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**Vegetation Sampling of the Forest Habitat in the FAP 301
(U S 20) Project Area,
Jo Daviess and Stephenson Counties**

Center for Biodiversity Technical Report 1995 (6)

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Introduction

In March of 1993 Illinois Department of Transportation requested a biological survey of US 20 (FAP 301) from IL-84 (northwest of Galena) in Jo Daviess County to Bolton/Freeport Bypass (west of Freeport) in Stephenson County. One of the several components to be included in the report was vegetation analysis of the major forested types. The following guidelines were to be followed when vegetation was sampled in the corridor:

1. Describe the woody vegetation in the study area qualitatively and quantitatively, including composition and structural characteristics of overstory, understory, and ground layer.
2. Quantitative samples of woody species should be obtained by a appropriate sampling method.
3. Resulting data should include frequency, density, basal area, and importance value of trees having ≥ 10 centimeters in diameter at breast-height.
4. Herbaceous communities should be described qualitatively in terms of composition and relative abundance.

General Description of Forest Habitat

The corridor covers approximately 75 square miles or 47,578 acres (19,260 hectares). The project area occurs in both the Wisconsin Driftless Division and the Freeport Section of the Rock River Hill Country Natural Division (Schwegman 1978). Forests in the Wisconsin Driftless Division are predominantly upland hardwood dominated by white oak (*Quercus alba*) and black oak (*Quercus velutina*) on dry sites and by sugar maple (*Acer saccharum*), basswood (*Tilia americana*), and red oak (*Quercus rubra*) on mesic sites. Floodplain forest dominated by silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), and green ash (*Fraxinus pennsylvanica* var. *subintegerrima*) occupy alluvial soils of the stream valleys. Cliff and cool, shaded slopes of this division often support white pine (*Pinus strobus*), Canada yew (*Taxus canadensis*), and white birch (*Betula papyrifera*). Forests in the Freeport Section of the Rock River Hill Country Natural Division are similar to those in the Wisconsin Driftless. Dry upland forests are dominated by bur oak (*Quercus macrocarpa*), white oak, and black cherry (*Prunus serotina*). Mesic sites support sugar maple, basswood, *Ulmus rubra* slippery elm, and red oak (Schwegman 1973). Most of the forests in the corridor were either dry mesic upland forest or mesic upland forest. Floodplain forest in the corridor comprises an extremely small portion of the forest habitat and will be discussed later. Most of the original forest vegetation in the US 20 corridor has been altered. Agriculture, logging or cutting for fuel, mining, and more recent housing developments and fire suppression have all impacted the present day forests in the corridor. Most forests in the corridor are currently being grazed or have been grazed within the last forty years. White-tailed deer, *Odocoileus virginianus* population densities in the driftless area are currently on the increase (C. M. Nixon. Illinois Natural History Survey pers. comm. 1994). This appears to be especially true around the Galena Territories. During surveys large groups of deer were sighted at several locations. Well established deer trails were seen along the Smallpox Creek drainage and along the forests in Irish Hollow. Because woody species differ greatly in palatability and sensitivity to browsing, even moderate levels of browsing by deer can greatly effect species composition (Strole and Anderson 1991). Of the approximate 19,260 hectares in the corridor only 2,367 hectares of forest habitat remains (approximately 12.2% of the total area). Of the 2,367 hectares of forest habitat remaining only 76.8 hectares (3.2%) are good enough quality to be considered and botanical resource (Taft 1995).

Methods

To achieve the goals proposed by IDOT the following vegetation sampling methods were utilized. Trees and shrubs in the corridor were sampled using the standard point quarter method to obtain frequency, density, basal area, and importance value data. Shrubs were included if they

were 2.5 meters or less in height. Transect lines were established through each forest perpendicular to slope and aspect. Sampling points were spaced 15 meters apart, and the number of points per forest was determined by the size of forest sampled. The herbaceous layer was sampled qualitatively to obtain composition and relative abundance. One 12.5 meter² triangular plot was sampled in the approximate center of each forest transect. Sampling occurred in late summer; therefore flora reflects late summer and fall components. Forest sites were arbitrarily selected. Small mammal and bird census forest points were vegetatively sampled with the exception of three forests. These three census points were excluded because they were not representative of the forests in the corridor. They are monotypic stands of black locust, *Robinia pseudoacacia* or boxelder, *Acer negundo*. The remainder of the forest sites were selected according to updated alignment changes, to add sampling points to a specific forest type, and to add enough points to give reliable data. A total of 24 forests were sampled in the corridor: thirteen mesic upland forests, nine dry mesic upland forests, and two bottomland forests. All forests with a southwest to southeast aspect were combined as southern forests (dry mesic upland forests). Forests with a northwest to northeast aspect were combined as northern forests (mesic upland forest). Table 4 - 1 is a summary of formulas used to determine composition and relative abundance of the herbaceous layer. During the last week of July and the first two weeks of August 1994 the vegetation of US 20 sampling was completed. The results are as follows.

Table 4 - 1 formulas used for herbaceous layer

6 = 100 to 95% cover = midpoint 97.5
 5 = 95 to 75% cover = midpoint 85
 4 = 75 to 50% cover = midpoint 62.5
 3 = 50 to 25% cover = midpoint 37.5
 2 = 25 to 5% cover = midpoint 15
 1 = 5 to 0% cover = midpoint 3

C value = total of midpoint values of species A
 # of Occ = total number of plots species A occurs
 Total = C value of species A x # of Occ
 Ranking = C value of species A x Number of occurrences/total number of plots

Results and Discussion

Northern Forests (mesic upland forests)

Northern forests (location and description)

Forest location	Age class	Disturbance (grazing, logging, etc)
3. T 27 N, R 3 E, Sec 12: Stockton	20-40 yrs	moderate (logging)
4. T 27 N, R 3 E, Sec 12: Stockton	40-90 yrs	moderate (grazing)
6. T 27 N, R 3 E, Sec 12: Stockton	40-90 yrs	none
8. T 27 N, R 2 E, Sec 24: Elizabeth	20-40 yrs	severe (grazing)
9. T 27 N, R 2 E, Sec 6: Hanover	40-90 yrs	none
11. T 28 N, R 1 E, Sec 26: Scales Mound West	40-90 yrs	light (grazing)
12. T 28 N, R 1 E, Sec 26: Scales Mound West	40-90 yrs	light (grazing)

Northern forest location continued on next page

Northern forests location and description concluded

14. T 27 N, R 2 E, Sec 18:	Hanover	20-40 yrs	moderate (grazing)
15. T 27 N, R 1 E, Sec 3:	Bellevue	20-40 yrs	heavy (grazing)
16. T 27 N, R 1 E, Sec 1:	Hanover	40-90 yrs	none
17. T 27 N, R 1 E, Sec 1:	Hanover	20-40 yrs	light (grazing)
18. T 27 N, R 1 E, Sec 1:	Hanover	20-40 yrs	light (grazing)
22. T 28 N, R 1 E, Sec 9:	Galena	40-90 yrs	moderate (grazing)

Northern Forests (discussion)

The majority of the mesic upland forests in the corridor are disturbed to some degree. Old stumps were present in the majority of the forests sampled indicating logging occurred sometime in the past. Forests were also grazed to some degree. Most northern forests sampled lacked conservative herbaceous species and had a very limited fern diversity which usually indicates some past disturbance. Most mesic upland forests were mature second growth (40-90 years of age). In this age class the dominant tree species was exclusively red oak. Other trees that occur to a lesser degree were white oak, black walnut (*Juglans nigra*), basswood, Americana elm, slippery elm and sugar maple. This association of species occurred in most upland forests along ridge tops and on gentle slopes. These forests had well developed shrub and herbaceous layers. Because of grazing of livestock and natural browsers such as white-tailed deer the shrub layers were dominated by thorny species. Dominant shrub species include gooseberry (*Ribes missouriense*), gray dogwood (*Cornus racemosa*), black raspberry (*Rubus occidentalis*), and hazelnut (*Corylus americana*). Herbaceous layer in the majority of the forests was dominated by Virginia creeper (*Parthenocissus quinquefolia*), Pennsylvania sedge (*Carex pennsylvanica*), hog peanut (*Amphicarpa bracteata*), and beggar's lice (*Desmodium glutinosum*). Disturbance tolerant species such as white avens (*Geum canadense*), common snakeroot (*Sanicula gergaria*), white snakeroot, (*Eupatorium rugosum*), and enchanter's nightshade (*Gircaea luteiana* spp. *canadensis*) were also major components. Forests with steep shaded north-facing to east-facing slopes in this age class were often totally dominated by sugar maple in the overstory with hop hornbeam (*Ostrya virginiana*), as the dominant mid-canopy tree. These sites represent the most mesic in the corridor. Their position in the landscape protected them from past fires and also creates the high moisture and shade conditions necessary for this type of forest development. Occasional species in this forest type were basswood, red oak, and slippery elm. The dense shade created by the sugar maple overstory limits the shrub and herbaceous layer. In these forests the herbaceous layer is more pronounced during late April and early May when spring ephemerals bloom before the leaves of trees are fully developed. Species that occur in the shrub layer include sugar maple, chokecherry (*Prunus virginiana*), gooseberry, and bladdernut (*Staphylea trifolia*). One of the best examples of this forest type is forest (11). Mesic forests in the young second growth (20 to 40 yrs) age class had the above mentioned species but mid-successional trees such as bitternut hickory (*Carya cordiformis*), white ash (*Fraxinus americana*), slippery elm, American elm, blackcherry, and white birch were a more important component. The herbaceous and shrub layers were similar to the older forests but because of the increased light conditions plant densities in the shrub and herbaceous layer were greater as well as having species that are adapted to early successional conditions such as blackberry (*Rubus allegheniensis*), black raspberry (*Rubus occidentalis*), and hazelnut. Forest (22) was different than other north-facing and east-facing forests and is responsible for the large number of bur oaks in the mesic forest sample. The forest was adjacent to two hill prairies and was dominated by large bur oaks in the overstory. The shallow soils over dolomite bedrock probably contributed to the drier conditions that one would expect on a northeast-facing slope.

Northern Forest tree analysis

N# number of individuals, basal area (meters²), mean basal area (meters²), density (stems/hectare), total basal area (meters²/hectare), percent relative density, percent frequency, percent relative frequency, percent relative basal area, and percent relative importance for all woody stems ≥ 10 centimeters DBH. List is arranged by relative importance.

SPECIES	N#	B.A m ²	mean B.A. m ²	density Stems /ha	total B.A m ² /ha	% rel density	% freq	% rel. freq	% rel B.A	% rel import
<i>Quercus rubra</i>	60	433.81	7.23	69.00	498.88	15.46	29.90	11.07	53.60	26.71
<i>Acer saccharum</i>	35	75.80	2.17	40.25	87.17	9.02	19.59	7.25	9.37	8.55
<i>Tilia americana</i>	33	41.48	1.26	37.95	47.70	8.51	25.77	9.54	5.13	7.72
<i>Quercus alba</i>	29	60.64	2.09	33.35	69.74	7.47	19.59	7.25	7.49	7.41
<i>Juglans nigra</i>	25	43.73	1.75	28.75	50.29	6.44	18.56	6.87	5.40	6.24
<i>Ulmus americana</i>	26	24.89	0.96	29.90	28.63	6.70	23.71	8.78	3.08	6.19
<i>Ulmus rubra</i>	29	32.10	1.11	33.35	36.91	7.47	17.53	6.49	3.97	5.98
<i>Ostrya virginiana</i>	31	16.73	0.54	35.65	19.25	7.99	19.59	7.25	2.07	5.77
<i>Carya cordiformis</i>	24	11.63	0.48	27.60	13.37	6.19	20.62	7.63	1.44	5.09
<i>Betula papyrifera</i>	19	16.40	0.86	21.85	18.86	4.90	13.40	4.96	2.03	3.96
<i>Quercus macrocarpa</i>	17	28.46	1.67	19.55	32.73	4.38	10.31	3.82	3.52	3.91
<i>Fraxinus americana</i>	15	7.68	0.51	17.25	8.83	3.87	13.40	4.96	0.95	3.26
<i>Carya ovata</i>	16	4.98	0.31	18.40	5.73	4.12	11.34	4.20	0.62	2.98
<i>Prunus serotina</i>	13	7.97	0.61	14.95	9.17	3.35	11.34	4.20	0.99	2.84
<i>Celtis occidentalis</i>	9	1.94	0.22	10.35	2.23	2.32	9.28	3.44	0.24	2.00
<i>Populus grandidentata</i>	5	0.88	0.18	5.75	1.01	1.29	4.12	1.53	0.11	0.97
<i>Populus deltoides</i>	1	0.13	0.13	1.15	0.15	0.26	1.03	0.38	0.02	0.22
<i>Populus tremuloides</i>	1	0.01	0.01	1.15	0.02	0.26	1.03	0.38	0.00	0.21
Total	388	809.29		446.20	930.68	100	270.10	100	100	100

Northern Forest shrub analysis

N# number of individuals, density (stems/hectare), percent relative density, percent relative frequency, and percent relative importance for all woody stems. List is arranged by relative importance.

Species	N#	Density (Stems/ha)	% Rel Density	% Rel Freq	% Rel Import
<i>Ribes missouriense</i>	149	2631.34	38.40	26.52	32.46
<i>Cornus racemosa</i>	42	741.72	10.82	11.74	11.28
<i>Rubus occidentalis</i>	30	529.80	7.73	6.52	7.13
<i>Corylus americana</i>	20	353.20	5.15	6.52	5.84
<i>Acer saccharum</i>	22	388.52	5.67	5.65	5.66
<i>Fraxinus americana</i>	16	282.56	4.12	5.65	4.89
<i>Prunus virginiana</i>	17	300.22	4.38	5.22	4.80

Northern forest shrub analysis continued on next page

Northern forest shrub analysis concluded

<i>Prunus serotina</i>	15	264.90	3.87	5.65	4.76
<i>Zanthoxylum americanum</i>	13	229.58	3.35	3.48	3.41
<i>Carya cordiformis</i>	8	141.28	2.06	3.91	2.99
<i>Staphylea trifolia</i>	12	211.92	3.09	2.61	2.85
<i>Ulmus americana</i>	6	105.96	1.55	2.17	1.86
<i>Berberis thunbergii</i>	6	105.96	1.55	1.74	1.64
<i>Carya ovata</i>	5	88.30	1.29	1.74	1.51
<i>Acer negundo</i>	4	70.64	1.03	1.30	1.17
<i>Rubus flagellaris</i>	3	52.98	0.77	1.30	1.04
<i>Ulmus rubra</i>	2	35.32	0.52	0.87	0.69
<i>Quercus macrocarpa</i>	2	35.32	0.52	0.87	0.69
<i>Prunus americana</i>	2	35.32	0.52	0.87	0.69
<i>Lonicera prolifera</i>	2	35.32	0.52	0.87	0.69
<i>Celtis occidentalis</i>	2	35.32	0.52	0.87	0.69
<i>Rubus allegheniensis</i>	2	35.32	0.52	0.43	0.48
<i>Viburnum lentago</i>	1	17.66	0.26	0.43	0.35
<i>Sambucus canadensis</i>	1	17.66	0.26	0.43	0.35
<i>Ribes cynosbati</i>	1	17.66	0.26	0.43	0.35
<i>Ribes americana</i>	1	17.66	0.26	0.43	0.35
<i>Quercus alba</i>	1	17.66	0.26	0.43	0.35
<i>Ptelea trifoliata</i>	1	17.66	0.26	0.43	0.35
<i>Lonicera mackii</i>	1	17.66	0.26	0.43	0.35
<i>Juglans nigra</i>	1	17.66	0.26	0.43	0.35
	388	6852.08	100.00	100.00	100.00

Northern Forest herbaceous analysis

C value (Total of midpoint values of species A), # of Occ (total number of plots species A occurs), Total (C value of species A x # of Occ), Ranking (C value of species A x Number of occurrences/total number of plots)

Genus species	common name	C value	# of occ	total	ranking
<i>Pathenocissus quinquefoil</i>	Virginia creeper	435	9	3915	355.91
<i>Carex pensylvanica</i>	Pennsylvania sedge	141	4	564	51.27
<i>Amphicarpa bracteata</i>	hog peanut	109	5	545	49.55
<i>Desmodium glutinosum</i>	begger's lice	115	3	345	31.36
<i>Geum canadense</i>	white avens	83.5	4	334	30.36
<i>Sanicula gergaria</i>	common snakeroot	83.5	4	334	30.36
<i>Alliaria petiolata</i>	garlic mustard	135	2	270	24.55
<i>Aralia nudicaulis</i>	wild sarsaparilla	77.5	2	155	14.09
<i>Circaea luteiana ssp. canadensis</i>	enchanter's nightshade	21	7	147	13.36
<i>Hepatica nobilis var. acuta</i>	sharp-lobed hepatica	36	4	144	13.09
<i>Asarum canadense</i>	wild ginger	65.5	2	131	11.91
<i>Geranium maculatum</i>	wild geranium	43.5	3	131	11.86

Northern forest herbaceous layer analysis continued on next page

Northern forest herbaceous analysis concluded

<i>Eupatorium rugosum</i>	white snakeroot	27	4	108	9.82
<i>Carex spp.</i>	sedges	33	3	99	9
<i>Galium triflorum</i>	sweet-scented bedstraw	24	4	96	8.73
<i>Smilacina stellata</i>	starry solomon seal	18	4	72	6.55
<i>Galium triflorum</i>	sweet-scented bedstraw	24	4	96	8.73
<i>Smilacina stellata</i>	starry solomon seal	18	4	72	6.55
<i>Poa pratense</i>	Kentucky bluegrass	62.5	1	62.5	5.68
<i>Polymnia canadensis</i>	leafcup	62.5	1	62.5	5.68
<i>Arisaema triphyllum</i>	Indian turnip	12	4	48	4.36
<i>Cystopteris bulbifera</i>	bulblet fern	37.5	1	37.5	3.41
<i>Solidago flexicalus</i>	zig-zag goldenrod	37.5	1	37.5	3.41
<i>Aster lateriflorus</i>	side-flowered aster	18	2	36	3.27
<i>Osmorhiza longistylis</i>	anise-root	18	2	36	3.27
<i>Pilea pumila</i>	clearweed	18	2	36	3.27
<i>Podophyllum peltatum</i>	mayapple	18	2	36	3.27
<i>Smilacina racemosa</i>	false solomon seal	18	2	36	3.27
<i>Uvularia grandiflora</i>	bellwort	18	2	36	3.27
<i>Viola pubesens var. eriocarpa</i>	smooth yellow violet	18	2	36	3.27
<i>Agrimonia pubesens</i>	soft agrimony	9	3	27	2.45
<i>Hydrophyllum virginicum</i>	Virginia waterleaf	9	3	27	2.45
<i>Sanicula canadensis</i>	Canada snakeroot	9	3	27	2.45
<i>Menispermum canadense</i>	moonseed	15	1	15	1.36
<i>Polygonum virginiana</i>	Virginia knotweed	15	1	15	1.36
<i>Thalictrum revolutum</i>	waxy meadow rue	15	1	15	1.36
<i>Adiantum pedatum</i>	maidenhair fern	6	2	12	1.09
<i>Athyrium angustum</i>	lady fern	6	2	12	1.09
<i>Phryma leptostachya</i>	lopseed	6	2	12	1.09
<i>Viola sororia</i>	wooly blue violet	6	2	12	1.09
<i>Anemone virginina</i>	tall anemone	3	1	3	0.27
<i>Asplenium rhizophyllum</i>	walking fern	3	1	3	0.27
<i>Campanula americana</i>	American bellflower	3	1	3	0.27
<i>Caulophyllum thalictoides</i>	blue cohosh	3	1	3	0.27
<i>Dioscorea villosa</i>	wild yam	3	1	3	0.27
<i>Erigeron strigosus</i>	daisy fleabane	3	1	3	0.27
<i>Galearis spectabilis</i>	showy orchid	3	1	3	0.27
<i>Hackelia virginiana</i>	stickseed	3	1	3	0.27
<i>Lobelia inflata</i>	Indian tobacco	3	1	3	0.27
<i>Osmorhiza claytonii</i>	sweet cicely	3	1	3	0.27
<i>Oxalis stricta</i>	yellow wood sorrel	3	1	3	0.27
<i>Polemonium reptans</i>	Jacob's-ladder	3	1	3	0.27
<i>Sanguinaria canadensis</i>	bloodroot	3	1	3	0.27
<i>Smilax hispida</i>	bristly greenbrier	3	1	3	0.27
<i>Solidago ulmifolia</i>	elm-leaved goldenrod	3	1	3	0.27
<i>Toxicodendron radicans</i>	posion ivy	3	1	3	0.27
<i>Zizia aurea</i>	golden alexanders	3	1	3	0.27

*forests with vegetative plots = 11

Southern Forests (dry mesic upland forests)

Southern Forest (location and description)

Forest location and number	Age class	Disturbance (grazing, logging, etc)
1. T 27 N, R 5 E, Sec 5: Kent	40-90 yrs	light (logging)
2. T 27 N, R 7 E, Sec 7: Freeport West	40-90 yrs	moderate to heavy (grazing)
5. T 27 N, R 4 E, Sec 8: Stockton	40-90 yrs	moderate (grazing)
7. T 27 N, R 3 E, Sec 20: Elizabeth	40-90 yrs	heavy (grazing)
10. T 27 N, R 2 E, Sec 6: Hanover	20-40 yrs	light (logging)
13. T 27 N, R 2 E, Sec 18: Hanover	20-40 yrs	moderate (grazing)
19. T 27 N, R 1 E, Sec 1: Hanover	40-90 yrs	light (grazing)
20. T 28 N, R 1 E, Sec 35: Galena	20-40 yrs	severe (grazing)
21. T 28 N, R 1 E, Sec 34: Galena	20-40 yrs	severe (grazing, logging)

Southern Forests (discussion)

Like the mesic forests in the corridor most southern forests show signs of disturbance both from grazing and logging. Fire probably played a important role in presettlement times in the southern forests, but now the shrub layer is dense in most forest stands. As one would expect the dominant tree species in the southern forests are oak and hickory. White oak, bur oak, and shagbark hickory (*Carya ovata*) were the dominant tree species. Blackcherry, black oak, red oak, bitternut hickory also made up a large percentage of the canopy. American elm and slippery elm were common especially in the younger forest age class (20 - 40 yrs). Black cherry was a major component in both the tree and shrub layers. In xeric forests in the Driftless Area of southern Wisconsin, black cherry occurs in great numbers in the seedling and sapling class. Young cherries have a high degree of shade tolerance but as they get older they become more intolerant and are unable withstand long periods of light suppression. When a opening in the canopy occurs they become the dominant tree in the canopy (Curtis 1959). Many of the southern forests had been logged recently (20 - 40 years); this would cause the canopy to open, allowing the cherry seedlings to become a dominant component in a given forest. Black cherry is also a fast growing species that is unpalatable to white-tailed deer, making it able to out compete other species in the presence of browsing (Tilghman 1989). As with the northern forests, many thorny species dominated the understory including gooseberry, prickly ash (*Zanthoxylum americanum*), and black raspberry (*Rubus occidentalis*). The herbaceous layer includes many of the same species as the northern forest except a few species that prefer dry mesic upland forests such as Short's Aster (*Aster shortii*). Forest 19 was the probably best example of a dry mesic upland forest in the corridor. The herbaceous plot was taken in the center of the forest and did not reflect the species that was present in other adjacent open areas of the forest which had a mixture of open forest and prairie plants such as stiff goldenrod (*Solidago rigida*), showy goldenrod (*Solidago speciosa*), culver's-root (*Veronicastrum virginicum*), and rough blazing-star (*Liatris aspera*). This forest tract was probably the most xeric sampled in the corridor. This was probably due to the shallow soils over the dolomite substratum; in many places in the area the dolomite was at the surface or within a few inches of the surface.

Southern Forest tree analysis

N# number of individuals, basal area (meters²), mean basal area (meters²), density (stems/hectare), total basal area (meters²/hectare), percent relative density, percent frequency, percent relative frequency, percent relative basal area, and percent relative importance for all woody stems ≥ 10 centimeters DBH. List is arranged by relative importance.

SPECIES	N#	B.A m ²	mean B.A. m ²	density Stems /ha	total B.A m ² /ha	% rel density	% freq	% rel. freq	% rel B.A	% rel import
<i>Quercus alba</i>	26	87.17	3.35	45.08	151.15	9.56	23.53	8.29	26.48	14.78
<i>Quercus macrocarpa</i>	24	53.17	2.22	41.62	92.20	8.82	25.00	8.81	16.15	11.26
<i>Carya ovata</i>	30	41.31	1.38	52.02	71.62	11.03	23.53	8.29	12.55	10.62
<i>Ulmus americana</i>	28	27.14	0.97	48.55	47.05	10.29	29.41	10.36	8.24	9.63
<i>Ulmus rubra</i>	24	24.54	1.02	41.62	42.56	8.82	30.88	10.88	7.46	9.05
<i>Prunus serotina</i>	24	19.67	0.82	41.62	34.12	8.82	26.47	9.33	5.98	8.04
<i>Quercus velutina</i>	13	30.73	2.36	22.54	53.28	4.78	14.71	5.18	9.34	6.43
<i>Carya cordiformis</i>	19	13.13	0.69	32.95	22.76	6.99	16.18	5.70	3.99	5.56
<i>Tilia americana</i>	13	5.06	0.39	22.54	8.77	4.78	14.71	5.18	1.54	3.83
<i>Quercus rubra</i>	12	8.62	0.72	20.81	14.95	4.41	8.82	3.11	2.62	3.38
<i>Juglans nigra</i>	9	8.71	0.97	15.61	15.11	3.31	11.76	4.15	2.65	3.37
<i>Fraxinus americana</i>	9	4.02	0.45	15.61	6.97	3.31	13.24	4.66	1.22	3.06
<i>Ostrya virginiana</i>	9	1.29	0.14	15.61	2.23	3.31	7.35	2.59	0.39	2.10
<i>Juniperus virginiana</i>	7	1.15	0.16	12.14	2.00	2.57	8.82	3.11	0.35	2.01
<i>Acer negundo</i>	8	1.55	0.19	13.87	2.68	2.94	7.35	2.59	0.47	2.00
<i>Populus tremuloides</i>	6	0.86	0.14	10.40	1.49	2.21	7.35	2.59	0.26	1.69
<i>Celtis occidentalis</i>	3	0.33	0.11	5.20	0.58	1.10	4.41	1.55	0.10	0.92
<i>Juglans cinerea</i>	2	0.34	0.17	3.47	0.60	0.74	2.94	1.04	0.10	0.63
<i>Prunus virginiana</i>	2	0.05	0.02	3.47	0.09	0.74	1.47	0.52	0.02	0.42
<i>Quercus ellipsoidalis</i>	1	0.27	0.27	1.73	0.46	0.37	1.47	0.52	0.08	0.32
<i>Populus deltoides</i>	1	0.02	0.02	1.73	0.03	0.37	1.47	0.52	0.01	0.30
<i>Morus alba</i>	1	0.01	0.01	1.73	0.03	0.37	1.47	0.52	0.00	0.30
<i>Malus pumila</i>	1	0.01	0.01	1.73	0.02	0.37	1.47	0.52	0.00	0.30
Total	272	329.15	16.60	471.65	570.75	100	283.82	100	100	100

Southern Forest shrub analysis

N# number of individuals, density (stems/hectare), percent relative density, percent relative frequency, and percent relative importance for all woody stems. List is arranged by relative importance.

Species	N#	Density (Stems/ha)	% Rel Density	% Rel Freq	% Rel Import
<i>Ribes missouriense</i>	108	2720.52	39.71	27.27	33.49
<i>Prunus serotina</i>	26	654.94	9.56	12.12	10.84

Southern forest shrub analysis continued on next page

Southern forest shrub analysis concluded

<i>Zanthoxylum americanum</i>	31	780.89	11.40	9.70	10.55
<i>Cornus racemosa</i>	26	654.94	9.56	8.49	9.02
<i>Rubus occidentalis</i>	14	352.66	5.15	4.85	5.00
<i>Prunus virginiana</i>	12	302.28	4.41	4.85	4.63
<i>Fraxinus americana</i>	9	226.71	3.31	4.85	4.08
<i>Carya cordiformis</i>	6	151.14	2.21	3.64	2.92
<i>Rosa multiflora</i>	7	176.33	2.57	3.03	2.80
<i>Corylus americana</i>	5	125.95	1.84	3.03	2.43
<i>Ostrya virginiana</i>	4	100.76	1.47	2.42	1.95
<i>Celtis occidentalis</i>	3	75.57	1.10	2.42	1.76
<i>Quercus velutina</i>	3	75.57	1.10	1.82	1.46
<i>Rubus allegheniensis</i>	3	75.57	1.10	1.82	1.46
<i>Lonicera mackii</i>	2	50.38	0.74	1.82	1.28
<i>Ulmus rubra</i>	2	50.38	0.74	1.82	1.28
<i>Rubus flagellaris</i>	2	50.38	0.74	1.21	0.97
<i>Acer negundo</i>	2	50.38	0.74	0.61	0.67
<i>Lonicera prolifera</i>	1	25.19	0.37	0.61	0.49
<i>Morus alba</i>	1	25.19	0.37	0.61	0.49
<i>Populus tremuloides</i>	1	25.19	0.37	0.61	0.49
<i>Quercus alba</i>	1	25.19	0.37	0.61	0.49
<i>Tilia americana</i>	1	25.19	0.37	0.61	0.49
<i>Ulmus americana</i>	1	25.19	0.37	0.61	0.49
<i>Viburnum lentago</i>	1	25.19	0.37	0.61	0.49
Totals	272	6851.68	100.00	100.00	100.00

Southern Forest herbaceous analysis

C value (Total of midpoint values of species A), # of Occ (total number of plots species A occurs), Total (C value of species A x # of Occ), Ranking (C value of species A x Number of occurrences/total number of plots)

Genus species	common name	C value	# of occ	total	ranking
<i>Parthenocissus quinquefolia</i>	Virginia creeper	225.5	5	1127.5	140.94
<i>Sanicula gergaria</i>	common snakeroot	185	3	555	69.38
<i>Geum canadense</i>	white avens	109.5	5	547.5	68.44
<i>Circaea luteiana ssp. canadensis</i>	enchanter's nightshade	64.5	6	387	48.38
<i>Carex pensylvanica</i>	Pennsylvania sedge	115.5	3	346.5	43.31
<i>Alliaria petiolata</i>	garlic mustard	147.5	2	295	36.88
<i>Cryptotaenia canadensis</i>	honestwort	65.5	2	131	16.38
<i>Desmodium glutinosum</i>	begger's lice	65.5	2	131	16.38
<i>Aster lateriflorus</i>	side-flowered aster	30	2	60	7.50

Southern forest herbaceous analysis continued on next page

Southern forest herbaceous analysis concluded

<i>Aster shortii</i>	Short's aster	30	2	60	7.50
<i>Eupatorium rugosum</i>	white snakeroot	18	2	36	4.50
<i>Pilea pumila</i>	clearweed	18	2	36	4.50
<i>Podophyllum peltatum</i>	mayapple	18	2	36	4.50
<i>Amphicarpa bracteata</i>	hog peanut	9	3	27	3.38
<i>Carex spp.</i>	sedges	9	3	27	3.38
<i>Anemone virginiana</i>	tall anemone	15	1	15	1.88
<i>Lactuca canadensis</i>	Canada lettuce	15	1	15	1.88
<i>Arisaema triphyllum</i>	Indian turnip	6	2	12	1.50
<i>Erigeron strigosus</i>	daisy fleabane	6	2	12	1.50
<i>Osmorhiza longistylis</i>	anise-root	6	2	12	1.50
<i>Solidago ulmifolia</i>	elm-leaved goldenrod	6	2	12	1.50
<i>Agrimonia pubescens</i>	soft agrimony	3	1	3	0.38
<i>Botrychium virginianum</i>	rattlesnake fern	3	1	3	0.38
<i>Dioscorea villosa</i>	wild yam	3	1	3	0.38
<i>Festuca obtusa</i>	nodding fescue	3	1	3	0.38
<i>Fragaria virginiana</i>	wild strawberry	3	1	3	0.38
<i>Galium triflorum</i>	sweet-scented bedstraw	3	1	3	0.38
<i>Hackelia virginiana</i>	stickseed	3	1	3	0.38
<i>Monarda fistulosa</i>	wild bergamont	3	1	3	0.38
<i>Osmorhiza claytonii</i>	sweet cicely	3	1	3	0.38
<i>Oxalis stricta</i>	yellow wood sorrel	3	1	3	0.38
<i>Toxicodendron radicans</i>	poison ivy	3	1	3	0.38
<i>Pilea pumila</i>	clearweed	3	1	3	0.38
<i>Podophyllum peltatum</i>	mayapple	3	1	3	0.38

of vegetative plots = 8

Floodplain Forests

Floodplain Forest (location and description)

Forest location	Age class	Disturbance (grazing, logging, etc)
1b. T 27 N, R 5 E, Sec 5: Kent	40-90 yrs	light (logging)
23. T 28 N, R 1 E, Sec 16 Galena	20-40 yrs	heavy (flooding)

Floodplain Forest (discussion)

Floodplain forest comprises an extremely small portion of the corridor. Only a few forests near the town of Galena (Forest 23) are true floodplain forests. Forest 1b was actually a wet mesic upland forest or terrace forest as classified by the Natural areas Inventory (White 1978). The species data reflect this as does the small sample size. Most floodplain forests occur out of the corridor toward the Mississippi River or have been converted to crop fields along the Apple and Galena rivers. Most floodplain forest habitat consists of a small band along the stream bank. These are too small to sample and usually consists of monotypic stands of disturbance tolerant species such as boxelder or American elm. Both shrub and herbaceous layers are typical of wet mesic upland forest as well as disturbed floodplain forest.

Floodplain Forest tree analysis

N# number of individuals, basal area (meters²), mean basal area (meters²), density (stems/hectare), total basal area (meters²/hectare), percent relative density, percent frequency, percent relative frequency, percent relative basal area, and percent relative importance for all woody stems ≥ 10 centimeters DBH. List is arranged by relative importance.

SPECIES	N#	B.A m ²	mean B.A. m ²	density Stems /ha	total B.A m ² /ha	% rel density	% freq	% rel. freq	% rel B.A	% rel import
<i>Celtis occidentalis</i>	8	2.75	0.34	176.80	60.76	22.22	16.67	22.22	36.15	26.86
<i>Tilia americana</i>	6	2.12	0.35	132.60	46.86	16.67	8.33	11.11	27.87	18.55
<i>Acer negundo</i>	5	1.06	0.21	110.50	23.52	13.89	11.11	14.81	13.99	14.23
<i>Ulmus americana</i>	4	0.27	0.07	88.40	5.98	11.11	11.11	14.81	3.56	9.83
<i>Carya cordiformis</i>	4	0.23	0.06	88.40	5.06	11.11	8.33	11.11	3.01	8.41
<i>Prunus serotina</i>	3	0.39	0.13	66.30	8.63	8.33	8.33	11.11	5.13	8.19
<i>Robinia pseudoacacia</i>	3	0.54	0.18	66.30	12.02	8.33	2.78	3.70	7.15	6.39
<i>Acer saccharinum</i>	1	0.15	0.15	22.10	3.25	2.78	2.78	3.70	1.94	2.81
<i>Fraxinus americana</i>	1	0.08	0.08	22.10	1.78	2.78	2.78	3.70	1.06	2.51
<i>Quercus rubra</i>	1	0.01	0.01	22.10	0.25	2.78	2.78	3.70	0.15	2.21
Totals	36	7.61	0.00	795.60	168.10	100	75.00	100	100	100

Floodplain Forest shrub analysis

N# number of individuals, density (stems/hectare), percent relative density, percent relative frequency, and percent relative importance for all woody stems. List is arranged by relative importance.

Species	N#	Density (Stems/ha)	% Rel Density	% Rel Freq	% Rel Import
<i>Ribes missouriense</i>	23	990.38	63.89	44.44	54.17
<i>Rosa multiflora</i>	7	301.42	19.44	22.22	20.83
<i>Acer negundo</i>	3	129.18	8.33	16.67	12.50
<i>Sambucus canadensis</i>	1	43.06	2.78	5.56	4.17
<i>Rhamnus cathartica</i>	1	43.06	2.78	5.56	4.17
<i>Prunus serotina</i>	1	43.06	2.78	5.56	4.17
Total	36	1550.16	100.00	100.00	100.00

Floodplain Forest herbaceous analysis

C value (Total of midpoint values of species A), # of Occ (total number of plots species A occurs), Total (C value of species A x # of Occ), Ranking (C value of species A x Number of occurrences/total number of plots)

Genus species	common name	C value	# of occ	total	ranking
<i>Alliaria petiolata</i>	garlic mustard	85	1	85	42.50
<i>Laportea canadensis</i>	Canada wood nettle	85	1	85	42.50
<i>Pilea pumila</i>	clearweed	40.5	2	81	40.50
<i>Rudbeckia laciniata</i>	cutleaf coneflower	62.5	1	62.5	31.25
<i>Hesperis matronalis</i>	dame's rocket	37.5	1	37.5	18.75
<i>Hydrophyllum virginicum</i>	Virginia waterleaf	37.5	1	37.5	18.75
<i>Osmorhiza longistylis</i>	anise-root	37.5	1	37.5	18.75
<i>Urtica dioica</i>	stinging nettle	37.5	1	37.5	18.75
<i>Aster simplex</i>	panicled aster	15	1	15	7.50
<i>Elymus virginicus</i>	Virginia wild rye	15	1	15	7.50
<i>Parthenocissus quinquefolia</i>	Virginia creeper	15	1	15	7.50
<i>Agastache neptoides</i>	yellow giant hyssop	3	1	3	1.50
<i>Arisaema triphyllum</i>	Indian turnip	3	1	3	1.50
<i>Geum canadense</i>	white avens	3	1	3	1.50
<i>Phalaris arundinacea</i>	reed canary grass	3	1	3	1.50
<i>Podophyllum peltatum</i>	mayapple	3	1	3	1.50
<i>Sanicula gergaria</i>	common snakeroot	3	1	3	1.50

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