	0.07	1.09	0.07	1.10	0.08
06	Oak-Hickory	0.98	0.01	1.10	0.11	1.14	0.11	1.03	0.04
09	Walnut-Hickory-Buckeye	0.86	0.13	0.90	0.05	0.98	0.05	0.89	0.09
10	Orchard	1.02	0.24	1.24	0.11	1.10	0.06	1.17	0.05
11	Virginia pine	0.90	0.14	1.03	0.08	1.05	0.07	1.11	0.07

*Based on 4 replicates per cover type per date sampled

Table III-24

Mean ($\bar{x}$) and Standard Error (SE) Values* for Soil pH (Measured in Water) from Each Vegetation Cover Type for September, October 1978 and April, June 1979

		1978				1979			
		Sep		Oct		Apr		Jun	
Code	Cover Type	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
01	Maple-Basswood	6.6	0.2	6.7	0.1	7.4	0.1	7.3	0.1
02	Oak-Maple	6.5	0.1	6.8	0.1	7.3	0.3	6.9	0.8
03	Chestnut oak	6.4	0.1	7.0	0.1	7.5	0.2	7.3	0.3
04	Red pine	6.3	0.3	6.4	0.6	6.3	0.6	6.1	0.5
05	Sycamore-Boxelder	6.2	0.1	6.2	0.3	6.9	0.8	6.9	1.0
06	Oak-Hickory	6.7	0.1	6.8	0.2	7.7	0.2	7.8	0.1
09	Walnut-Hickory-Buckeye	6.9	0.1	7.1	0.1	7.4	0.1	7.3	0.1
10	Orchard	6.4	0.3	6.7	0.3	5.9	0.4	5.7	1.0
11	Virginia pine	6.5	0.1	6.2	0.0	6.2	0.4	5.6	0.5

*Based on 4 replicates per cover type per date sampled

Table III-25

Mean ($\bar{x}$) and Standard Error (SE) Values* for Soil Conductivity (μmho/cm) from Each Vegetation Cover Type for September, October 1978 and April, June 1979

		1978				1979			
		Sep		Oct		Apr		Jun	
Code	Cover Type	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
01	Maple-Basswood	375	142	400	87	263	123	286	67
02	Oak-Maple	340	60	262	43	220	163	211	50
03	Chestnut oak	333	27	488	101	278	31	209	17
04	Red pine	194	84	171	34	183	92	228	52
05	Sycamore-Boxelder	323	48	238	39	231	215	233	51
06	Oak-Hickory	475	111	370	76	464	202	264	77
09	Walnut-Hickory-Buckeye	321	125	255	89	264	44	258	49
10	Orchard	328	91	313	139	626	154	333	51
11	Virginia pine	92	28	108	12	204	41	140	14

*Based on 4 replicates per cover type per date sampled.

To understand existing salt accumulation patterns in the soil, it is necessary to briefly describe a few characteristics of soluble salts. Naturally occurring soluble salts tend to move with water and may be carried by precipitation or runoff into topographically lower areas where percolation allows salts to move deep in the soil-forming layers.

Soluble salt concentrations in the surface soil vary seasonally and are highly related to the precipitation-evaporation characteristics of a site. After periods of considerable precipitation, salts may be leached from the site or deposited deeper in the soil layers at the same site. During dry periods, evaporation of soil moisture draws salts to the surface where accumulation results.

Drainage patterns, largely influenced by topography, and physical characteristics of the soil determine salt deposition patterns for any given area. Ridges or hilltops in an area often have greater leaching of the soil due to runoff characteristics while moist areas or lowland basins receive runoff waters high in soluble salts from other areas.

Vegetation cover types in an area are often correlated with drainage and salt accumulation patterns. This is well illustrated by the vegetation cover types within the study area. For example, the Virginia pine and red pine cover types both occur on the ridgetops and have the lowest soil moisture and soluble salt concentrations when compared with soils of other cover types (Table III-26). Similarly, the maple-basswood, oak-hickory, and walnut-hickory-buckeye generally have the highest soil moisture and soluble salt concentrations. The high salinity values for soils in the Reed Orchard Company site are probably a result of fertilizer applications. Based on other soil parameters, the orchard type is more similar to the pine cover types.

The effects of salts on vegetation are often evaluated on the basis of electrical conductivity of an aqueous solution (e.g., soil, irrigation, or rainwater). As shown in Figure III-4, salt solutions with electrical conductivity values of 0 to 2,000 micromhcs/cm at 25°C usually have negligible effects on plants; values from 2,000 to 4,000 may restrict the

Table III-26

Mean ($\bar{x}$) and Standard Error (SE) for Soil Conductivity (μmho/cm at 25°C) from Each Vegetation Cover Type for September 1978 to June 1979 Sampling Period

		Soil Moisture (%)				Soil Conductivity (micromhos/cm)				
Code	Cover Type	$\bar{x}$	SE	1978-1979 Rank	1977-1978 Rank	$\bar{x}$	SE	1978-1979 Rank	1977-1978 Rank	Maximum Single Value (Sep 78-Jun 79)
01	Maple-Basswood	36.0	3.4	1	1	331	67	3	1	560***
02	Oak-Maple	30.5	3.1	3	3	258	59	6	7	420***
03	Chestnut oak	28.2	5.4	4	4	327	119	4	5	625**
04	Red pine	23.7	4.1	6	6	194	25	8	8	320***
05	Sycamore-Boxelder	25.3	2.9	5	7	256	45	7	6	440*
06	Oak-Hickory	22.5	3.8	7	5	393	98	2	3	770*
09	Walnut-Hickory-Buckeye	33.2	2.1	2	2	275	31	5	4	461***
10	Orchard	21.1	4.4	8	8	400	151	1	2	850*
11	Virginia pine	21.5	3.2	9	9	136	50	9	9	240*

*In April 1979.
**In October 1978.
***In September 1978.

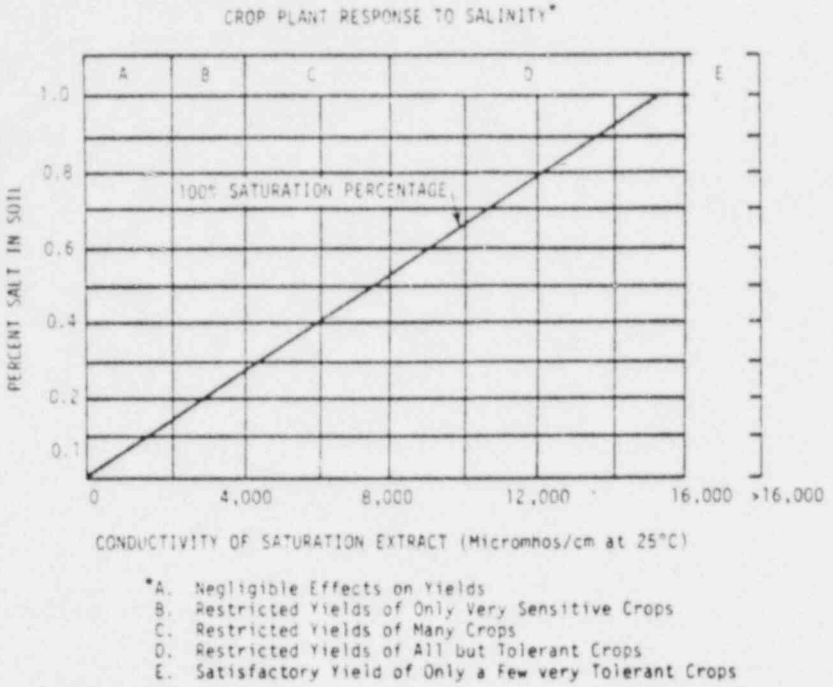

Figure III-4. Relation of the Percent Salt in the Soil to the Electrical Conductivity of the Saturation Extract to Crop Response in the Conductivity Ranges Designated by Letters (A, B, C, D, E). (These ranges are related to crop response by salinity scale, after Richards 1954, p.9.)

yield of salt-sensitive crops; values from 4,000 to 8,000 restrict the yield of many plant species, and at values over 8,000 micromhos/cm only salt-tolerant species yield satisfactorily (Richards 1954). As shown in Table III-26 the highest single electrical conductivity value encountered was 850 micromhos/cm in the orchard cover type. This is still far below salinity levels that might be harmful to crop or native plant species. From the existing data collected to date it does not appear that natural salinity levels reach sufficient concentrations to create serious soil salinity problems.

- Cation Exchange Capacity and Base Saturation Percentage

During September, October, and April of the current sampling period (1978-1979), cation exchange capacity values of the soil (Table III-27) were slightly higher than values from September, October, and April

of the previous sampling period (1977-1978). However, during June of the current sampling period, values were generally lower than values measured for June of the previous sampling period.

Those cover types with high soil moisture also had high cation exchange capacities. Soils from maple-basswood, chestnut oak, and walnut-hickory-buckeye cover types had high cation exchange capacities, while soils from Virginia and red pine, sycamore-boxelder and the orchard cover types had low cation exchange capacities. Seasonal fluctuations in the cation exchange capacity is probably due to complex relationships involving soil moisture, pH, and organic matter.

Patterns for high and low values of soil base saturation (Table III-28) were similar to those for cation exchange capacities. Seasonal values of soil base saturation were more variable than values for cation exchange capacity.

Table III-27

Mean ($\bar{x}$) and Standard Error (SE) Values* for Soil Cation Exchange Capacity (meq/100 g) from Each Vegetation Cover Type for September, October 1978 and April, June 1979

		1978				1979			
		Sep		Oct		Apr		Jun	
Code	Cover Type	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
01	Maple-Basswood	37.8	3.6	43.6	19.8	70.4	16.2	29.1	3.2
02	Oak-Maple	34.9	6.3	23.9	9.4	42.7	6.4	30.6	4.4
03	Chestnut oak	38.6	3.8	45.4	16.7	86.0	17.6	29.0	4.7
04	Red pine	18.9	2.6	25.8	2.1	17.0	3.8	14.9	1.4
05	Sycamore-Boxelder	18.9	1.2	21.4	2.9	24.0	4.2	14.0	1.3
06	Oak-Hickory	31.4	3.7	40.3	5.4	34.0	6.2	26.0	4.4
09	Walnut-Hickory-Buckeye	37.7	3.1	57.6	5.3	52.4	8.7	33.8	6.5
10	Orchard	16.9	1.2	17.3	2.7	16.8	3.6	12.2	0.3
11	Virginia pine	17.1	2.3	20.6	1.3	13.4	2.1	14.2	3.9

*Based on 4 replicates per cover type per date sampled.

Table III-28

Mean ($\bar{x}$) and Standard Error (SE) Values* for Soil Base Saturation (%) from Each Vegetation Cover Type for September, October 1978 and April, June 1979

		1978				1979			
		Sep		Oct		Apr		Jun	
Code	Cover Type	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE	$\bar{x}$	SE
01	Maple-Basswood	30.8	7.0	75.0	23.1	88.8	12.1	73.2	13.7
02	Oak-Maple	34.9	6.0	72.9	36.8	98.8	14.8	52.9	6.0
03	Chestnut oak	28.1	16.3	75.3	25.8	70.3	14.1	71.9	12.6
04	Red pine	28.4	4.3	23.5	19.1	60.9	45.8	39.4	7.1
05	Sycamore-Boxelder	47.7	19.7	51.9	47.6	76.6	61.1	76.2	45.9
06	Oak-Hickory	47.6	6.8	40.2	43.2	141.1	57.0	83.4	13.7
09	Walnut-Hickory-Buckeye	35.6	4.1	40.2	13.4	91.9	22.2	61.7	9.3
10	Orchard	30.6	9.9	44.0	18.1	48.4	60.0	48.4	15.7
11	Virginia pine	22.1	6.3	32.7	10.9	44.9	54.2	14.7	4.1

*Based on 4 replicates per cover type per date sampled

B. VEGETATION STRESS

One hundred discrete areas of vegetation stress were delineated within the survey area (Figure III-2); 50 were less than 5 acres and are listed by cover type and location in Table III-29. These small areas consisted of one to several individuals or small stands that were moderately or severely infected with the various stress agents. Because of the generally universal presence of locust leaf miner (Chalepus dorsalis) on black locust (Robinia pseudoacacia) in cover types, 2, 3, 5, and 8 and of leaf blotch (Guignardia aesculi) on the Buckeyes (Aesculus) in cover types 6, 3, and 9, areas that appeared to have less than moderate infestations were not mapped.

Stress reactions that were identified were produced by natural causal agents. No direct man-induced causes were apparent. Areas previously affected by agents such as SO_2, herbicide, and effluent from pipelines have recovered or are near complete recovery; no new areas were encountered. Table III-30 lists cover type, location, causal agent, and extent of areas showing stress reactions greater than 5 acres.

Table III-29

Cover Type and Location of Vegetation Stress Areas Covering Less than 5 Acres within Marble Hill Survey Area, July 1979

Cover Type	Location*	Number of Stress Areas	Comments		
			Species	Agent	Extent
5	2B	1	Silver maple	Undetermined	No visual
3	3A	1	Black locust	Locust leaf miner	Severe
9	3B**	6	Black locust	Locust leaf miner	Severe
2	3B	1	Black locust	Locust leaf miner	Severe
7	3B	1	Black locust	Locust leaf miner	Severe
7	3C	1	Black locust	Locust leaf miner	Severe
1	4A	1	Black locust	Locust leaf miner	Severe
2	4A	1	Black locust	Locust leaf miner	Moderate
6	4B	1	Ohio buckeye	Leaf blotch	Severe
2	4B	1	Black locust	Locust leaf miner	Moderate
2	5A	1	Black locust	Locust leaf miner	Moderate
5	5C	1	Silver maple	Undetermined	No visual
7	5C	1	Black locust	Locust leaf miner	Moderate
2	6B	1	Black locust	Locust leaf miner	Moderate
1	6B	3	Black locust	Locust leaf miner	Moderate
5	6B	1	Silver maple	Undetermined	No visual
7	6B	1	Black locust	Locust leaf miner	Severe
6	6C	2	Ohio buckeye	Leaf blotch	Severe
5	7B	1	Silver maple	Undetermined	No visual
1	8B	1	Black locust	Locust leaf miner	Moderate
5	8B	2	Silver maple	Undetermined	No visual
10	9A	2	Peach	General decline	Slight
2	9B	3	Black locust	Locust leaf miner	Moderate
2	9C	1	Black locust	Locust leaf miner	Severe
2	10B	2	Black locust	Locust leaf miner	Moderate
7	10B	2	Black locust	Locust leaf miner	Moderate
5	10D	1	Silver maple	Undetermined***	No visual***
8	11A	2	Black locust	Locust leaf miner	Moderate
2	11A	5	Black locust	Locust leaf miner	Moderate
7	11A	2	Black locust	Locust leaf miner	Severe

*Keyed to location grid on vegetation cover type map (Figure III-1) and within a grid unit from north to south.

**Stress areas first recorded during previous sampling (May 1977).

***CIR photographs indicated potential stress, however no visual stress symptons were apparent during ground truthing.

Table III-30

Cover Type, Location, and Causal Agent of Vegetation Stress for Areas Greater than 5 Acres within Marble Hill Survey Area, May 1979

Cover Type	Location*	Number of Stress Areas	Species	Comments: Agent	Comments: Extent
2	1B	1	Black locust	Locust leaf miner	Severe
9	1B	1	Black locust	Locust leaf miner	Severe
5	1C	1	Black locust	Locust leaf miner	Severe
2	2A	1	Black locust	Locust leaf miner	Moderate
5	2B	1	Silver maple	Undetermined**	No visual**
5,3	3A	1	Black locust, silver maple	Locust leaf miner, undetermined	Moderate
9	3A	1	Ohio buckeye	Leaf blotch	Severe
2	4A	1	Black walnut	Undetermined	No visual
5	4B	1	Silver maple	Undetermined	No visual
5,9	4C	1	Black locust	Locust leaf miner	Moderate
9	4C	1	Black locust, Ohio buckeye	Locust leaf miner, leaf blotch	Moderate
1	5B	1	Black locust, Ohio buckeye	Locust leaf miner, leaf blotch	Moderate
9	5C	2	Black locust, Ohio buckeye	Locust leaf miner, leaf blotch	Moderate
2	6A	1	Black locust	Locust leaf miner	Moderate
5	6C	2	Silver maple	Undetermined	No visual
6	6C	1	Black locust, Ohio buckeye	Locust leaf miner, leaf blotch	Moderate
2	6C	1	Black locust	Locust leaf miner	Severe
1	7B	1	Black locust	Locust leaf miner	Moderate
3	7B	1	Black locust	Locust leaf miner	Moderate
3,2	8A	2	Black locust	Locust leaf miner	Moderate
11	8B	1	Red pine	General decline	Moderate
3	8B	1	Black locust	Locust leaf miner	Moderate
3,2	8B	1	Black locust	Locust leaf miner	Moderate
1	8B	1	Black locust	Locust leaf miner	Severe
6	8C	1	Yellow buckeye, black locust	Leaf blotch, locust leaf miner	Severe
8	8C	1	Silver maple	Undetermined	No visual
2	9B	2	Black locust	Locust leaf miner	Moderate
5	9B	1	Silver maple	Undetermined	No visual
6,2	9C	1	Yellow buckeye	Leaf blotch	Severe
5	9C	1	Silver Maple	Undetermined	No visual
2	10B	4	Black locust, buttermut, sycamore	Locust leaf miner, insect, Corythuca	Moderate
4	10B	1	Red pine	General decline	Severe
1	10B	1	Black locust	Locust leaf miner	Moderate
5	10B	1	Silver maple	Undetermined	No Visual
5	10C,D	2	Silver maple	Undetermined	No Visual
2	11A	3	Black locust	Locust leaf miner	Severe
2	11B	1	Black locust	Locust leaf miner	Severe
3,2	11C	1	Black locust, yellow buckeye	Locust leaf miner, leaf blotch	Severe
5	11C	2	Silver maple	Undetermined	No Visual

*Keyed to location grid on vegetation cover type map (Figure III-1), and within a grid unit from north to south.

**Stress areas first recorded during previous sampling (May 1977).

Stress to the vegetation within the Marble Hill site was attributed to continued general decline of the red pine in areas 4-10B and of sycamore in area 2-10B. Locust leaf miner was present in all stands of black locust with the most severe infestations on the margins of the cleared area near the settling pond and on the eastern perimeter. Sycamores in area 7-10B also exibited a moderate infestation of lace bug (Corythuca sp.). Butternut (Juglans cinera) in area 1-10B showed some slight damage caused by an undetermined insect pest. Silver maples in area 5-10C, D also appeared stressed on the CIR aerial photographs, but exhibited no visual indication of stress during the ground truthing.

As in 1978 (TI 1978), the locust leaf miner was present in nearly all stands of black locust. The areas with moderate and severe infestations are presented in Table III-30 and in Figure III-2. Forty-six percent of all stressed areas greater than 5 acres was attributed to this insect. Not all stands were affected to the same extent as during 1978; however, the infestation appeared about the same as during 1978.

Lace bug is another insect pest that is widespread in eastern United States. At Marble Hill it was observed as a moderate infestation on sycamore. Since most lace bugs are host-specific, it is likely that the species infestation is due to Corythucha ciliata which is host-specific for sycamore.

Symptoms of lace bug damage to plants may include grayish stippling or mottling of the upper leaf surface, a result of the destruction of mesophyll tissue. In heavy infestations, the green color completely disappears and leaves drop prematurely. The lower surfaces of infested leaves are characteristically disfigured by dark varnish-like spots of dried excrement, cast nymphal skins, and living nymphs and adults.

The life cycle of lace bugs is generally similar for most species (Beshear, Tippins, and Howell 1976). Eggs are inserted into leaf tissue. There are 4 or 5 nymphal instars. There are one to several generations per year depending on the species. The overwintering stage for species with deciduous hosts is probably always the adult.

In the chestnut oak (3), oak-hickory (6) and walnut-hickory-buckeye (9) cover types, the Ohio buckeye and yellow buckeye were infested with leaf blotch. Nearly all infestations were considered moderate or severe. This disease is caused by the fungus Guignardia aesculi. It produces irregular reddish-brown blotches with narrow yellowish margins (Carter 1964). In slight infestations the dark blotches may be small and be confined to interveinal or marginal tissue. In moderate to severe infestations, the dark blotches cover the entire leaf including the veins and midrib. Yellowing of the entire leaf and early senescence often accompany the severe infestations, which if this occurs over several successive years may stunt the growth of these trees.

The first indication of this disease may have been apparent during the September 1978 sampling, when what appeared to be early senescence was first observed.

General decline of the Virginia pines in areas 11-8A,B were observed. The trees exhibited needle browning and were being overtopped by other deciduous trees in the stands.

Silver maple in the sycamore-boxelder (5) cover type showed potential stress on the CIR aerial photographs. No visual stress reaction were observed during ground truthing, however. Generally, trees of the sycamore-boxelder type are tolerant of prolonged flooding with the exception of silver maple which can withstand temporary flooding but is susceptible to prolonged flooding (Fowells 1965). The unusually high water levels of the Ohio river during the spring 1979 may have caused or contributed to the stress condition. Under fluctuating water table conditions silver maple, pin oaks, and American elms growing with sycamore have been reported to die (Fowells 1965).

SECTION IV

SUMMARY

During the monitoring period (May 1976 to present) the seasonal patterns that were observed for vegetation in the sample plots have been within those expected for the Marble Hill, Indiana area. Fluctuations in species composition, as well, appeared normal. The introduction of several plant species into the sampling plots for red pine (04), sycamore-boxelder (05), and Virginia pine (11) cover types, as part of normal secondary succession may have been attributed to clearing operations for the Marble Hill construction site. These new species generally were insignificant components of the plots and were species which were already associated with the affected cover types or species which were considered weeds. Differences observed in the soils were considered to be within normal expected fluctuations, and differences between soil types also appeared to follow those expected, based on topographical differences.

Within the study area, numerous areas of stressed vegetation have been observed during the 3-year monitoring period. The causal agents included insects, fungus and viral diseases, cold weather, general decline, herbicides, pipeline effluent, and SO_2. Insects were the most widespread causal agents. Most notable of these were the locust leaf miner which affected black locust throughout the study area and peach tree borer which affected black locust and peach trees of the Reed Orchard. In 1979 Ohio buckeyes and yellow buckeyes were infested with leaf blotch, a fungal disease, which was rated as moderate to severe in most stands of these trees.

All of the above major stress areas were caused either by natural vectors or were caused by manmade activities other than Marble Hill.

SECTION V

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APPENDIX A

TAXA PRESENT IN SAMPLED COVER TYPES,
SEPTEMBER 1976 THROUGH JUNE 1979

Table A-1

List of Plant Taxa Present in Sampled Cover Types, September 1976 through June 1979

Scientific Name	Common Name	Cover Type 01	02	03	04	05	06	09	11
Acer negundo	Boxelder					-		?	
Acer saccharum	Sugar maple	x	x	x	x	O	x	x	O
Aesculus pavia	Red buckeye		O	O	O		O		
Actinomeris alternifolia	Wingstem			-		x	O	x	O
Aesculus glabra	Ohio buckeye					-	x	x	
Aesculus octandra	Yellow buckeye	x	-	-					
Allium canadense	Wild garlic		x	x			x	-	-
Amaranthus sp.	Pigweed					-	-		
Ambrosia artemisiifolia	Common ragweed				x				
Anemone canadensis	Canada anemone						-	O	
Anemone quinquefolia	Wood anemone		x	x			O		
Anemone virginica	Thimbleweed			x					
Anemonella thalictroides	Rue anemone	-	x	x			-		
Arabis laevigata	Smooth rock-cress		O	-				-	
Aralia spinosa	Hercules-club		-						
Arisaema atrorubens	Jack-in-the-pulpit	x	O			O			
Asarum canadense	Wild ginger	x					O		
Asimina triloba	Pawpaw	x						x	
Asplenium platyneuron	Ebony spleenwort								-
Aster sp.	Aster		-		O	-			
Aster azureus	Azure aster		-	x			x	x	
Aster divaricatus	White wood aster		O			O			
Bidens sp.	Beggar's ticks					x			
Boehmeria cylindrica	False nettle	O	O		O			O	
Botrychium virginianum	Virginia grape-fern		-						-
Bryophyta	Mosses								-
Bumelia lanuginosa	Chittamwood						-		
Campsis radicans	Trumpet vine								-
Cardamine douglassii	Purple cress						x	x	
Carex leersii	Little prickly sedge								x
Carex swanii	Swan's sedge								x
Carex sp.	Sedge		O	x	O	x	x	O	
Carpinus caroliniana	Blue beech	-	-						
Carya sp.	Hickory							-	
Carya cordiformis	Yellowbud hickory	-	-				x	x	x
Carya ovata	Shagbark hickory							x	
Caryophyllaceae	Chickweed		x						
Catalpa speciosa	Northern catalpa						x		
Celtis occidentalis	Hackberry		x	x		-		-	
Cercis canadensis	Eastern redbud		x	x	x		x	x	x
Circaea alpina	Small enchanter's nightshade	O	O		O	x	x	x	
Claytonia virginica	Spring-beauty	x	-			x			
Clematis viorna	Leather flower		x	x					
Commelina virginica	Dayflower					x	x		
Compositae	Sunflower							x	x
Convolvulus sp.	Bindweed							-	
Cornus florida	Flowering dogwood		x	O	x	x	x		x
Cornus pricea	Miss Price's cornel						x		
Cruciferae	Mustard				x				
Cryptotaenia canadensis	Honewort					x			
Delphinium tricorne	Dwarf larkspur		O	x			x		
Dentaria laciniata	Cut-leaved toothwort	x	x	x	x	x	x	x	
Desmodium glutinosum	Pointed-leaved tick-trefoil		x						
Desmodium paniculatum	Panicled tick-trefoil								x
Dicentra sp.	Bleeding heart								-
Dicentra cucullaria	Dutchman's breeches		-				O		
Dioscorea villosa	Wild yam		O	x	O				O
Diospyros virginiana	Persimmon			x					-
Elymus virginicus	Virginia wild rye		x	x		x			O
Erigenia bulbosa	Harbinger-of-spring	x	x			O		x	
Erigeron sp.	Daisy fleabane				x				
Erythronium albidum	White trout-lily						x		
Erythronium americanum	Adder's-tongue		-						
Euonymus americanus	American strawberry-bush						-		
Eupatorium maculatum	Spotted joe-pye-weed			x					
Eupatorium serotinum	Late-flowering thoroughwort	x			x	x	x	x	-
Eupatorium sp.	Thoroughwort		x						
Fagus grandifolia	Beech	-	x		x				O
Fragaria virginiana	Wild strawberry				-	O			x
Fraxinus americana	White ash	x	x	x	x		x	x	x
Fraxinus quadrangulata	Blue ash		x	x	x		x	x	x
Galium aparine	Bedstraw							-	
Galium asprellum	Rough bedstraw				x				
Galium boreale	Northern bedstraw	x	x						
Galium circaezans	White wild licorice		x	x	x	x	x		x
Galium triflorum	Fragrant bedstraw	x	O		x	x		O	O
Geum canadense	Canadian avens		x	x	x	x	x	x	x
Glechoma hederacea	Gill-over-the-ground	O					-	x	
Gleditsia triacanthos	Honey locust						-	-	
Goodyera sp.	Rattlesnake plantain				-				
Gymnocladus dioica	Kentucky coffee-tree						x	-	

K = Taxa observed during 1978-79 sampling.
O = Taxa observed for the first time during 1978-79 sampling.
- = Taxa observed during the monitoring period, but not during 1978-79 sampling.

Table A-1 (Contd)

Scientific Name	Common Name	Cover Type 01	02	03	04	05	06	09	11
Hamamelis virginiana	Witch-hazel								-
Helianthus sp.	Sunflower			X				-	
Hemerocallis fulva	Day-lily	-							
Heuchera (americana)*	Heuchera							-	
Hydrophyllum appendiculatum	Appendaged water leaf		-				0	-	
Hystrix patula	Bottlebrush		0	X		0	X		
Impatiens biflora	Jewelweed					X			
Impatiens pallida	Yellow jewelweed	0	0		-	X			
Jeffersonia diphylla	Twinleaf		X	X		X			0
Juglans nigra	Black walnut	X				X		X	
Juniperus virginiana	Eastern red cedar	-	X	X	-		X	-	X
Krigia sp.	Dwarf dandelion			0					
Lactuca sp.	Lettuce			-					
Laportea canadensis	Wood nettle					X			
Leptostachya sp.	Mint			X					
Liliaceae	Lily		X						
Lindera benzoin	Spicebush	0	-	-		X		X	
Liriodendron tulipifera	Yellow poplar		-		X				X
Lonicera japonica	Japanese honeysuckle			X	X		X	X	X
Lonicera tatarica	Tartarian honeysuckle								X
Luzula multiflora									X
Maianthemum canadense	Canada mayflower	X		X					
Mertensia virginica	Bluebells						X		
Muhlenbergia sobolifera	Muhly grass			X	X		X		
Nepeta cataria	Catnip						X		
Oenothera sp.	Evening primrose			-					
Osmorhiza claytonii	White snakeroot		-			X			0
Ostrya virginiana	Ironwood		X	X					
Panicum boscii	Bosc's panicum			X	0				0
Panicum clandestinum	Corn grass			0			0		-
Parthenocissus quinquefolia	Virginia creeper	X	X	X	X	X	X	X	X
Passiflora lutea	Yellow passion-flower			0					
Phryma leptostachya	Lopseed	-	0		X				0
Pilea pumila	Clearweed	X	0		-	X	0		
Pinus resinosa	Red pine				X				
Pinus strobus	White pine	-			X				
Pinus virginiana	Virginia pine			-					X
Platanus occidentalis	Sycamore		-			X		-	0
Podophyllum peltatum	May apple					-			-
Polygonatum biflorum	Solomon's-seal			-			X		
Polygonum sagittatum	Long-bristled smartweed					X			
Prunus serotina	Black cherry		X	X	X	X		0	0
Prunus virginiana	Choke cherry							0	
Quercus coccinea	Scarlet oak		-				-		
Quercus falcata	Southern red oak		-						
Quercus palustris	Pin oak		-						
Quercus prinus	Chestnut oak		X	X	X	0	0	X	X
Quercus rubra	Red oak			X			0		X
Quercus velutina	Black oak		-	X	X		-		
Ranunculus abortivus	Small-flowered buttercup	0							
Ranunculus sp.	Buttercup							-	
Rhus aromatica	Fragrant sumac			X					
Rhus radicans	Poison ivy	X	X	X	X	X	X	X	X
Robinia pseudoacacia	Black locust			X			-	-	-
Rosa sp.	Rose			X	X	0	-	-	
Rubus sp.	Blackberry				X		0	X	X
Ruellia caroliniensis	Hairy ruellia			X		0			
Sanguinaria canadensis	Bloodroot		-	X			X		
Sanicula trifoliata	Snakeroot	X	X	X	X	X	X	X	X
Sassafras albidum	Sassafras	0	-	-	X				
Smilacina racemosa	False Solomon's-seal			X			X		
Smilax sp.	Greenbrier		0						X
Smilax herbacea	Carrion-flower		-	-	0	X			X
Solidago sp.	Goldenrod			X	0	X	-		X
Solidago simplex	Goldenrod			X					
Symphoricarpos orbiculatus	Coralberry		-	X	-		X	X	0
Taraxacum officinale	Common dandelion			X	0			0	0
Thalictrum dioicum	Early meadow-rue			X					
Tilia americana	Basswood	X				X			
Tradescantia virginiana	Spiderwort						-		
Trillium sessile	Toadshade	-	-				X	X	
Umbelliferae	Umbel							X	
Ulmus rubra	Slippery elm	X	X	X	X	X	X	X	X
Ulmus thomasii	Rock elm								-
Urtica dioca	Stinging nettle					0			
Veratrum sp.	Veratrum			X					
Viburnum prunifolium	Black-haw		-	X					
Viola affinis	Smoothish-yellow violet		-			X			
Viola sororia	Hooly-blue violet	X	X	-	X	X	X	X	X
Viola sp.		X							
Vitis aestivalis	Summer grape	X		X			X	X	
Vitis rotundifolia	Muscadine grape				X			0	

X = Taxa observed during 1977-78 sampling.
0 = Taxa observed for the first time during 1977-78 sampling.
- = Taxa observed during the monitoring period, but not during the 1978-79 sampling.
* = Probable taxa.

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STATE of INDIANA

DEPARTMENT OF NATURAL RESOURCES
JOSEPH D. CLOUD
DIRECTOR

INDIANAPOLIS, 46204

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June 7, 1977

Mr. S.W. Shields
Vice President - Engineering
Public Service Company of Indiana, Inc.
1000 East Main Street
Plainfield, Indiana 46168

Re: Docket No. G-5260
and NR-10

Dear Mr. Shields:

Pursuant to Chapter 318, 1945 Flood Control Act, as amended, (IC, 13-2-22) and Chapter 60, Acts of 1919, as amended, (IC, 14-3-1-14), enclosed is the Certificate of Approval for Construction in a Floodway and the Permit to Withdraw Water from a Navigable River granted by the Natural Resources Commission as referenced above. Special attention should be given to the Limitations and Conditions under which the approval was granted.

Also enclosed is a copy of the Engineer's Report pertaining to said Docket.

Very truly yours,

Robert F. Jackson, PE
Chief
Division of Water

RFJ/PWC/sd

Enclosures: Certificate of Approval
Permit No. NR-10
Engineer's Report

cc: Herbert F. Fuller, SWCD
James Durbin, ICO

Permit No. NR-10

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO WITHDRAW WATER FROM A NAVIGABLE RIVER

This permit is issued by the Department of Natural Resources in accordance with the provisions of Chapter 60, Acts of 1919, as amended, to the Public Service Company of Indiana, Inc., 1000 East Main Street, Plainfield, Indiana 46168, to withdraw water from the Ohio River at River Mile 570 in Jefferson County.

This permit is issued upon the following terms and conditions:

1. Water be withdrawn at an average rate not to exceed 21,347 g.p.m., (47.6 c.f.s.) for the purpose of water make-up to the Marble Hill Nuclear Generating Station.

2. Public Service Company of Indiana, Inc., provide to the Department of Natural Resources, annual reports showing daily quantities of water withdrawn from the river.

3. The water withdrawals authorized herein relate only to protection of the public interest within the jurisdiction of the Natural Resources Commission and are not intended to create, establish or vest in Public Service Company of Indiana. Inc. any measure of riparian rights to use water from the Ohio River.

4. This permit is subject to all the powers, rights and authority of the Untied States Government pertaining to the navigation and navigability of said river and is subject to all rights of riparian owners.

5. The DEPARTMENT does not consider the granting of this permit to be a proprietary function. If the granting of this permit should be adjudged proprietary function, the PERMITTEE, its agents and employees, herein agree to hold harmless the State of Indiana and the Department of Natural Resources, an administrative agency thereof, from all liability arising from the withdrawal of water and all other activities by the PERMITTEE under this permit.

6. This permit shall not and does not divest the State of Indiana or the Department of Natural Resources of any of its rights or duties to enforce any law of the State of Indiana, nor does it divest the State or the Department of Natural Resources of any of its property rights.

IN WITNESS WHEREOF, the DEPARTMENT OF NATURAL RESOURCES, by its Director has hereunto subscribed this instrument, in duplicate, this 25th day of May, 1977.

DEPARTMENT OF NATURAL RESOURCES

By: Joseph D. Cloud

Joseph D. Cloud, Director