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Floristics, plant community structure and bank profiles, for five sites along the Middle Ohio River

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Floristics, Plant Community Structure, and Bank Profiles for Five Sites along the Middle Ohio River

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Abstract

Plant community structure, floristics, and bank profiles for five sites along the middle Ohio River were described. Values obtained were compared with a similar study by Clagg and Mills in 1978 on four of the five sites. A total of 186 plant species was observed in the plant community and floristic study. Glenwood Bend had the greatest diversity with 109 plant species. Mason-Pomeroy had the lowest diversity with only 35 plant species. Six species, representing 3.2 percent of the total observed number of species, were present at all five sites. The majority of species, 51 percent, were present at only one of the five study sites. Of the 186 plant species, 73 percent are native to West Virginia and 27 percent are either adventive, introduced, or exotic. The number of non-native plant species is consistent with the average for the overall flora of West Virginia and unglaciated Ohio. The floristic composition found in this study differed greatly from that found in the study by Clagg and Mills in 1978. Using Coefficient of Similarity, the similarity of the sites to the 1978 study ranged from 0.51 to 0.27. All five sites were different, each with unique habitats or disturbances. Using Coefficient of Similarity, the similarity of sites to one another ranged from 0.49 to 0.26. Bank profiles from 1995 were compared to those of 1996. Overall, there was minor to moderate erosion at the five sites despite two periods of flooding during the study year, January 1996 and May 1996. Site 1, Indian Guyan, had the most erosion along the bank and Site 3, Ashton Campground, had the least erosion. Indian Guyan, with the most erosion, had 525 stems of woody vegetation per acre. The Ashton Campground site, with 2156.8 stems per acre, had the largest number of woody seedlings and shrubs along the bank.

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CHAPTER I
Introduction

The Ohio River is formed in Pittsburgh, Pennsylvania, where the Allegheny and Monongahela Rivers meet, and continues to the confluence of the Ohio and Mississippi Rivers in Cairo, Illinois. This study proposes to describe the vascular vegetation along river banks including sand and mud flats of the middle Ohio River in the Gallipolis-Greenup navigational pools, and to determine how bank erosion and stability were related to vegetative composition.

Riparian zones have great value as buffers and filters between man's urban and agricultural development and his most vital life supporting resource, water (Odum, 1978). However, riverbanks are subject to erosion due to wave action, slumping, and vegetation removal (Clagg and Mills, 1978). Erosion results in loss of productive farm and residential land as well as the loss of economically important trees, and creates an increased sediment load in rivers. Further, considerable money is expended to control riverbank erosion. Materials used to curb erosion are numerous and include stone rip-rap, concrete slabs, gabions, discarded automobile tires, and woody plantings (Logan *et al.*, 1979). Most woody plantings are non-native species that are flood-tolerant, root easily, and quickly develop extensive thickets to prevent bare shorelines resulting from die-off of flood-intolerant plants (Allen and Klimas, 1986).

Riparian zones are the interfaces between terrestrial and aquatic ecosystems (Gregory et al., 1991). Riparian ecosystems have two essential characteristics. They have laterally flowing water that rises and falls at least once within a growing season and a high degree of connectedness with other ecosystems (Ewel, 1978). Receding water levels allow vascular plants to become established along the flats during summer and fall growing seasons. Annuals and first year perennials are major components of sand and mud flats due to frequent river fluctuations, while woody vegetation develops at the ordinary high water line (Evans, 1979). Bank soil is held in place largely by roots of plants. Riparian plants often have an unlimited water supply and

the stems of riparian plants help to reduce the velocity of water during flooding (Myers, 1989).

Rivers are corridors for plant migration, dispersal, and provide the opportunity for plants to colonize areas outside of their normal range. Riparian plant communities exhibit a high degree of structural and compositional diversity (Gregory et al., 1991). Relatively pristine and unregulated areas of large rivers have nearly vanished from developing nations (Thorp, 1992). Yet, because sand and mud flats are not as influenced by farming and other destructive activities, they remain as one of our more natural habitats. Riparian areas are important ecological areas that need to be maintained for wildlife habitats, shorebirds, and migrating waterfowl. Managed rivers have a more homogeneous habitat than unmanaged rivers (Thorp, 1992) and therefore have fewer varied habitats for wildlife. Vegetal variety is more desirable than a monotypic plant community (Myers, 1989).

Clagg and Mills (1978) studied natural vegetation and flora associated with river banks including sand and mud flats at five sites along the middle Ohio River. Bank profiles were drawn to scale and vegetation associated with increments of the profiles was defined. A catalog of the flora was compiled.

The objectives of this current study were to:

1) compile a complete check list of the vascular plants occurring at all of the study sites and preserve labeled voucher specimens in the Marshall University Herbarium (MUHW);

2) define the plant community structure and importance value of each vascular plant species along the study transect at each site;

3) compare current floristic composition and plant community structure to those demonstrated in Clagg and Mills' 1978 study;

4) define microelevation along bank profiles and compare the 1995 and 1996 bank profiles to determine which plant communities discourage erosion;

5) determine the patterns of distribution of vascular plants from site to site;

6) determine the rareness or commonness of vascular plants; and

7) compare the flora of the Greenup and Gallipolis Navigation Pools of the middle Ohio River with similar habitats of the middle Mississippi River described by Evans in 1979.

CHAPTER II
Materials and Methods

Five sites were chosen for a floristic survey, plant community study, and definition of bank profiles along the middle Ohio River (Figure 1). The five sites were Indian Guyan, Glenwood Bend, Ashton Campground, Crab Creek and Mason-Pomeroy. Four of the five sites were those studied by Clagg and Mills (1978). One site was unavailable for the current study and was replaced by the Ashton Campground site. The five sites span 55 river miles in the Greenup and Gallipolis Navigation Pools.

At each site, a floristic survey and quantitative analysis of vegetation were conducted along a transect from the water's edge to top of the bank and landward. Each transect was composed of three topographic parts, flats or beach area, bank, and floodplain. The flats are areas of sand and mud that become exposed during the summer and fall by receding water levels. The bank represents the area above the normal high water line leading to the floodplain. In addition, bank profiles for each site were determined in the fall of 1995 and again in late spring 1996.

Plots for the plant community study were placed continuously from the water's edge to an end point on the floodplain. Three different sized circular plots of 1/10, 1/100, and 1/1000 acre were used for the vegetation analysis (Figure 2). Trees with diameters greater than 4 inches at breast height (dbh) were identified and diameters measured in 1/10 acre plots. Density, frequency, and basal area along with relative values and importance values were calculated for each species. Shrubs greater than 1 meter in height and trees greater than 1 inch dbh but less than 4 inches were identified and numbers of stems recorded in each 1/100 acre plot. Density, frequency, relative values and importance values were calculated for each species. Herbaceous plants, woody vines, and woody seedling less than 1 meter in height were identified and percent cover estimated within each 1/1000 acre plot. Frequency, dominance, relative values, and importance values were calculated for each species along the flats, banks, and floodplains in each study site. The three species with the greatest importance value for each

topographic area at each study site were noted as the dominant elements.

Voucher specimens were collected and placed in the Marshall University Herbarium (MUHW). All specimens were identified to the lowest taxonomic level following the nomenclature of the Flora of West Virginia (Strausbaugh and Core, 1977), The West Virginia Natural Heritage Program (WVHP) Checklist of the Vascular Flora of West Virginia (Harmon *et al.*, 1996), and Manual of Cultivated Plants (Bailey, 1949).

Bank profiles were evaluated with a surveying rod and a transit mounted on a tripod placed on the floodplain (Figures 3 and 4). Profile elevations were assessed at 5-foot linear intervals along transects used for the plant community study starting from the water's edge and continuing to the top of the bank. A permanent marker, locating the transect and end point, was recorded for each site. The pool height of the Ohio River on each survey day was obtained from the Army Corps of Engineers Huntington Division. A different zeroing value for each site was also obtained to convert the river pool level to feet above sea level for bank measurements. The 1995 and 1996 bank profiles were compared and areas with the most and least erosion were noted. Vegetation in the areas associated with erosion was described.

Figure 1: Location of the five study sites along the middle Ohio River from river mile 251 to river mile 306

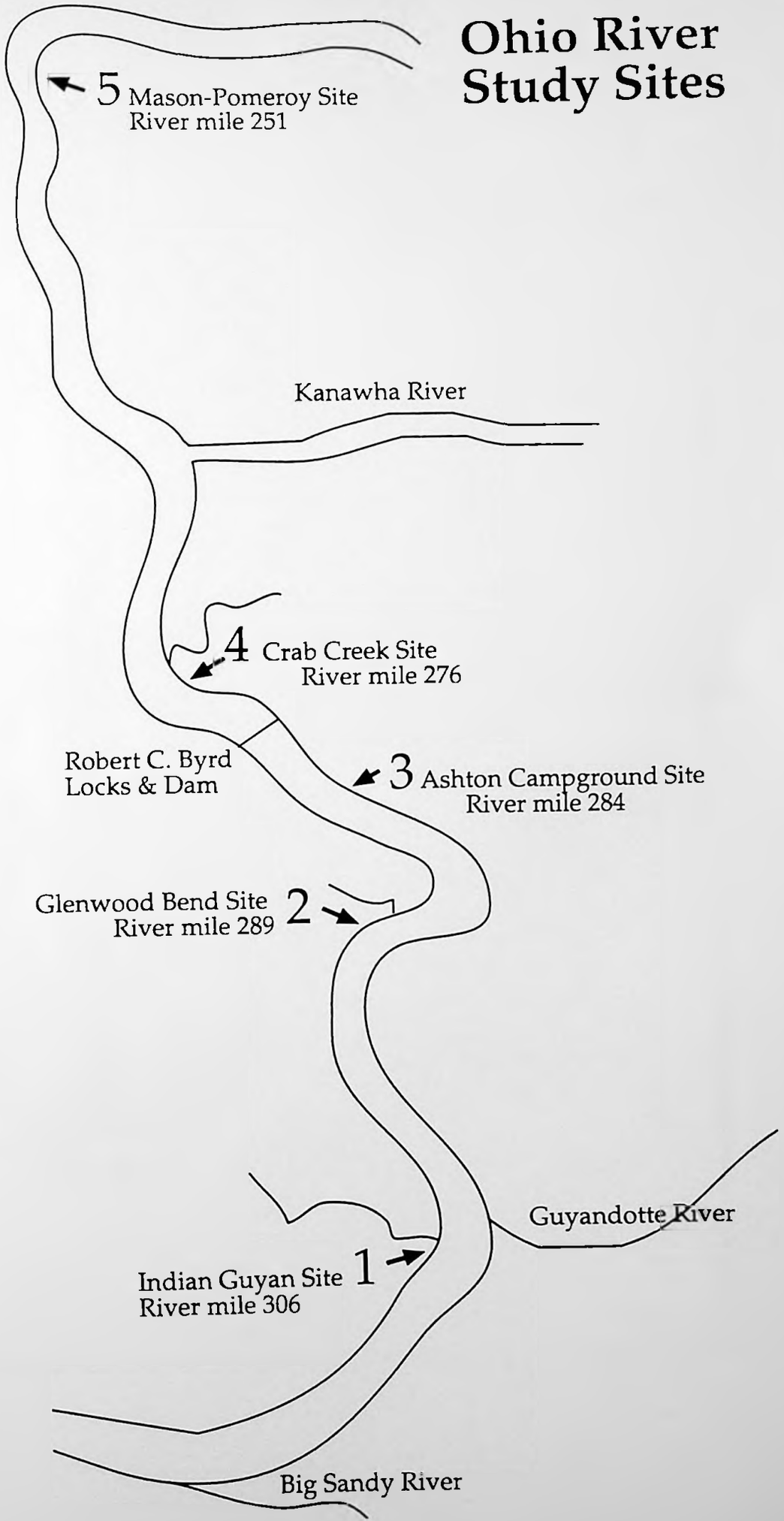

Ohio River
Study Sites
5 Mason-Pomeroy Site
River mile 251
Kanawha River
4 Crab Creek Site
River mile 276
Robert C. Byrd
Locks & Dam
3 Ashton Campground Site
River mile 284
Glenwood Bend Site
River mile 289
2
Guyandotte River
Indian Guyan Site
River mile 306
1
Big Sandy River

Figure 2: Plant community study sampling technique used for the five study sites along the middle Ohio River.

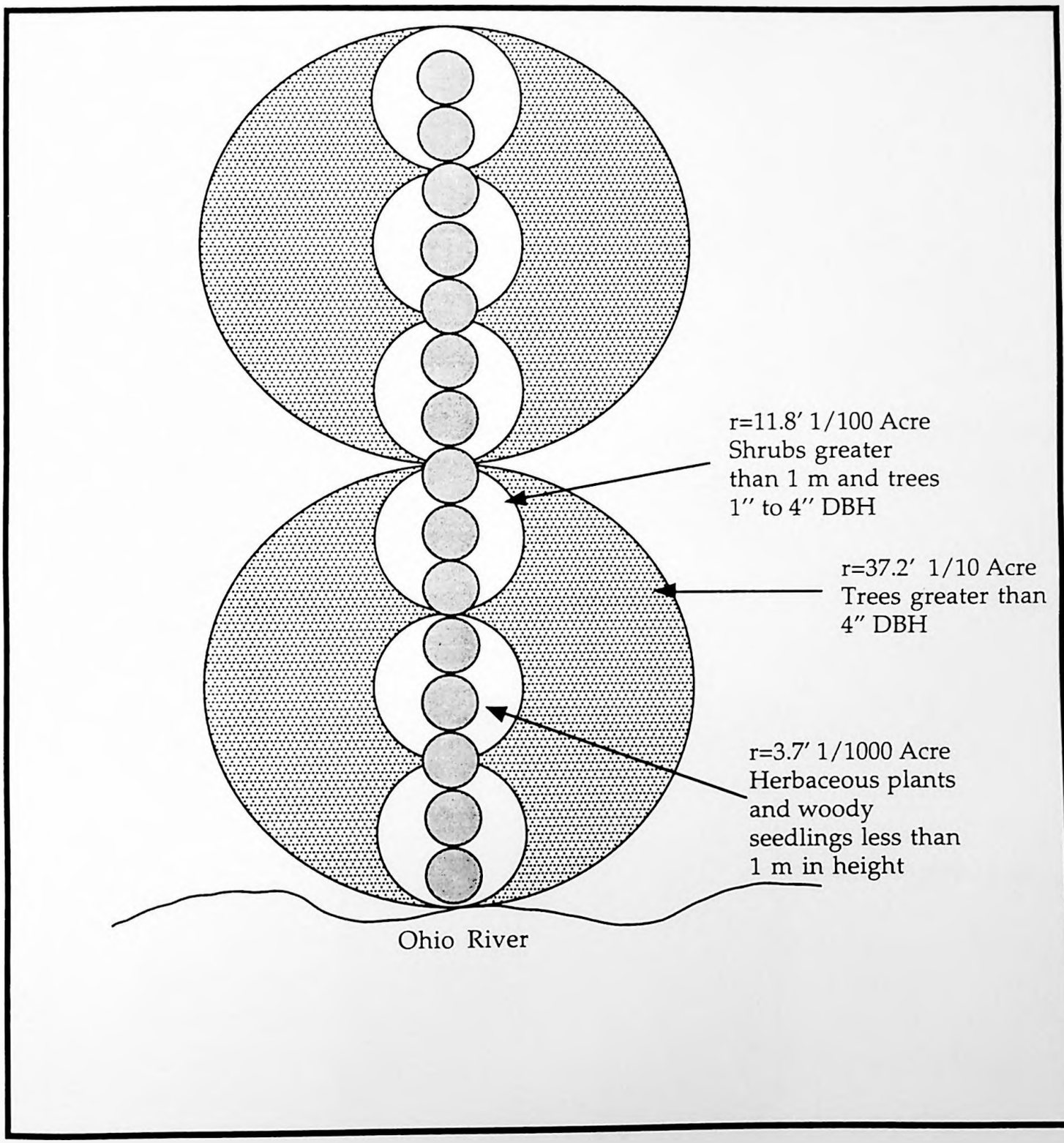
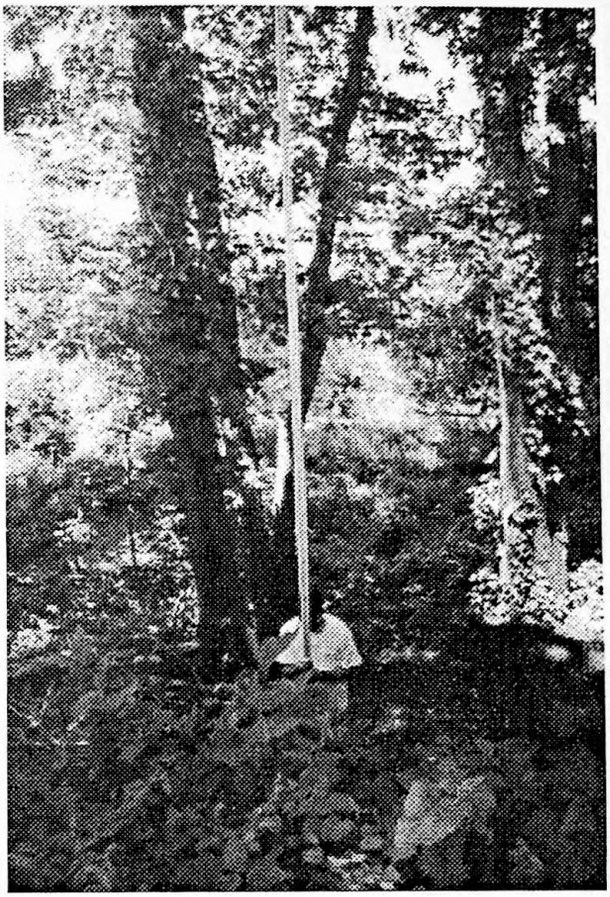

r=11.8′ 1/100 Acre
Shrubs greater
than 1 m and trees
1″ to 4″ DBH
r=37.2′ 1/10 Acre
Trees greater than
4″ DBH
r=3.7′ 1/1000 Acre
Herbaceous plants
and woody
seedlings less than
1 m in height
Ohio River

Figure 3: Surveying rod used for bank profile survey.

Figure 4: Tripod with transit used for bank profile survey.



CHAPTER III
Results and Discussion

Plant Community Study

Site 1 Indian Guyan River Mile 306

The Indian Guyan site was located along the state of Ohio side of the Ohio River near Proctorville, 300 feet downstream of the mouth of Indian Guyan Creek and adjacent to a public boat access area (Figure 5). The bank profile transect was 80 feet long from the water's edge to the top of the bank inward along the floodplain. The site had a narrow flats or beach area and a steep rising bank leading to the floodplain (Figure 6 and 7). The bank showed evidence of erosion during times of high water.

The flats or beach area supported only two species of plants, *Chamaesyce maculata* and *Eragrostis hypnoides* (Table 1, Appendix 1). The bank area supported 25 species of plants. The dominant elements were *Artesmisia vulgaris, Sorghum halepense,* and *Phalaris arundinacea* (Table 2). The three dominant species accounted for 84.7 out of a possible Importance Value (IV) of 199.3. Five species of tree and woody shrub seedlings were recorded along the bank.

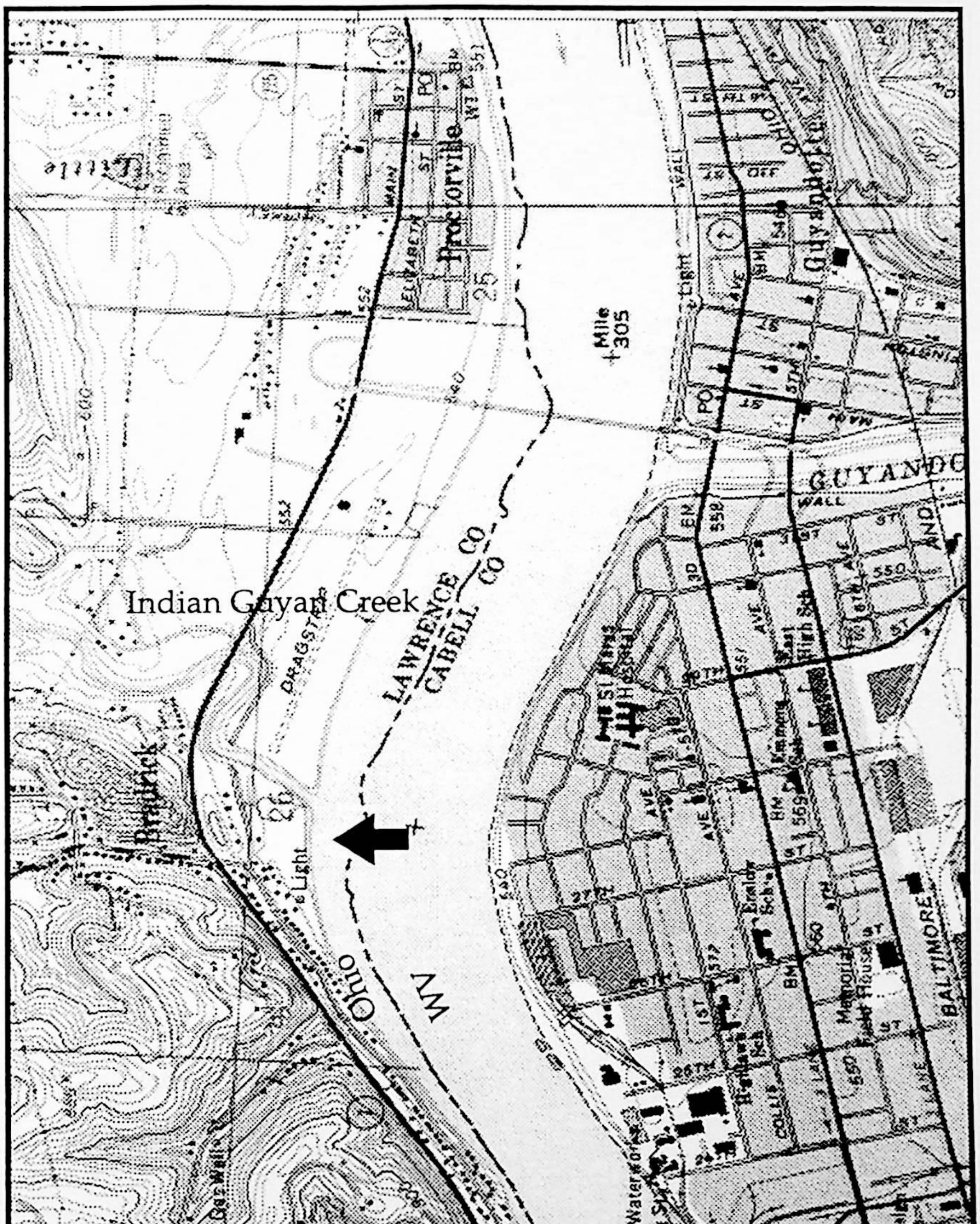
The vegetation in the floodplain area had been cut over in the 1978 study; therefore, no species were identified from the floodplain at that time. However, in 1995, the area was covered with tall herbaceous plants but no woody plants. The floodplain had only six species present and was dominated by *Phalaris arundinacea* and *Verbesina alternifolia* (Table 3). These two species accounted for 146.8 out of a possible IV of 200.1.

The most dominant shrub species was *Ailanthus altissima* , (IV=80) (Table 4), and the most dominant tree species was *Robinia pseudoacacia* (IV=214.9) (Table 5). These species were found on the bank but not on the floodplain. There were no trees or shrubs present in the 1978 study by Clagg and Mills.

Thirty-one species were found along the study transect in the plant community study. An additional 23 species were identified in adjacent areas

in the floristic study for a total of 54 species of plants for the study site. The 1978 study recorded 89 species with 34 common to the two studies.

Figure 5: USGS topography map of Site 1, Indian Guyan, along the middle Ohio River at river mile 306. Site is designated with an arrow. Scale 1:24000



Indian Guyan Creek
LAWRENCE CO
CABELL CO
Ohio
WV
Proctorville
Mile 305
GUYANDO
BALTIMORE

Figure 6: Bank profile from 1995 survey with corresponding dominant vegetation for Site 1, Indian Guyan.

Indian Guyan Plant Communities

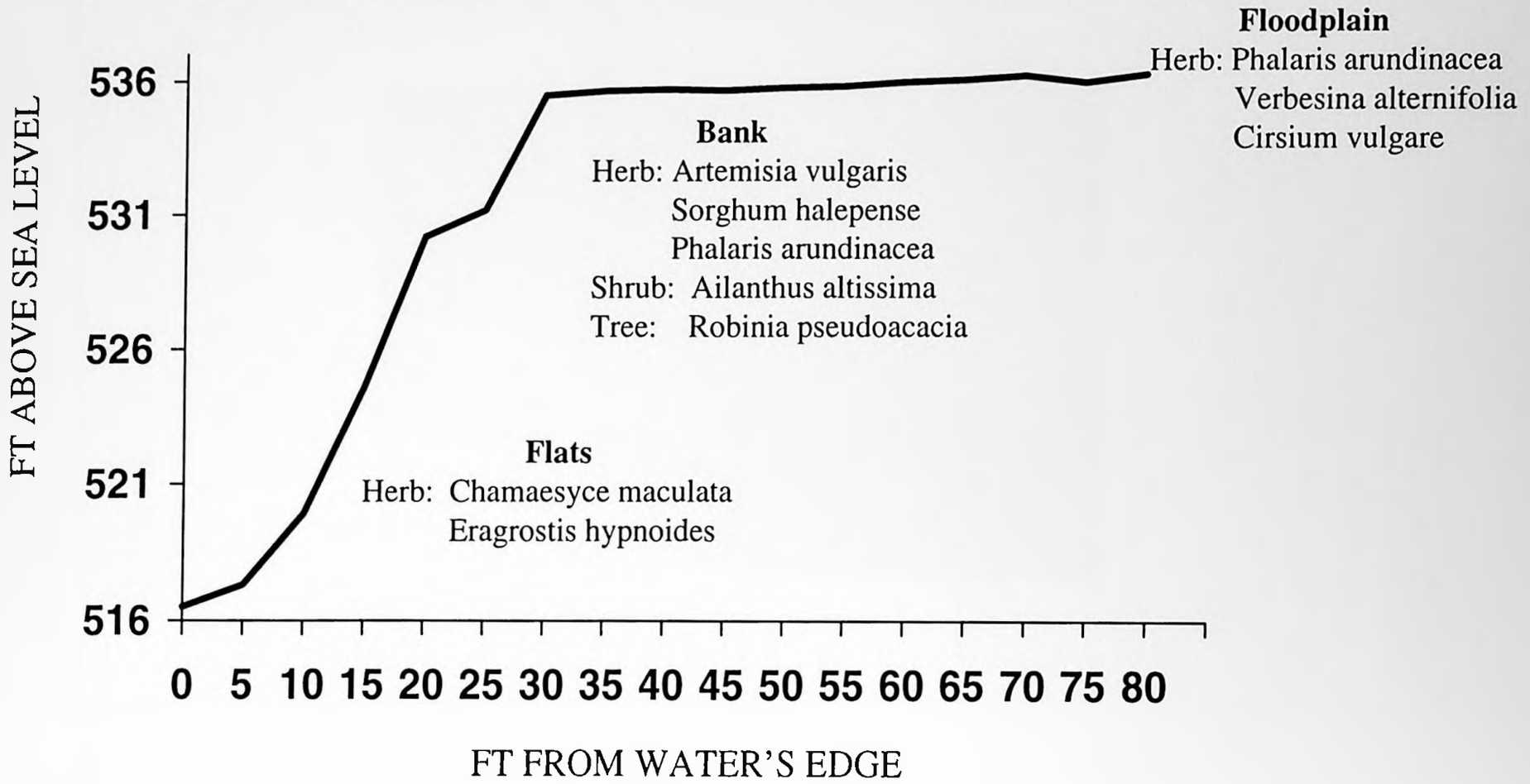
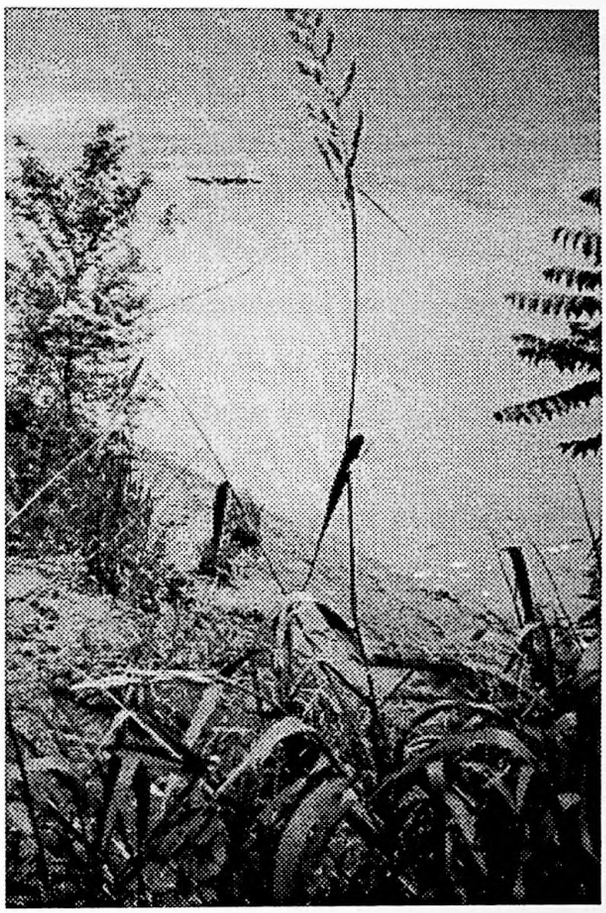


Figure 7: View from floodplain down to water's edge at Site 1, Indian Guyan.



Site 2 Glenwood Bend River Mile 289

The second site was located along a farm field 150 feet upstream of the mouth of Stillhouse Branch on the state of Ohio side of the Ohio River at river mile 289 (Figure 15). The study transect was 90 feet long from the water's edge to the floodplain (Figure 9).

This site had flats or beach area that gradually sloped up to the bank and floodplain (Figures 10 and 11). The flats were dominated by seedlings of *Salix exigua* and *Digitaria sanguinalis*. These two species accounted for 76.6 out of a possible IV of 200.8. There were 14 species of plants present in the quantitative study along the flats (Table 6).

The bank rose gently to a steep 4 foot embankment at the floodplain. A tree with exposed roots was present along the bank, evidence of erosion (Figure 12). The bank was dominated by *Glechoma hederacea, Muhlenbergia frondosa,* and *Boehmeria cylindrica*. These three species accounted for 59.8 out of a possible IV of 201. There were 53 species of plants present along the bank in herbaceous plots (Table 7).

On the floodplain, nine species of plants were present. The dominant herbaceous species were *Glechoma hederacea, Impatiens capensis,* and a species of *Galium* . These elements accounted for 128.6 out of a possible IV of 199.8 (Table 8).

Shrubs and tree species were present along both the bank and the floodplain of the site. The dominant species in the shrub plots was *Salix exigua* (IV= 108.3) (Table 9). The dominant tree species were *Acer negundo* var. *negundo* and *Salix exigua* (Table 10). These two tree species accounted for 158.9 out of a possible IV of 300.1. The shrub and tree plots contained seven species.

The Glenwood Bend site was the most floristically diverse of the five study sites. There were 69 species present along the community study transect. An additional 40 species of plants were found in adjacent areas giving the site 109 species. In the 1978 study, there were 89 species at this site, 50 of which are common to the two studies. The Glenwood Bend site shows the greatest floristic similarity to the 1978 study.

Figure 8: USGS topography map of Site 2, Glenwood Bend, along the middle Ohio River at river mile 289. Site is designated with an arrow. Scale 1:24000

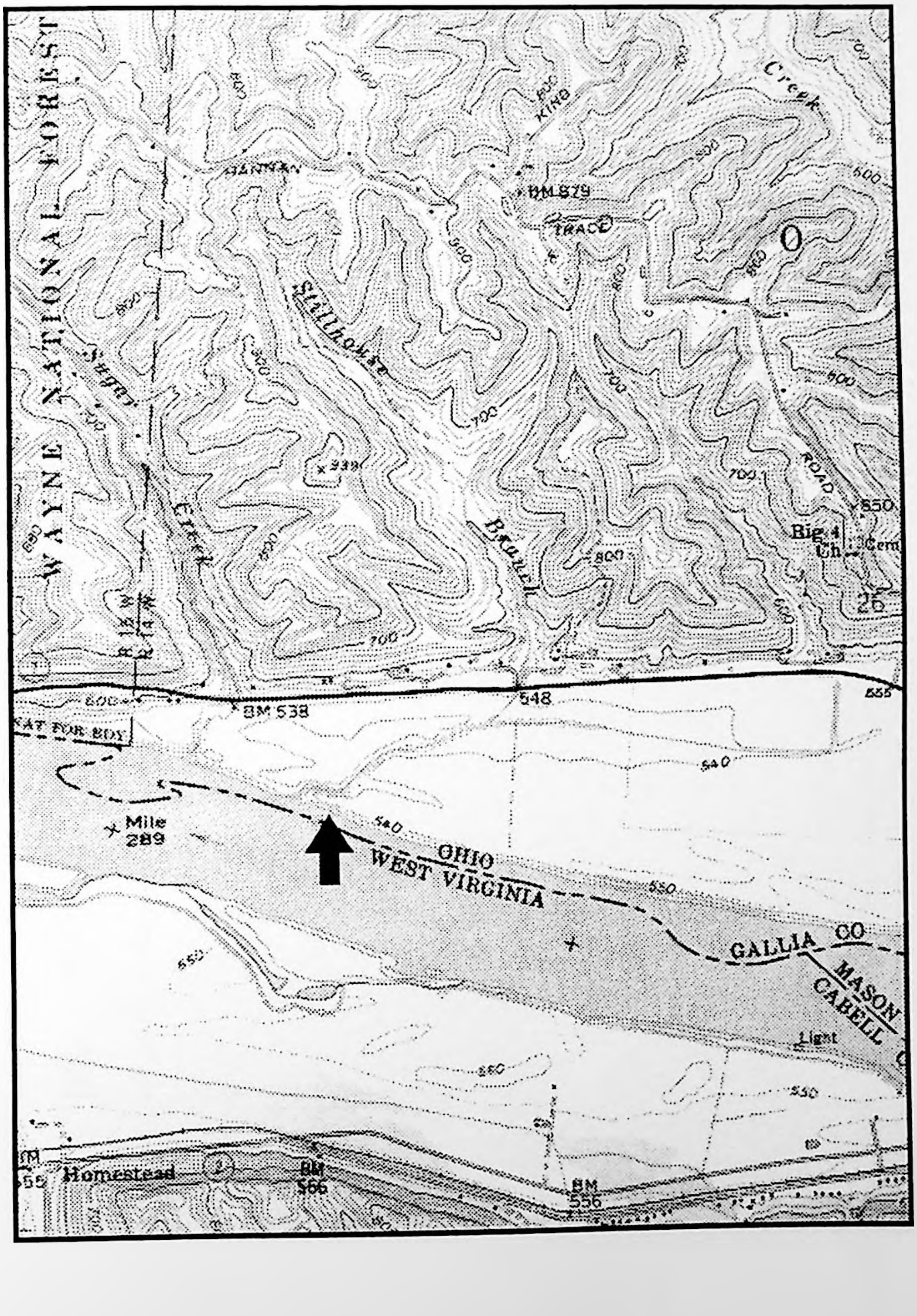

WAYNE NATIONAL FOREST
Sugar
Creek
Stillhouse
Branch
Creek
KING
TRACE
BM 879
ROAD
Big 4
Ch
Cem
26
BM 538
548
Mile
289
OHIO
WEST VIRGINIA
GALLIA CO
MASON
CABELL
Light
Homestead
BM
566
BM
556

Figure 9: Bank profile from 1995 survey with corresponding dominant vegetation for Site 2, Glenwood Bend.

Glenwood Bend Plant Communities

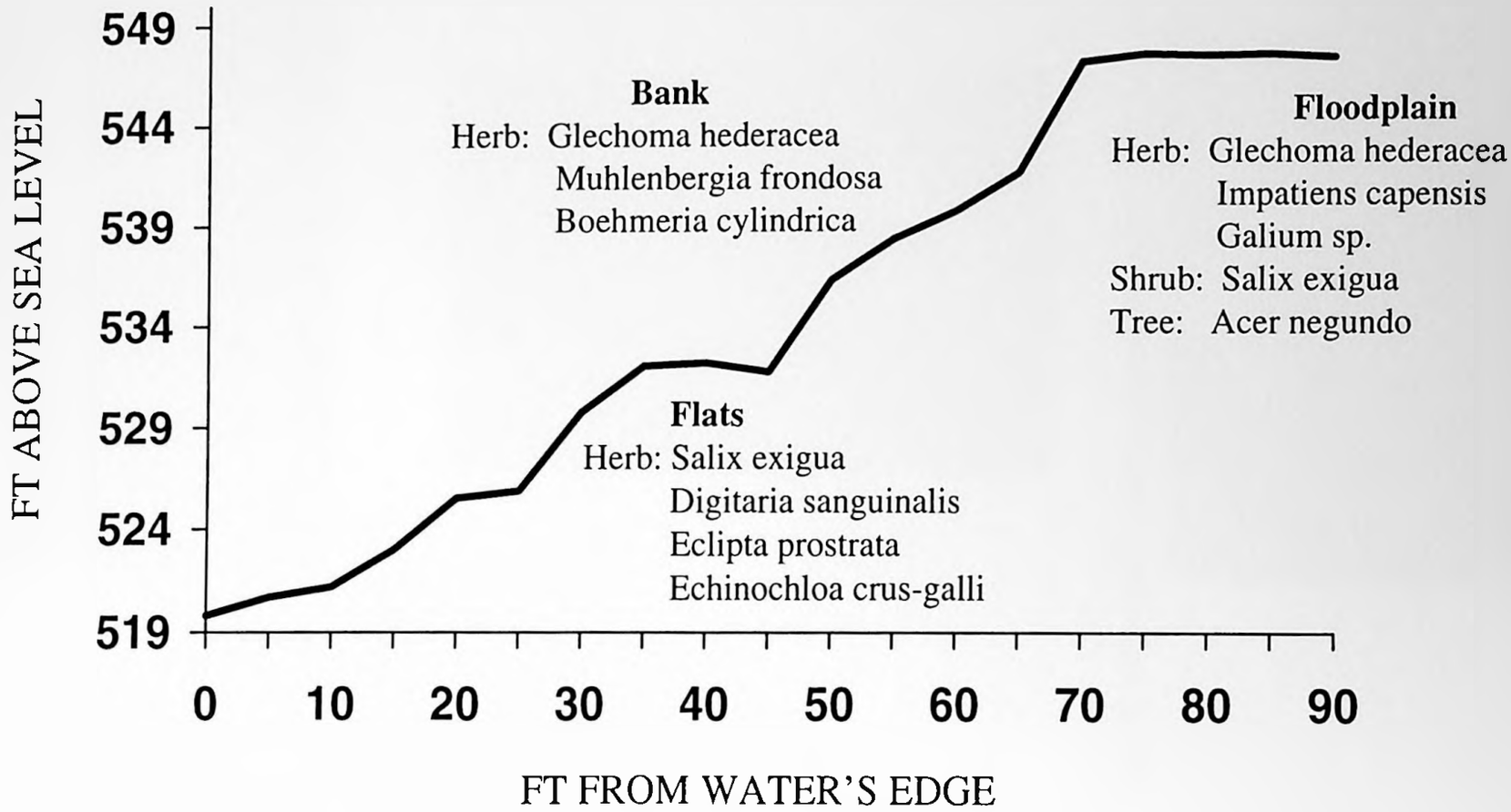
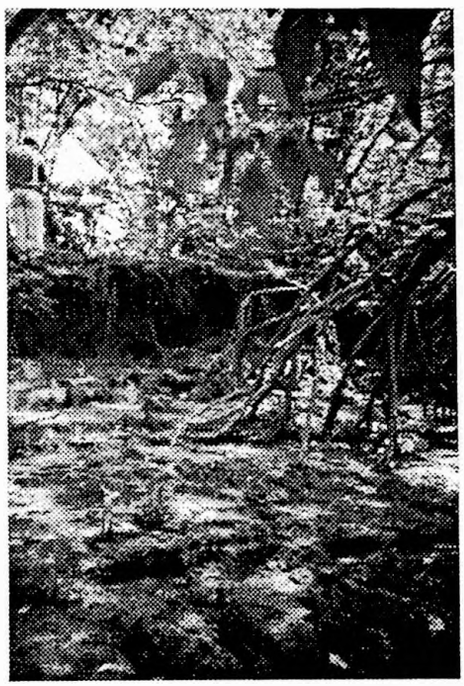
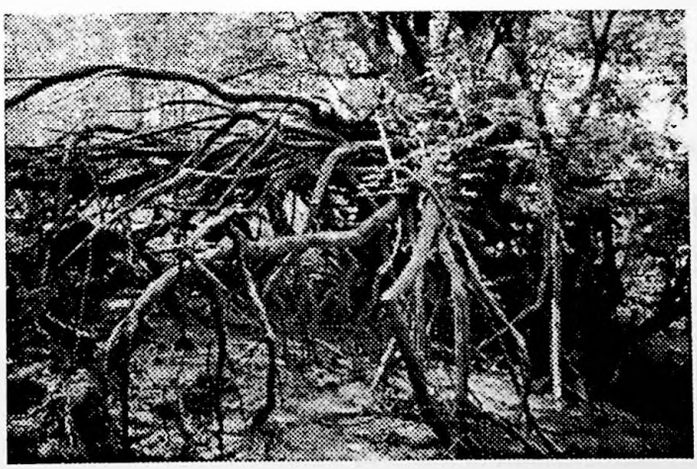


Figure 10: Downstream view of flats at Site 2, Glenwood Bend.

Figure 11: Inland view of transect showing terracing of bank at Site 2, Glenwood Bend.

Figure 12: Exposed root system of tree located on bank at Site 2, Glenwood Bend.





Site 3 Ashton Campground River Mile 284

Site three was located at Ashton Campground on the West Virginia side of the Ohio river, upstream of Eighteen Mile Creek at river mile 284 (Figure 13). This site was not part of the Clagg and Mills' 1978 study. Access to the Sixteen Mile Creek site, in the 1978 study, was denied by the land owner. The Ashton Campground site was chosen due to the wide beach area, a limited habitat at the other sites.

The beach at the Ashton site was 60 feet wide and led to a gradually sloping bank (Figures 14 and 15). Two steep rises in the bank, each approximately 6 feet high, occurred 125 feet and 160 feet from the water's edge, respectively. The second steep rise led to the floodplain area where grasses dominated the campground area. The transect was 180 feet long from the water's edge to the floodplain (Figure 16).

The wide flats or beach area was dominated by *Digitaria sanguinalis*, *Eragrostis pectinacea*, *Justicia americana*, and seedlings of *Amorpha fruticosa*. These four species accounted for 106.3 out of a possible IV of 200.7. There were 29 species along the flats (Table 11). This area had the most diverse flats area due to being wide and relatively undisturbed.

The bank was dominated by *Muhlenbergia frondosa*, *Arthraxon hispidus*, and *Glechoma hederacea*. These three species accounted for 63.1 out of a possible IV of 201. There were 51 species of plants recorded in the herbaceous plots at this site (Table 12).

The floodplain was disturbed by cultivated lawn grasses and trailers of summer campers. There were only eight species found on the floodplain. The dominant elements were *Poa* sp. and *Glechoma hederacea* (Table 13). The unknown species of *Poa* was the planted grass. These two species accounted for 116.5 out of a possible IV of 199.9.

The dominant shrubs were *Salix exigua* and *Amorpha fruticosa*. These two species accounted for 145 IV points out of a possible 200 (Table 14). The dominant tree species was *Acer saccharinum* (IV=158) (Table 15).

There were 76 species of plants found as part of the plant community study and 26 more species found in the floristic study. A total of 102 species of

plants was recorded at the Ashton Campground study site.

Figure 13: USGS topography map of Site 3, Ashton Campground, along the middle Ohio River at river mile 284. Site is designated with an arrow. Scale 1:24000.

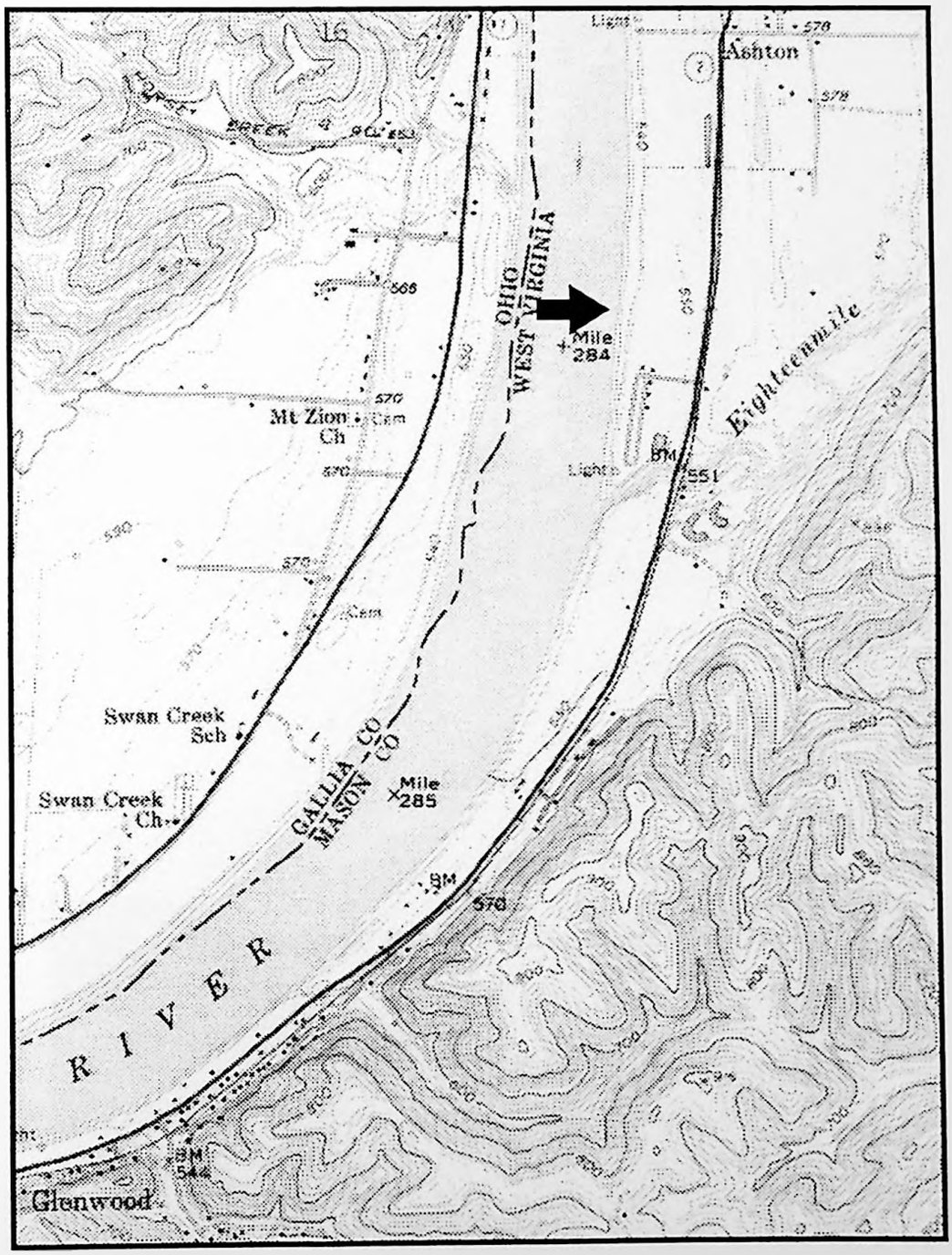

Ashton
OHIO
WEST VIRGINIA
Mile 284
Eighteenmile
Mt Zion Ch
Cem
BM 551
Swan Creek Sch
Swan Creek Ch
CALLIA CO
MASON CO
Mile 285
BM 570
RIVER
BM 544
Glenwood

Figure 14: Inland view of study transect at Site 3, Ashton Campground.

Figure 15: Downstream view of beach area at Site 3, Ashton Campground.

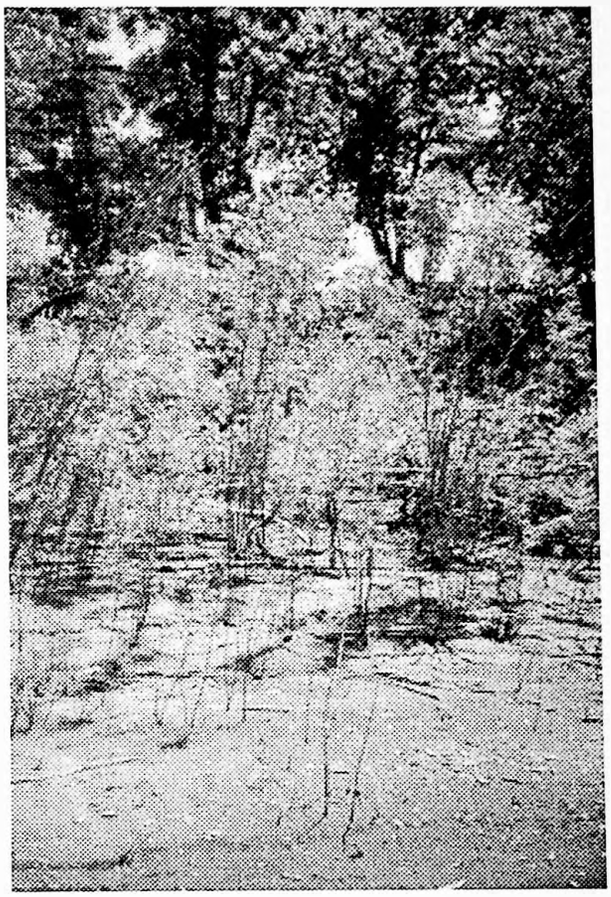
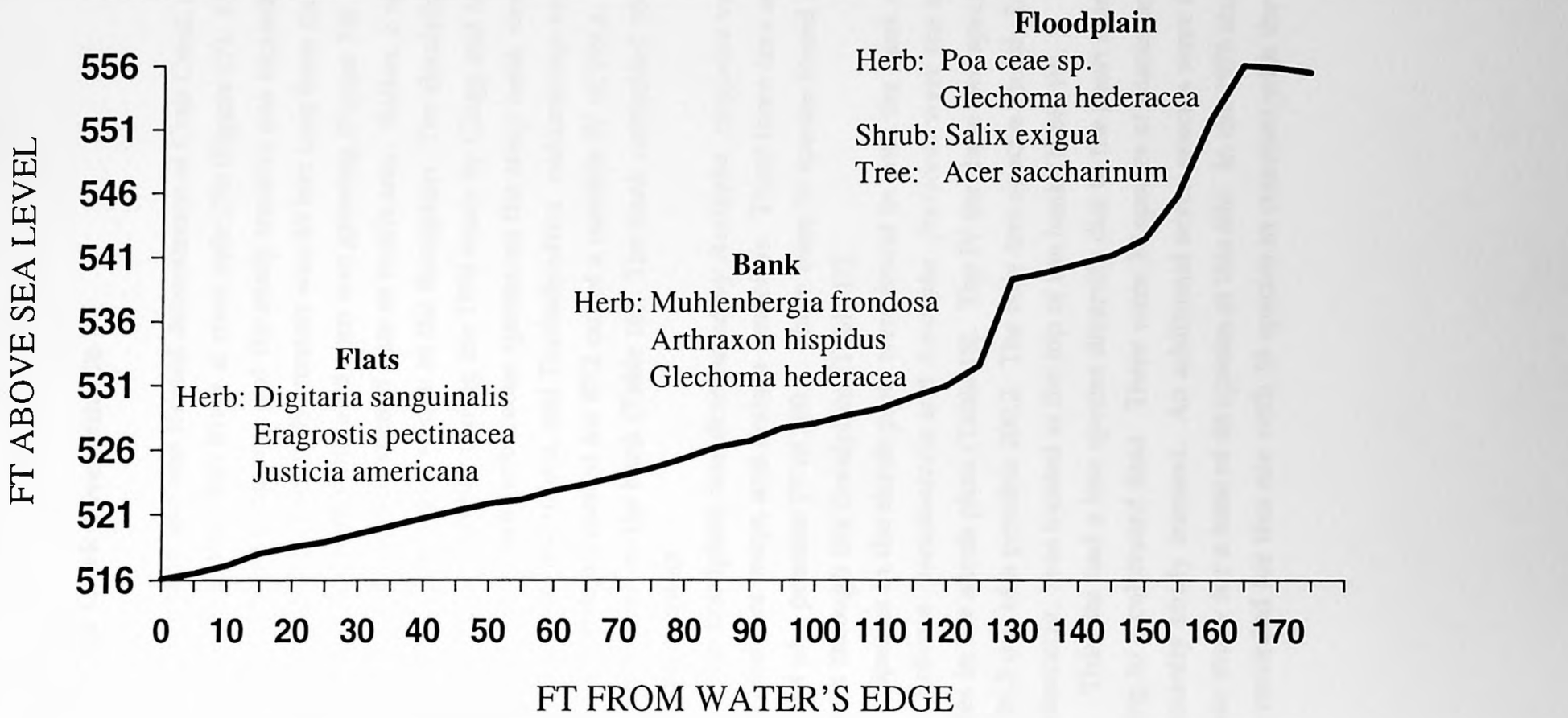


Figure 16: Bank profile from 1995 survey with corresponding dominant vegetation for Site 3, Ashton Campground.

Ashton Campground Plant Communities



Site 4 Crab Creek River Mile 276

The fourth site was located downstream of Crab Creek on the West Virginia side of the Ohio River at river mile 276 (Figure 17). Crab Creek is located near a camping area and the study transect was located in a neighboring field. The study transect was 45 feet long from the water's edge to the floodplain where cultivated corn was growing (Figure 18).

This site had no exposed flats or beach area. Rather, a sharply rising bank led from the water's edge to the floodplain. The floodplain field had been cultivated with hay during the 1978 study by Clagg and Mills.

The dominant herbaceous species on the steep bank were *Lonicera japonica*, *Rosa multiflora*, and *Toxicodendron radicans* ssp. *radicans*. These three elements accounted for 87.2 out of a possible IV of 199.4. There were 24 species present on the bank (Table 16). The bank comprised 30 feet of the 45 foot long transect.

The floodplain was dominated by *Acalypha virginica* var. *rhomboidea*, cultivated *Zea mays*, and *Festuca pratensis*. These three taxa accounted for 79.3 out of a possible IV of 200.6. There were 16 species found along the transect through the floodplain (Table 17).

Species in the shrub plots were found in both the bank and floodplain area. *Robinia pseudoacacia* and *Amorpha fruticosa* were the most common species in the shrub plots (Table 18). The IV for these two species accounted for 126.5 out of a possible 200.2. The only tree species found, *Robinia pseudoacacia*, was located at the top of the bank (Table 19).

This site had a low species diversity due to the short study transect leading to a cultivated field. There were 39 species of plants present in the community study transect. An additional seven species were found in the floristic study for a total of 46 species at this site. In the 1978 study, 52 species were recorded for this site with 18 species in common with the current study.

Figure 17: USGS topography map of Site 4, Crab Creek, along the middle Ohio River at river mile 276 Site is designated with an arrow. Scale 1:24000.

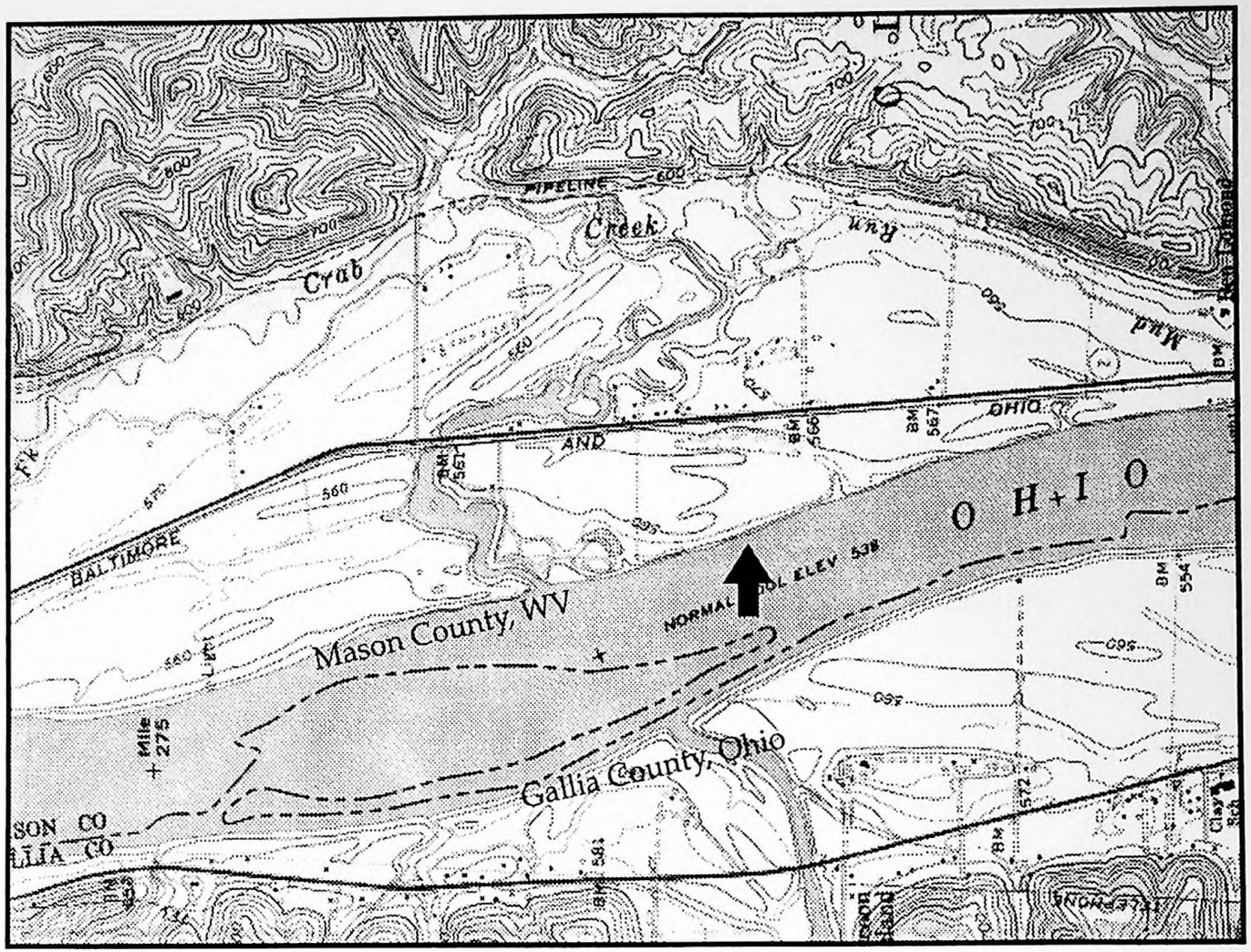
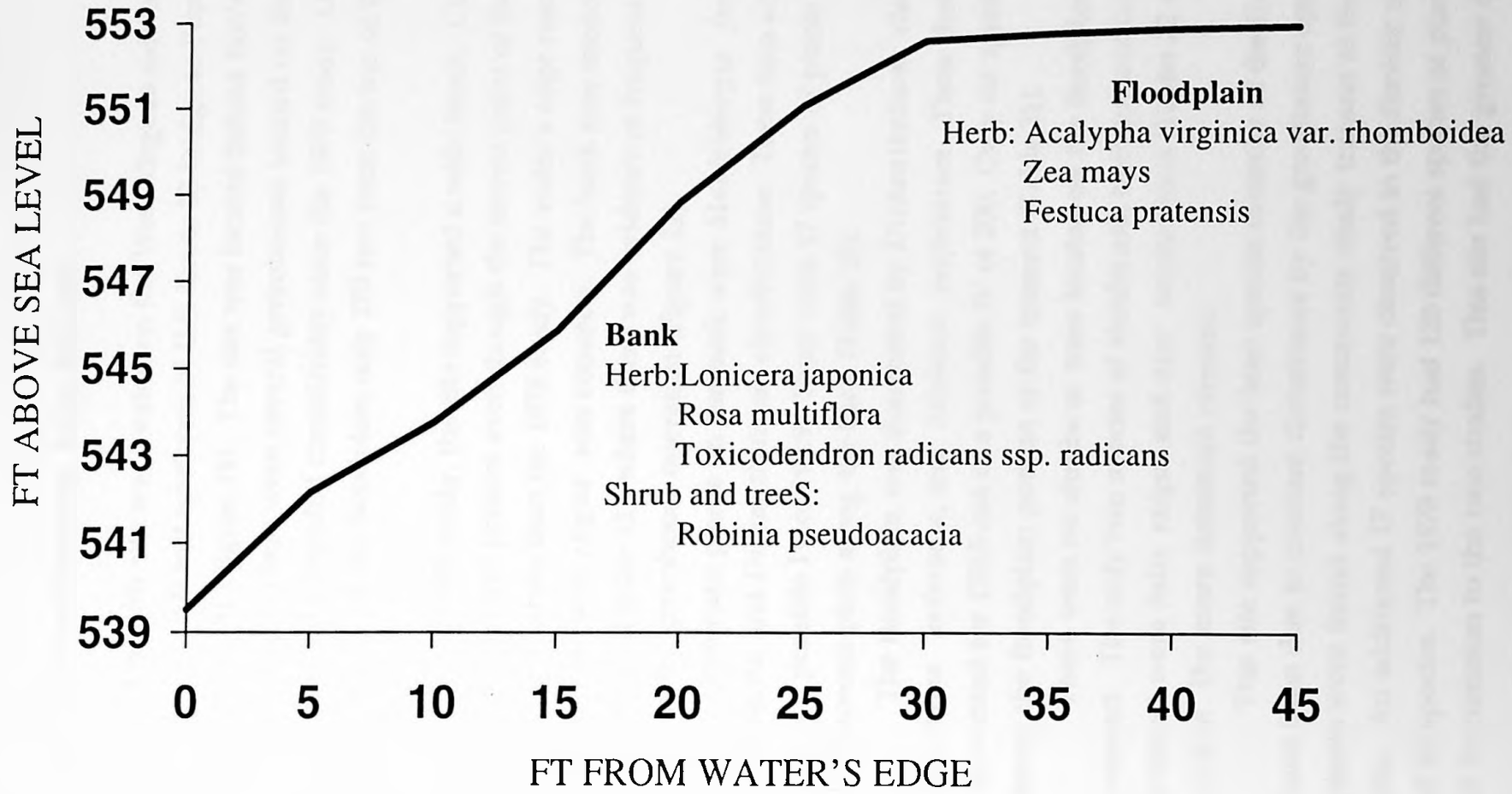

Crab
Creek
PIPELINE
OHIO
AND
BALTIMORE
O H I O
Mason County, WV
Gallia County, Ohio
NORMAL POOL ELEV 538
Mile 275
SON CO
LLIA CO

Figure 18: Bank profile from 1995 survey with corresponding dominant vegetation for Site 4, Crab Creek.

Crab Creek Plant Communities



Site 5 Mason-Pomeroy River Mile 251

The fifth site was located on the West Virginia side of the Ohio River in Mason, 1800 feet upstream of U.S. Route 33 bridge to Pomeroy, Ohio at river mile 251 (Figure 19). The site was located behind Bob's Market and Greenhouse. There were several greenhouses located on the land and the business had expanded considerably since the 1978 study. One greenhouse was located on the floodplain only 170 feet from the top of the bank (Figure 20).

In the 1978 study, the site supported a wide beach. Currently, no flats or beach areas were present even though the lowest point of the 1995 profile is at a lower elevation than the 1978 study. The water's edge reached to the tree line where *Salix exigua* was common. The bank rose moderately to the floodplain (Figure 21), where there was evidence of frequent disturbance by the nearby greenhouse operation (Figure 22).

Dominant plants on the bank were *Muhlenbergia frondosa, Glechoma hederacea,* and *Dichanthelium clandestinum.* These taxa accounted for 94.3 out of a possible IV of 199.9. There were 17 species of plants present in the herbaceous plots along the bank (Table 20).

The floodplain was dominated by *Dichanthelium clandestinum, Glechoma hederacea,* and *Silphium perfoliatum.* These three species accounted for 150.5 out of a possible IV of 200. Only six species were present along the floodplain portion of the transect (Table 21).

There were no shrubs or trees located on the floodplain portion of the transect. The only two species of shrubs and trees present on the entire study transect were *Salix exigua* and *Acer saccharinum* (Tables 22 and 23), with *Salix exigua* the more dominant element.

This site supported the least species diversity of the five sites. This may have been due to constant disturbance by the greenhouse operation. Only 18 plants were found along the community study transect at the Mason-Pomeroy site. An additional 17 species were observed in the floristic survey for a total of 35 species. The 1978 study had 120 different species of plants present with 21 in common to the two studies. This site had the greatest diversity of plants

in the previous study by Clagg and Mills (1978).

Figure 19: USGS topography map of Site 5, Mason-Pomeroy, along the middle Ohio River at river mile 251. Site is designated with an arrow. Scale 1:24000.

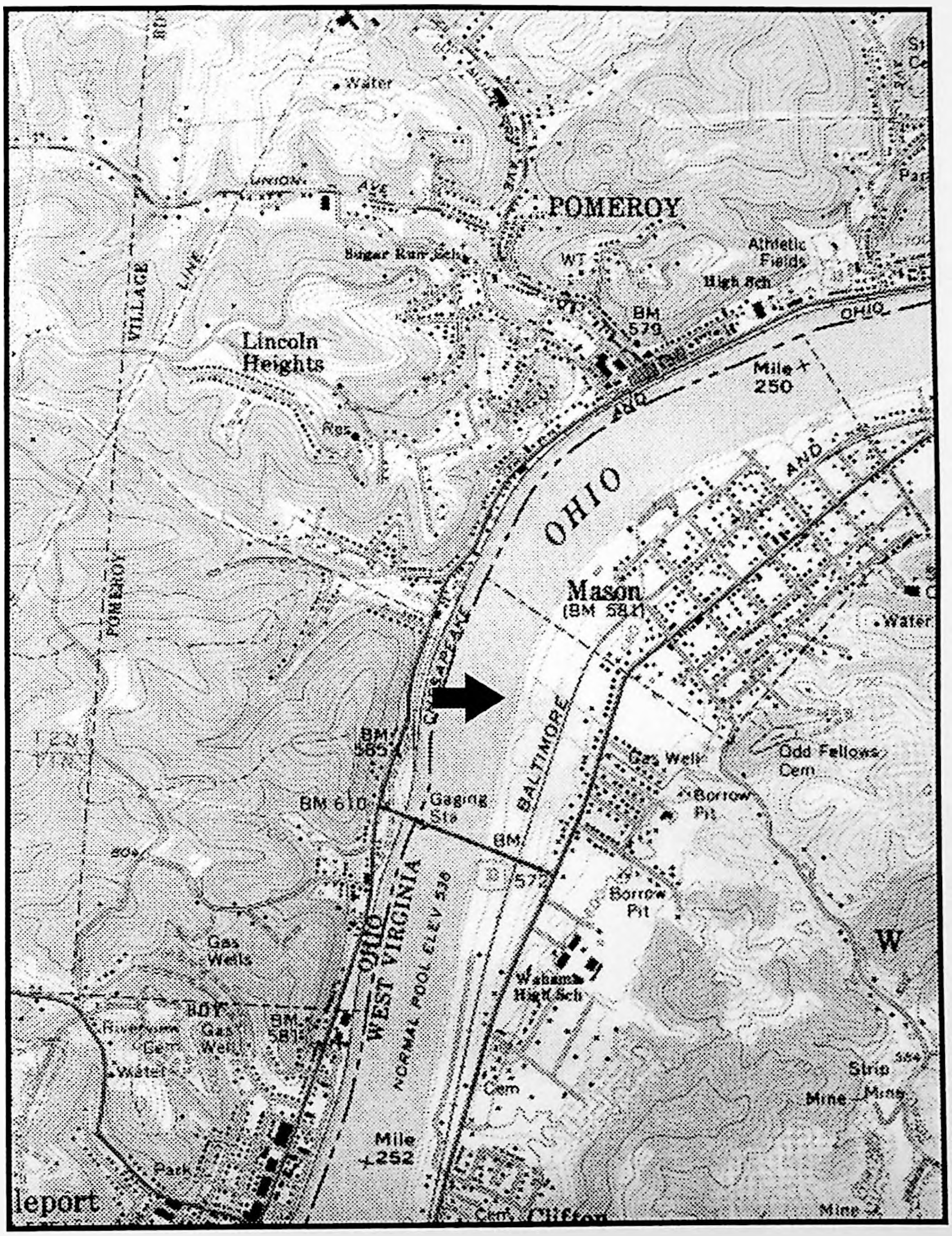
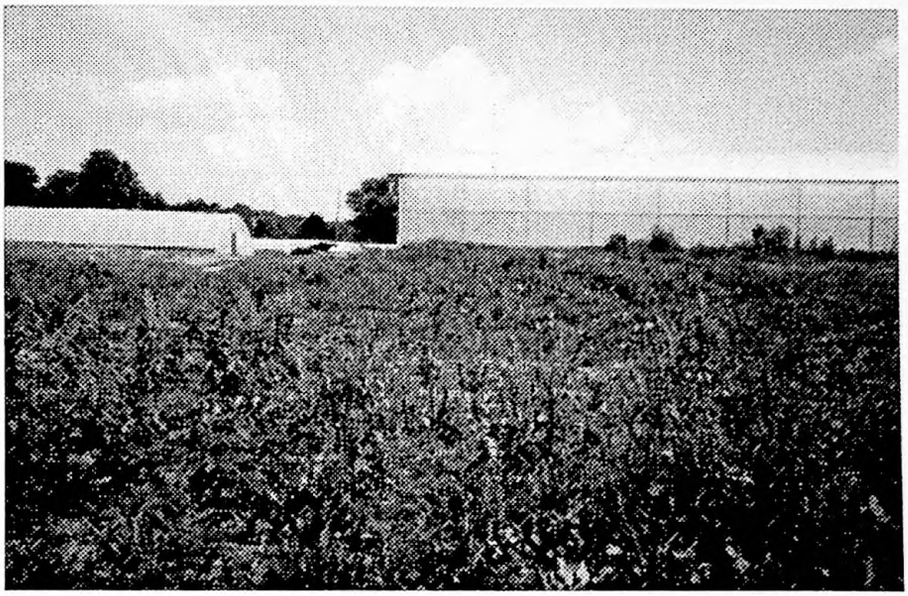

POMEROY
Lincoln Heights
Sugar Run Sch
Athletic Fields
High Sch
BM 579
Mile 250
OHIO
Mason
(BM 581)
Water
BALTIMORE
Odd Fellows Cem
Gas Well
Borrow Pit
Gaging Sta
BM 610
BM 585
POMEROY
VILLAGE
LINE
UNION AVE
Gas Wells
OHIO
WEST VIRGINIA
NORMAL POOL ELEV 538
Wahama High Sch
Gas Well
Riverview Cem
Water
BM 581
Park
Cem
Mile 252
Strip Mine
Mine
W
Clifton
leport

Figure 20: View of greenhouses on floodplain at Site 5, Mason-Pomeroy.

Figure 21: Inland view of study transect showing bank terracing and a cut log at Site 5, Mason-Pomeroy.



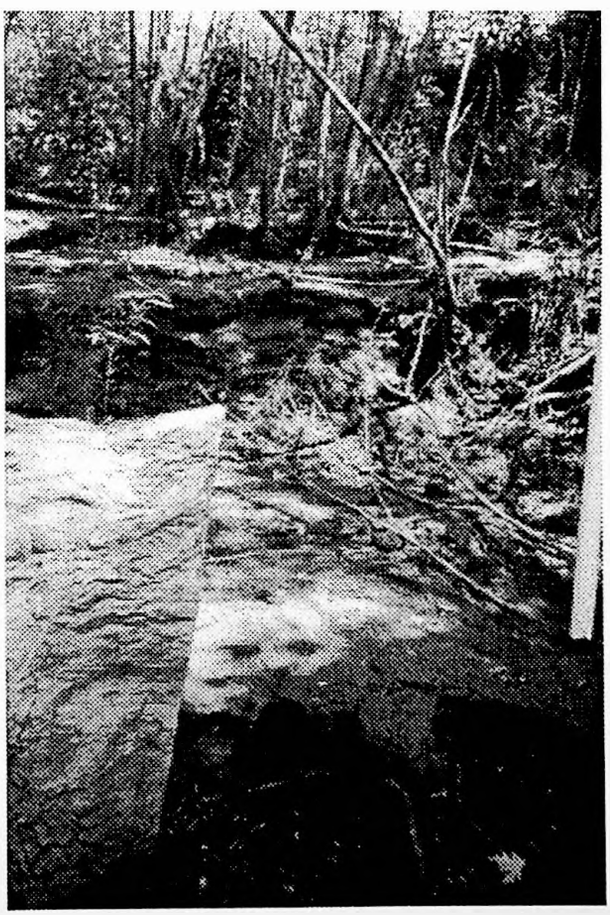
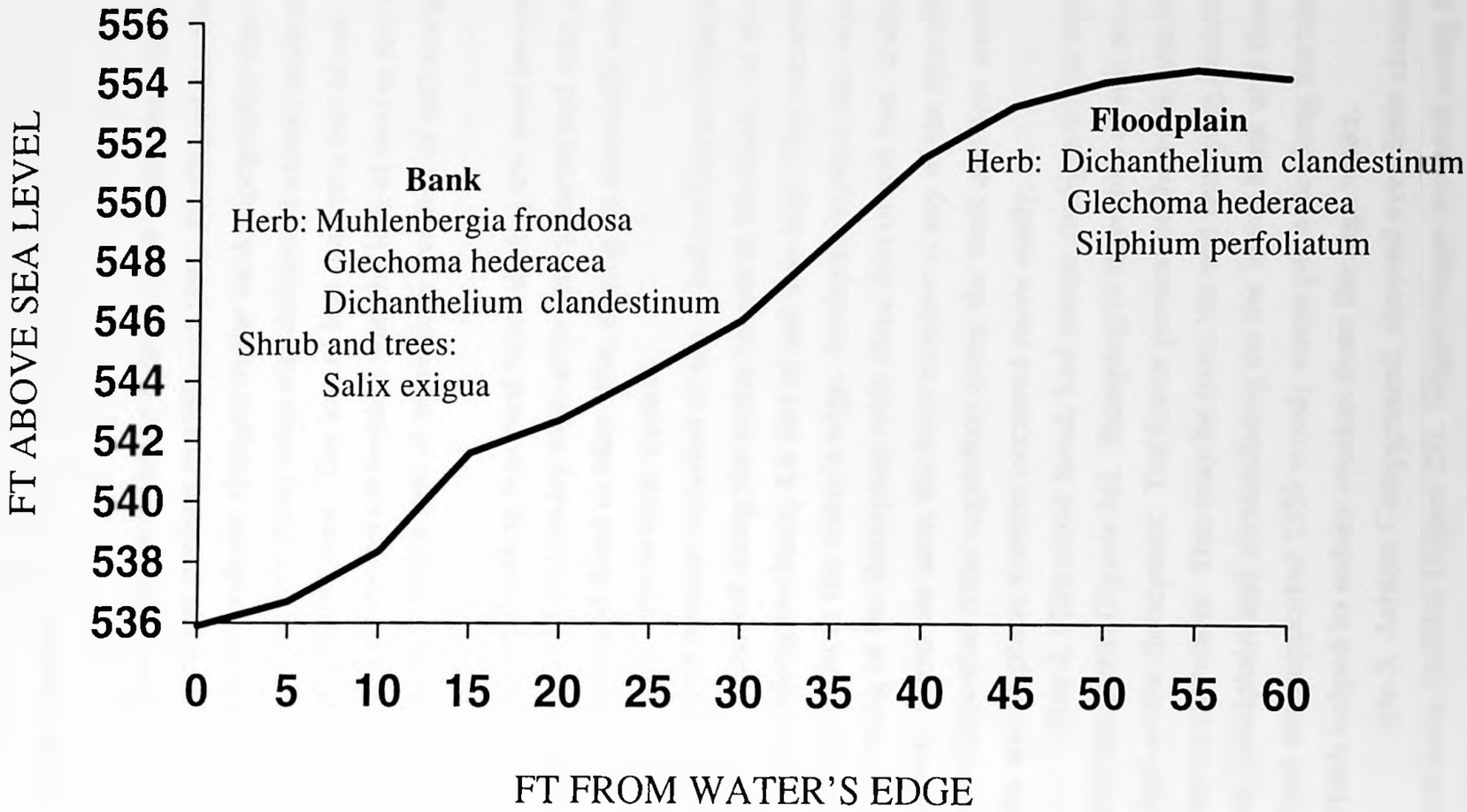


Figure 22: Bank profile from 1995 survey with corresponding dominant vegetation for Site 5, Mason-Pomeroy.

Mason-Pomeroy Plant Communities



Bank Profiles

Bank profiles from the water's edge to the floodplain were topographically defined in 1995 and 1996. Profiles of the two years were compared to evaluate changes in the bank topography due to erosion. Erosion at the five study sites was defined at minor, moderate, or severe for each topographic area. The loss of less than two feet of soil was considered minor. While moderate erosion was the loss of two to five feet of soil. And severe erosion was a loss of more than five feet of soil along any topographic area.

Major flooding occurred twice during the year between surveys. One flood occurred in January 1996 after heavy snows and rain and lasted several days. A second flood in May 1996, during an unusually wet spring, raised water levels over several weeks.

Most erosion occurred at site 1, Indian Guyan (Figure 23). Moderate erosion occurred along the entire length of the bank. At the point of greatest erosion along the bank, 4.6 feet of soil was lost. This occurred 20 to 25 feet landward from the water's edge. Moderate erosion also occurred at the beginning of the floodplain with three feet of soil lost. Indian Guyan had 525 woody stems per acre, the least number at any of the five sites. Because this site supported little vegetation along the bank and few woody plants to hold the soil in place, erosion occurred more easily.

Site 2, Glenwood Bend, had minor changes in the bank profiles from 1995 and 1996 (Figure 24). Slumping of three feet of soil occurred along the edge of the floodplain. The lower portion of the bank and flats gained three feet in elevation. This may be from the soil slumping occurring at the edge of the floodplain and accumulating on the lower bank and flats. The Glenwood Bend site supported 1355 woody stems per acre along the bank and floodplain, which helped to reduce erosion from the high water.

Site 3, Ashton Campground, showed very little change between the two bank profiles (Figure 25). Slight change occurred along the wide flats area, where some erosion was observed. The water level was still high during the 1996 survey. Therefore, 40 feet of flats surveyed in 1995 remained under

water in the 1996 survey. Along the bank, this site had a large amount of woody vegetation including *Amorpha fruticosa* and *Salix exigua*. The Ashton Campground site supported the greatest amount of woody stems per acre with 2156.8 and had the least erosion. This woody vegetation likely kept the bank in place during high water. Myers (1989) stated that the stems of vegetation slows down the water velocity during times of flooding, thereby reducing erosion.

Site 4, Crab Creek, had minor soil loss at the top of the bank and along the floodplain (Figure 26). On the floodplain, 1.5 feet of soil was lost during the flooding. This site had a cultivated field on the floodplain which may explain the soil loss. *Rosa multiflora* and *Lonicera japonica* grew abundantly on the lower bank, and this helped to reduce erosion. This site supported 1740 woody stems per acre.

Site 5, Mason-Pomeroy, had terracing occur due to the flooding. Terracing was evident at 10 feet and 25 feet landward from the water's edge (Figure 27). There was only minor erosion on the upper portion of the bank. The lower bank and floodplain areas gained two feet of soil over the year. The gain at the bottom of the bank may have been due to the slumping of the bank and accumulation of soil at the bottom of the bank. The floodplain more than likely gained soil from man-made activity of the greenhouse operation also which was located on the floodplain.

Overall, the survey areas at all five sites had minor to moderate change over the past year even with two incidents of major flooding (Table 24). Ashton Campground had the least erosion on the bank, most likely due to the large amount of woody vegetation growing there. Indian Guyan had the most erosion due to a lack of woody plants, which would form an extensive root system to hold the bank in place.

Figure 23: Comparison of 1995 and 1996 bank profiles of Site 1, Indian Guyan. Profile of 1995 is designated with a black line, 1996 is designated with a dashed line. Water level higher in 1996 than 1995.

Indian Guyan: River Mile 306

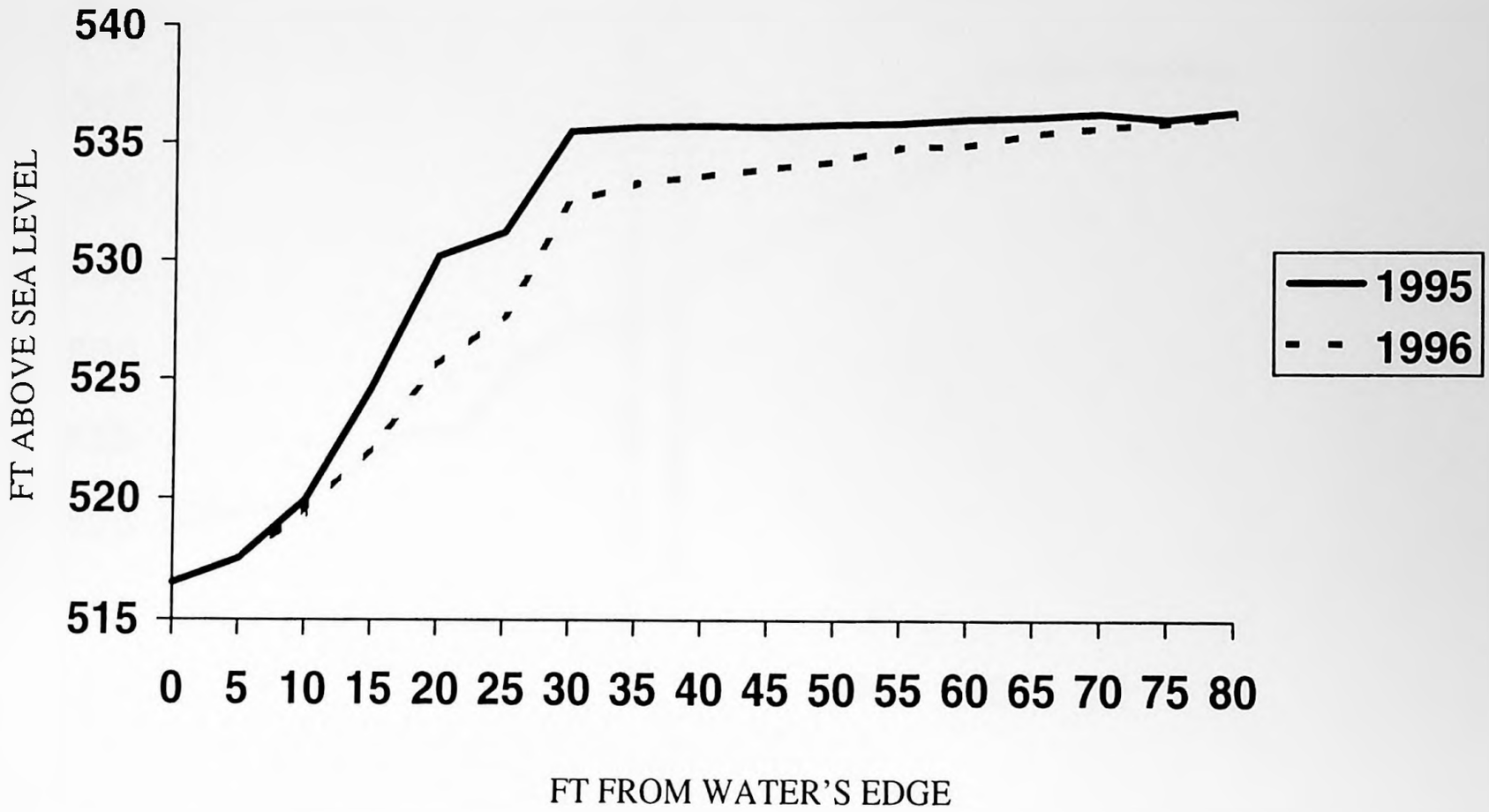


Figure 24: Comparison of 1995 and 1996 bank profiles of Site 2, Glenwood Bend. Profile of 1995 is designated with a black line, 1996 is designated with a dashed line.

Glenwood Bend: River Mile 289

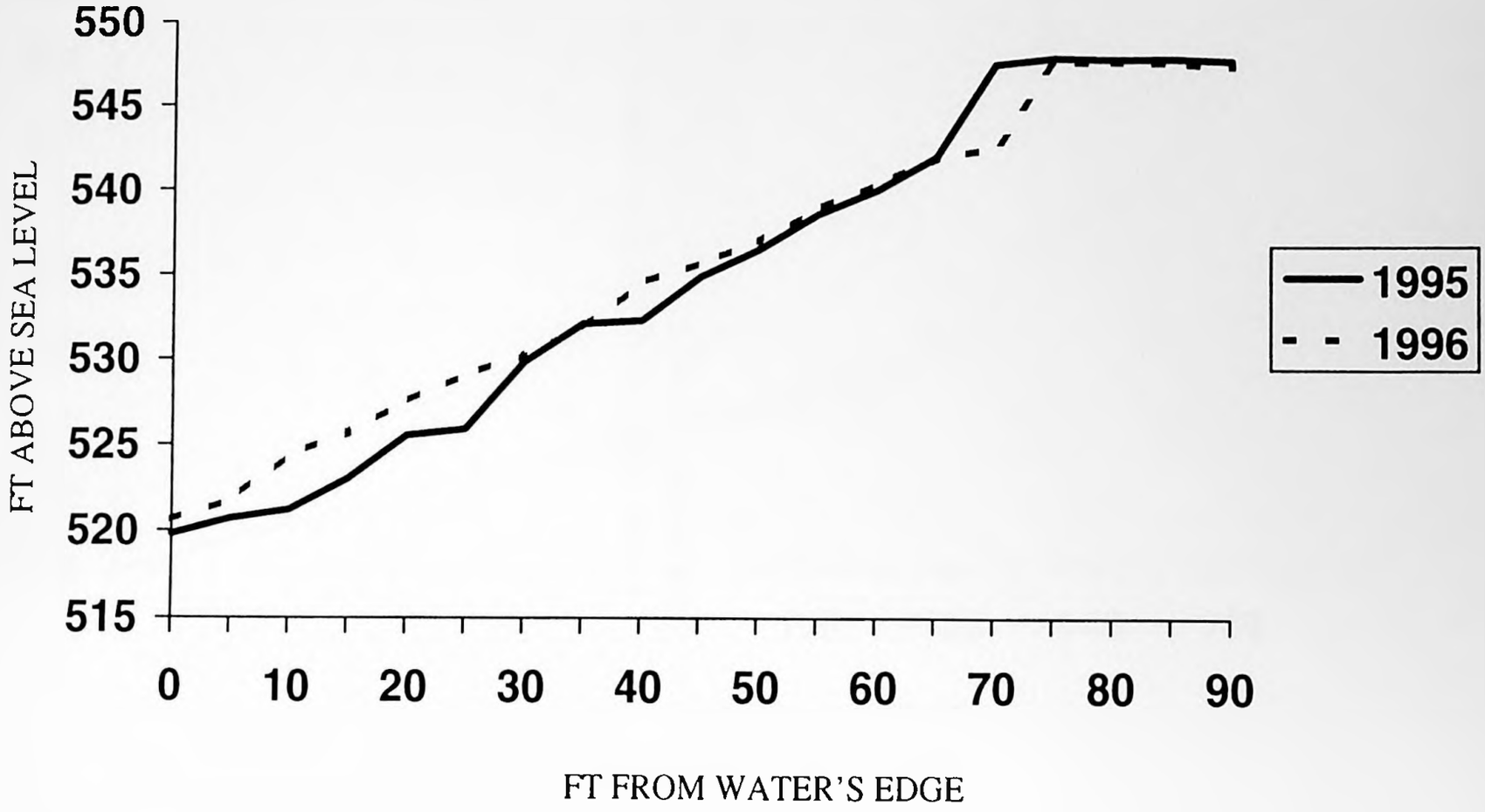


Figure 25: Comparison of 1995 and 1996 bank profiles of Site 3, Ashton Campground. Profile of 1995 is designated with a black line, 1996 is designated with a dashed line. Water level higher in 1996 than 1995.

Ashton Campground: River Mile 284

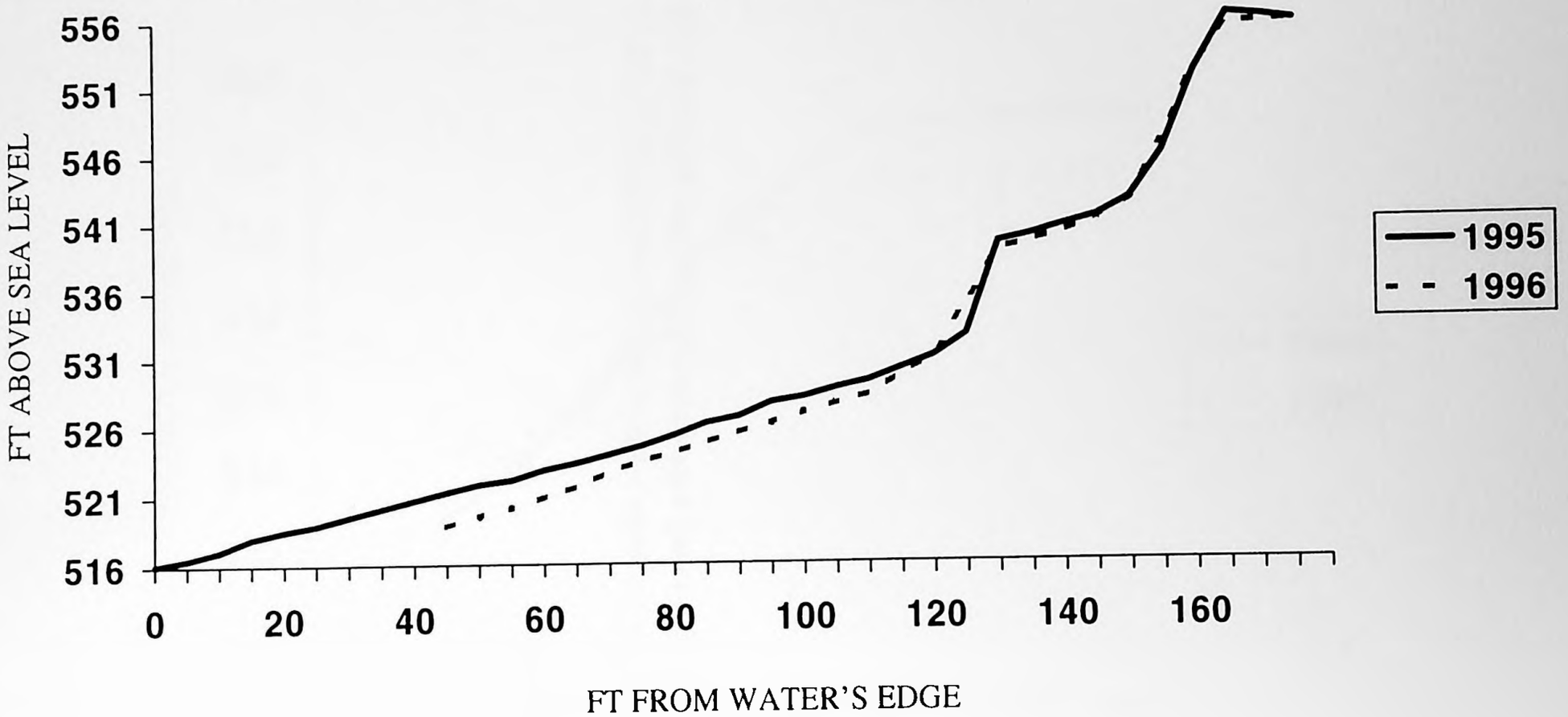


Figure 26: Comparison of 1995 and 1996 bank profiles of Site 4, Crab Creek. Profile of 1995 is designated with a black line, 1996 is designated with a dashed line.

Crab Creek: River mile 276

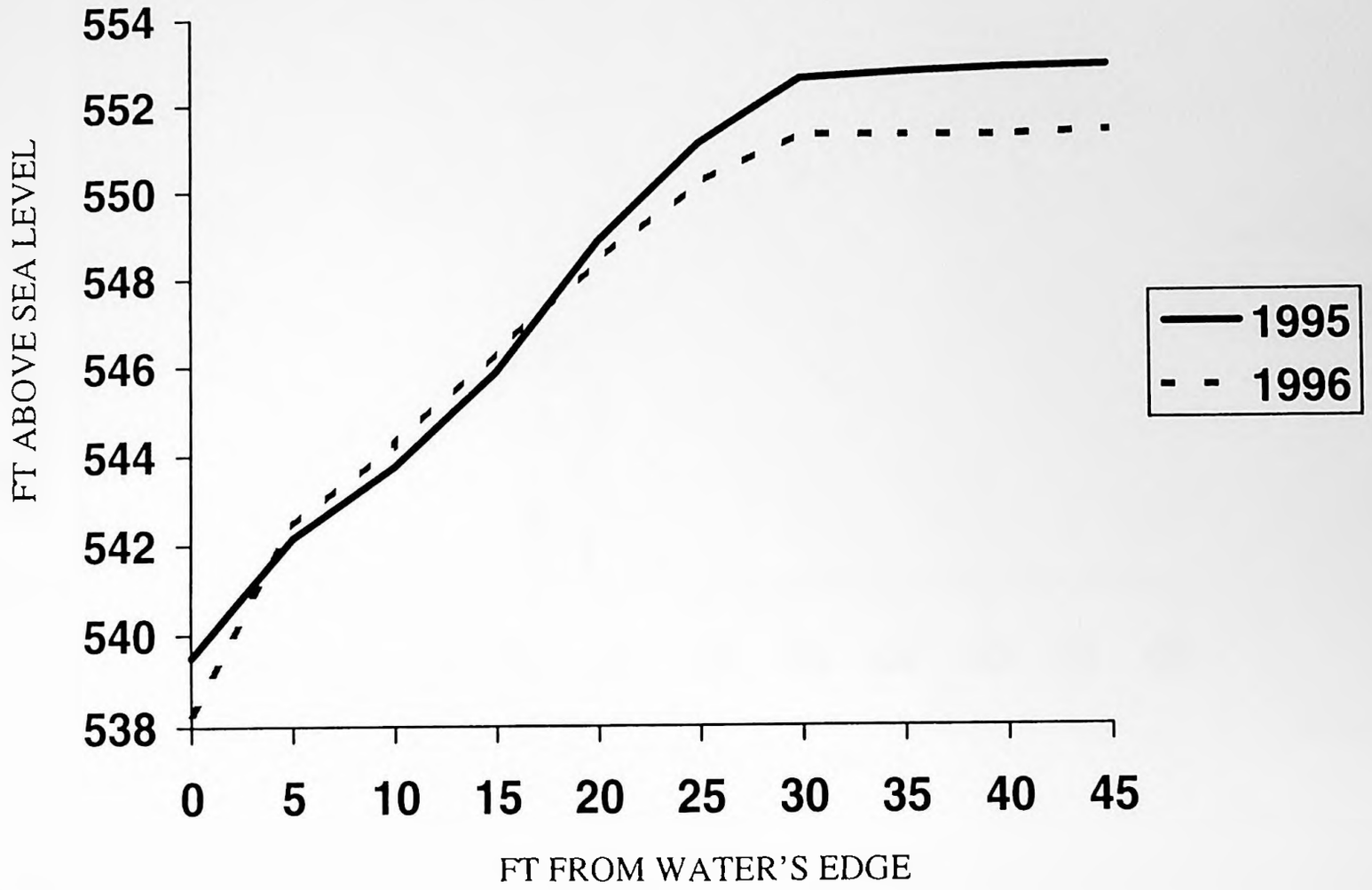


Figure 27: Comparison of 1995 and 1996 bank profiles of Site 5: Mason-Pomeroy. Profile of 1995 is designated with a black line, 1996 is designated with a dashed line.

Mason-Pomeroy: River Mile 251

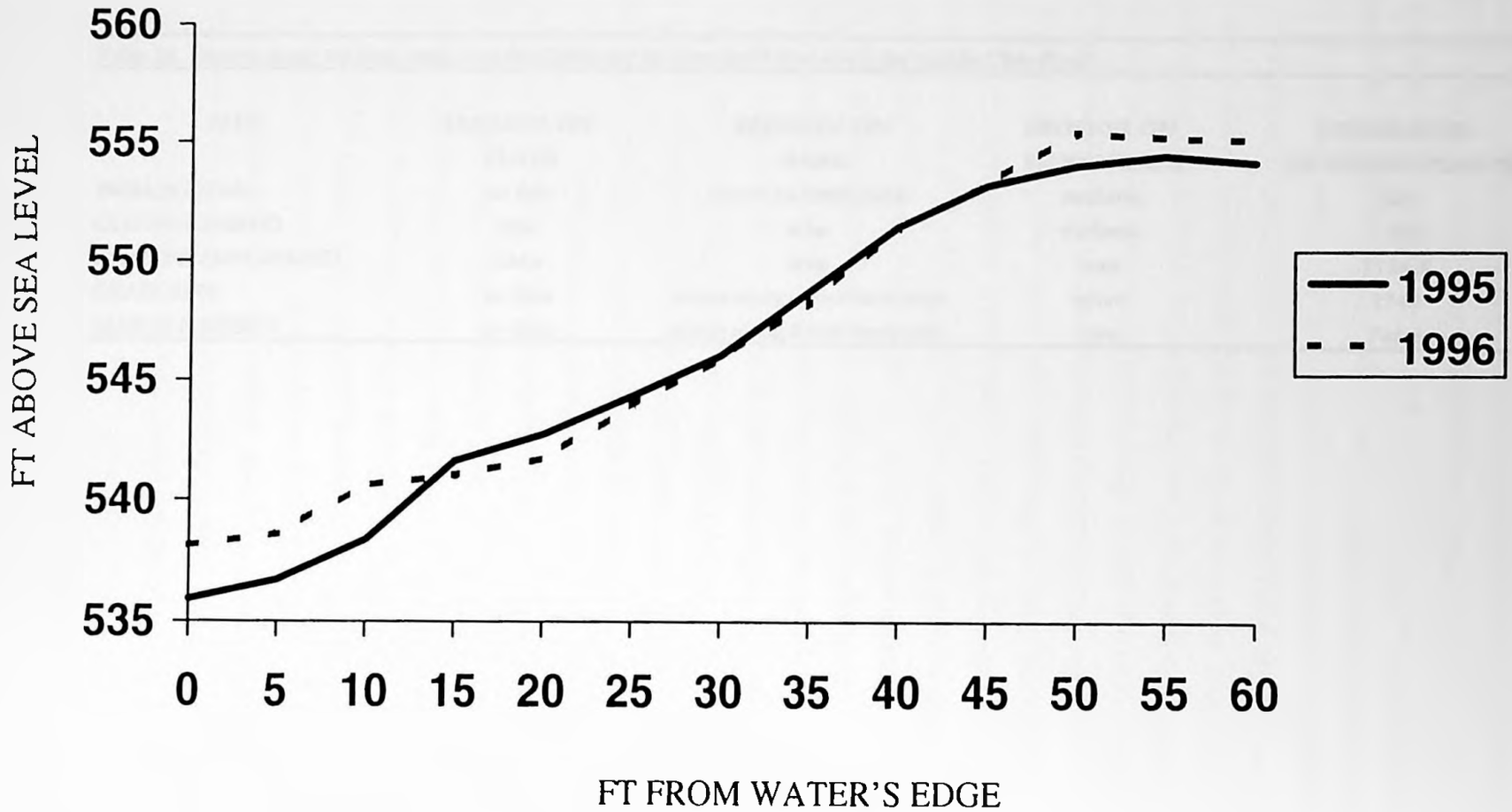


Table 24. Erosion along the flats, bank, and floodplain for the five study sites along the middle Ohio River.

SITE	EROSION ON FLATS	EROSION ON BANK	EROSION ON FLOODPLAIN	STEMS/ACRE OF WOODY PLANTS
INDIANGUYAN	no flats	severe for entire bank	moderate	525
GLENWOODBEND	none	none	moderate	1355
ASHTONCAMPGROUND	minor	none	none	2156.8
CRABCREEK	no flats	minor along upper bank only	minor	1740
MASON-POMEROY	no flats	minor along lower bank only	none	746.6

Floristic Study

A total of 186 plant species was recorded at the five sites. Of these, 73 percent were native, 2 species were adventive, 8 were introduced, and 37 were exotic to West Virginia (Table 25). The non-native species made up twenty-seven percent of the flora found in the study and the dominant species for the five study sites. Strausbaugh and Core (1977) reported that a full twenty-five percent of West Virginia's flora is not native, most having been introduced by man. For the state of Ohio, Cusick and Silberhorn (1977) stated that twenty-four percent of the flora of unglaciated Ohio was not native. Therefore, the twenty-seven percent non-native flora found in this study of the middle Ohio River is consistent other floras in the region.

It was expected that the riparian areas of study would contain a smaller percentage of non-native species of plants than the overall flora for the states of Ohio and West Virginia. Evans (1979) found the flora had only twenty percent non-native species in his study of the floristics of the middle Mississippi River flats. The bordering states of the Middle Mississippi River study of Illinois and Missouri had respectively, twenty-five and twenty-three percent non-native flora. It was expected that more native and flood-tolerant species would be able to tolerate the constant river level flucuations. In the current study, river flats, banks, and floodplains were included, therefore, providing more habitats for non-native species to become established.

The distribution of species for the five sites along the middle Ohio River was similar to that found by Evans (1979) on the middle Mississippi River. Only six species, representing 3.2 percent of the total taxa, were found at all five sites along the middle Ohio River. Twelve species were found at four of the fives sites, making up 6.5 percent of the total taxa. Twenty-two species representing 11.9 percent of the taxa were found at three of the five sites and 50 species representing 27 percent of the taxa were found at two of the five sites. Over half, 51 percent of all species observed, were found at only one of the five study sites along the middle Ohio River. Therefore, these species may be adapted to a more limited habitat than other species or were accidentallly distributed by water from various seed sources upstream.

Specialized habitats were present at the study sites. Two of the study areas bordered creeks and two sites had greatly disturbed floodplains that excluded many species. Only Ashton Campground had a substantial flats area for those taxa specialized for colonizing flat or beach areas. All sites were quite different from one another. Evans' (1979) found 4 percent of the observed taxa occurred at all of his study sites and 43 percent of the observed taxa occurred at a single study site.

Site comparison using the Coefficient of Similarity was used to compare the five sites with one another and to the same sites in the Clagg and Mills (1978) study. The 1995 floristic studies of the five sites compared with one another showed that none of the sites have a high degree of similarity (Table 26). Sites 2 and 3 were most closely related with a coefficient of 0.49. This similarity may be because sites 2 and 3 both had beach areas and similar gradual ascending banks with the least amount of human disturbance. Sites 1 and 4 were the next closely related with a coefficient value of 0.44 (Figure 28). Sites 1 and 4 both had little or no beach area and a steep sloping bank that led to the floodplain. Sites 3 and 5 were the least related with a coefficient of 0.26. Site 3 had little disturbance and a wide beach, while site 5 was greatly disturbed by the greenhouse operation and had no beach area.

Site 2 showed the greatest floristic similarity when comparing the 1978 and the 1995-1996 studies (Table 27). Site 2 had little human disturbance since it was isolated from the road by a wide farm field and Stillhouse Creek. Site 5, with a coefficient value of 0.27, was least similar to the 1978 study. This may be due to the large amount of human disturbance over the 17 years by the greenhouse business located at site 5. Also, no beach was present in the 1995 study, but a wide beach was noted in the 1978 study by Clagg and Mills (1978). Site 3 could not be compared to the 1978 study because it was at a different location due to access to the 1978 site being denied by the land owner. A new site 3 was located on the opposite side of the river within a few miles of the 1978 study site.

There were three species found on the West Virginia sites that are species of concern. These species are *Amorpha fruticosa, Cyperus squarrosus,* and *Geum rivale* (Table 28). *Amorpha fruticosa* was very abundant and well

established along the beach as seedlings and along the banks as shrubs at the Ashton Campground site. This species was also present at the Crab Creek site, but was not as abundant. *Cyperus squarrosus* was located along the flats at the Ashton Campground site. *Geum rivale* was located along the bank at the Crab Creek site.

Table 26. Floristic comparison of five study sites along the middle Ohio River using Coefficient of Similarity.

Site #	1	2	3	4	5
1	—				
2	0.3681	—			
3	0.3718	0.4925	—		
4	0.4400	0.2967	0.4054	—	
5	0.2697	0.3333	0.2628	0.3210	—

Figure 28: Dendrogram showing degree of floristic similarity between five study sites of the middle Ohio River.

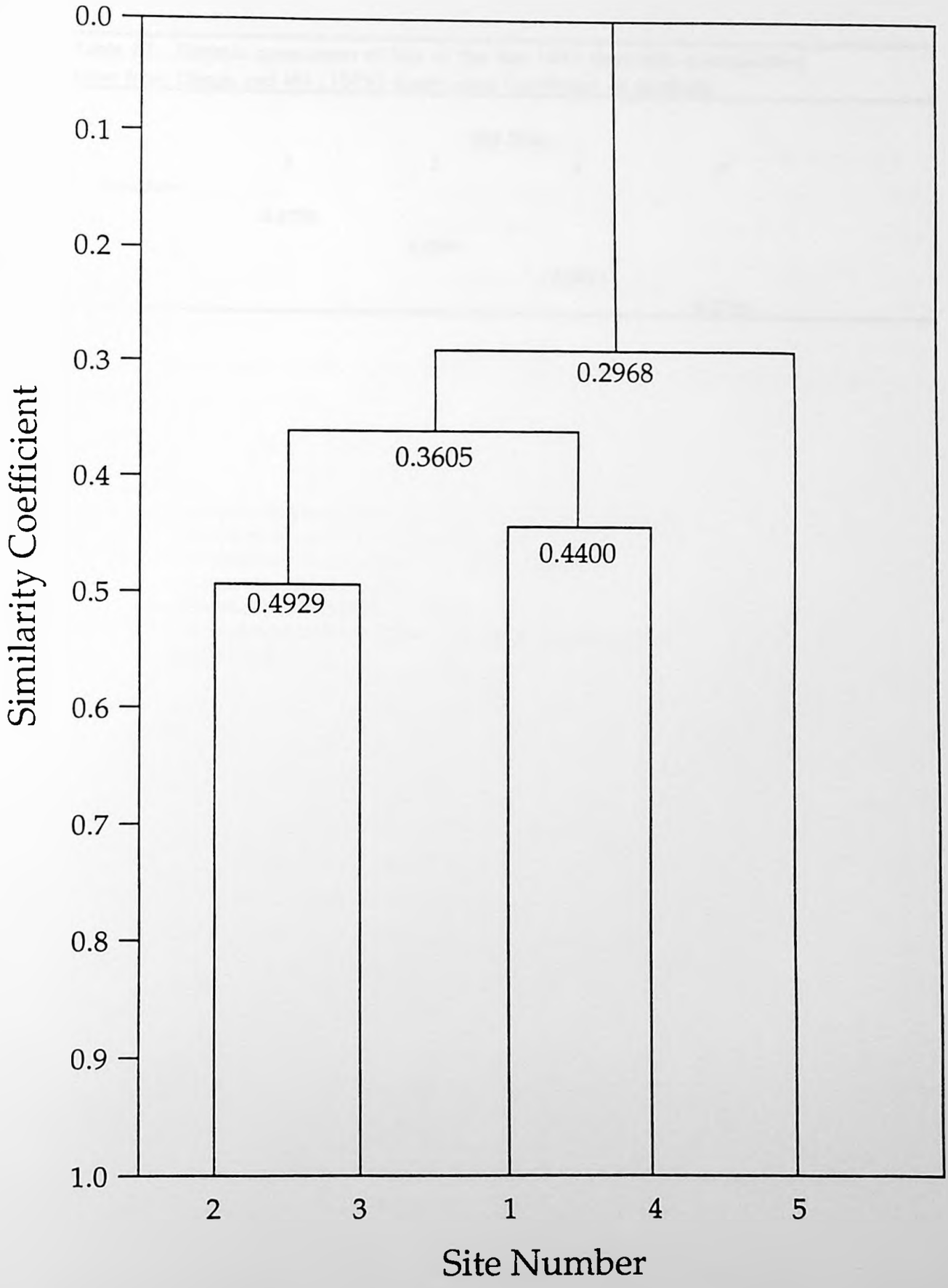

0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Similarity Coefficient
0.2968
0.3605
0.4400
0.4929
2
3
1
4
5
Site Number

Table 27. Floristic comparison of four of the five 1995 sites with corresponding sites from Claggs and Mill (1978) study using Coefficient of Similarity.

	Old Sites			
	1	2	4	5
New Sites				
1	0.4755			
2		0.5050		
4			0.3673	
5				0.2710

Table 28. Species found in West Virginia study sites that are listed as rare within West Virginia by the West Virginia Natural Heritage Program and the species ranking* as of June 1994.

Species	Site Located	Rank
Amorpha Fruticosa	Ashton Campground Crab Creek	S2
Cyperus squarrosus *(Cyperus inflexus)*	Ashton Campground	S2
Geum rivale	Crab Creek	S2

* State Ranking

S1 = Critically imperiled in state. Five or fewer occurrences.
S2 = Imperiled in state. Six to 20 occurrences.
S3 = Rare or uncommon in state. 21 to 50 occurrences.
S4 = Apparently secure in state.
S5 = Essentially ineradicable in state.
SH = Of historical occurence, but not verified in recent years (since 1970)

CHAPTER IV

Summary

I. A checklist of 186 plant species was recorded for the five study sites along the middle Ohio River. Voucher specimens were collected, labeled, and placed in Marshall University Herbarium (MUHW). Of the 186 plant species, 47 were non-native to West Virginia accounting for 27 percent of the study flora. This percentage was consistent with the percentage of non-native species in West Virginia's flora and the flora of unglaciated Ohio.

II. The plant community structure for each site was determined and importance values calculated for each species. The dominant elements for each site are as follows:

Site 1, Indian Guyan-

Flats: *Chamaesyce maculata*
Eragrostis hypnoides
Bank: *Artesmisia vulgaris*
Sorghum halepense
Phalaris arundinacea
Floodplain: *Phalaris arundinacea*
Verbesina alternifolia
Cirsium vulgara
Shrub: *Ailanthus altissima*
Tree: *Robinia pseudoacacia*

Site 2, Glenwood Bend-

Flats: *Salix exigua*
Digitaria sanguinalis
Eclipta prostrata
Echinochloa crus-galli
Bank: *Glechoma hederacea*
Muhlenbergia frondosa
Boehmeria cylindrica
Floodplain: *Glechoma hederacea*
Impatiens capensis

Galium sp.

Shrub: *Salix exigua*

Tree: *Acer negundo*

Site 3, Ashton Campground-

Flats: *Digitaria sanguinalis*

Eragrostis pectinacea

Justicia americana

Bank: *Muhlenbergia frondosa*

Arthraxon hispidus

Glechoma hederacea

Floodplain: *Poa* sp.

Glechoma hederacea

Shrub: *Salix exigua*

Tree: *Acer saccharinum*

Site 4, Crab Creek-

Flats: *none*

Bank: *Lonicera japonica*

Rosa multiflora

Toxicodendron radicans ssp. radicans

Floodplain: *Acalypha virginica var. rhomboidea*

Zea mays

Festuca pratensis

Shrub: *Robinia pseudoacacia*

Tree: *Robinia pseudoacacia*

Site 5, Mason-Pomeroy-

Flats: *none*

Bank: *Muhlenbergia frondosa*

Glechoma hederacea

Dichanthelium clandestinum

Floodplain: *Dichanthelium clandestinum*

Glechoma hederacea

Silphium perfoliatum

Shrub:*Salix exigua*

Tree: *Salix exigua*

III. Current floristic composition was compared to Clagg and Mills' 1978 study. The current sites had very different vegetation than the 1978 study. Using Coefficient of Similarity, site 2, Glenwood Bend, was determined to be most similar to the 1978 study of the same site. Site 5, Mason-Pomeroy had the least similarity to the 1978 study of the site.

IV. Bank profiles were compared from 1995 and 1996. Ashton Campground, the site with the greatest amount of woody stems per acre, had the least erosion occur along the bank. Site 1, Indian Guyan, had the most erosion and few woody plants along the bank. Erosion less than two feet of soil was considered minor. Erosion of two to five feet of soil was considered moderate and more than five feet of soil loss was severe.

V. Of the 186 plant species recorded in the study, 51 percent were found at only one of the five sites. Twenty-seven percent of the taxa were observed at two of the five sites and 11.9 percent were observed at three of the five sites. Only 3.2 percent of the taxa were recorded at all five study sites.

VI. Three species of concern for West Virginia were located in this study. *Amorpha fruticosa* was present at the Ashton Campground site in large numbers and at the Crab Creek site. *Cyperus squarrosus* was also present at the Ashton Campground site. *Geum rivale* was observed at the Crab Creek site.

VII. This study had a greater percentage of non-native flora than did Evans' middle Mississippi River study. Evans recorded 20 percent of the taxa as non-native, while 27 percent of the taxa from the middle Ohio River study was non-native. Plant distribution was similar between the current study and Evans' study. The majority of species in both studies were recorded at only one of the study sites. Only a small percent of taxa were observed at all of the study sites.

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APPENDIX I.

Tables of vegetative data for the five study sites along middle Ohio River

Table 1: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height on the flats at the Indian Guyan sites.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Chamaesyce maculata	100	1	50	50	100
Eragrostis hypnoides	100	1	50	50	100
Total	200	2	100	100	200

Table 2: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and for herbaceous plants , tree seedlings and shrubs less than one meter in height on the banks at the Indian Guyan site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Artemisia vulgaris	100	128	9.8	31.1	40.9
Phalaris arundinacea	75	60	7.3	14.6	21.9
Sorghum halepense	50	70	4.9	17	21.9
Oxalis stricta	100	16	9.8	3.9	13.7
Chamaesyce maculata	50	30	4.9	7.3	12.2
Acalypha virginica var. rhomboidea	75	18	7.3	4.4	11.7
Digitaria sanguinalis	25	30	2.4	7.3	9.7
Catystegia sepium ssp. sepium	50	13	4.9	3.2	8.1
Eragrostis hypnoides	50	11	4.9	2.7	7.6
Hypericum mutilum	50	4	4.9	1	5.9
Populus deltoides	50	3	4.9	0.7	5.6
Aster pilosus var. pilosus	25	5	2.4	1.2	3.6
Robinia pseudoacacia	25	5	2.4	1.2	3.6
Rumex obtusifolius	25	4	2.4	1	3.4
Bidens aristosa	25	2	2.4	0.5	2.9
Polygonum pensylvanicum	25	2	2.4	0.5	2.9
Ulmus rubra	25	2	2.4	0.5	2.9
Ailanthus altissima	25	1	2.4	0.2	2.6
Amaranthus hybridus	25	1	2.4	0.2	2.6
Boehmeria cylindrica	25	1	2.4	0.2	2.6
Cyperus odoratus	25	1	2.4	0.2	2.6
Ludwigia palustris	25	1	2.4	0.2	2.6
Salix exigua	25	1	2.4	0.2	2.6
Sida spinosa	25	1	2.4	0.2	2.6
Solanum americanum	25	1	2.4	0.2	2.6
Total	1025	411	99.6	99.7	199.3

Table 3: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height on the floodplain at the Indian Guyan site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Phalaris arundinacea	100	385	26.7	85	111.7
Verbesina alternifolia	100	38	26.7	8.4	35.1
Cirsium vulgare	75	13	20	2.9	22.9
Urtica dioica	50	15	13.3	3.3	16.6
Lycopus virginicus	25	1	6.7	0.2	6.9
Rumex obtusifolius	25	1	6.7	0.2	6.9
Total	375	453	100.1	100	200.1

Table 4: Density (D), Frequency (F), Relative Density (RD), Relative Frequency (RF) and Importance Value (IV) for tree speices having diameters greater than 1 inch and less than 4 inches and shrubs greater than 1 meter in height at the Indian Guyan Site.

SPECIES	D Stems/Acre	F % Occ.	RD	RF	IV
Ailanthus altissima	200	100	40	40	80
Acer saccharinum	100	50	20	20	40
Amorpha fruticosa	100	50	20	20	40
Robinia pseudoacacia	100	50	20	20	40
Total	500	250	100	100	200

Table 5: Density (D), Frequency (F), Basal Area (BA), Relative Density (RD), Relative Frequency (RF), Relative Basal Area (RBA) for tree species having diameters greater than 4 inches at breast height at the Indian Guyan Site.

SPECIES	D Stems/Acre	F % Occ.	BA Ft2/Acre	RD	RF	RBA	IV
Robinia pseudoacacia	20	50	10.1	80	50	84.9	214.9
Acer saccharinum	5	50	1.8	20	50	15.1	85.1
Total	25	100	11.9	100	100	100	300

Table 6: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height on the flats of Glenwood Bend Site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Salix exigua					
Digitaria sanguinalis	66.7	6	13.4	13	26.4
Echinochloa crus-galli	33.3	5	6.7	10.9	17.6
Eclipta prostrata	33.3	5	6.7	10.9	17.6
Amaranthus hybridus	33.3	1	6.7	2.2	8.9
Boehmeria cylindrica	33.3	1	6.7	2.2	8.9
Chamaesyce maculata	33.3	1	6.7	2.2	8.9
Cyperus odoratus	33.3	1	6.7	2.2	8.9
Cyperus sp.	33.3	1	6.7	2.2	8.9
Eupatorium serotinum	33.3	1	6.7	2.2	8.9
Hypericum mutilum	33.3	1	6.7	2.2	8.9
Kyllinga pumila	33.3	1	6.7	2.2	8.9
Leersia virginica	33.3	1	6.7	2.2	8.9
Rorippa sylvestris	33.3	1	6.7	2.2	8.9
Total	499.6	46	100.5	100.3	200.8

Table 7: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height on the banks of Glenwood Bend Site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Glechoma hederacea	33.3	200	2.6	17.7	20.3
Muhlenbergia frondosa	100	141	7.7	12.5	20.2
Boehmeria cylindrica	88.9	141	6.8	12.5	19.3
Acer saccharinum	77.8	64	6	5.7	11.7
Apios americana	55.6	82	4.3	7.3	11.6
Eupatorium serotinum	33.3	45	2.6	4	6.6
Pilea pumila	44.4	33	3.4	2.9	6.3
Equisetum arvense	44.4	32	3.4	2.8	6.2
Bidens frondosa	33.3	35	2.6	3.1	5.7
Salix exigua	22.2	40	1.7	3.5	5.2
Oxalis stricta	33.3	21	2.6	1.9	4.5
Eragrostis hypnoides	33.3	20	2.6	1.8	4.4
Lycopus virginicanus	22.2	25	1.7	2.2	3.9
Juncus tenuis	33.3	12	2.6	1.1	3.7
Digitaria sanguinalis	33.3	11	2.6	1	3.6
Eclipta prostrata	33.3	11	2.6	1	3.6
Panicum dichotomiflorum	22.2	21	1.7	1.9	3.6

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Calystegia sepium ssp. sepium	22.2	20	1.7	1.8	3.5
Amaranthus hybridus	33.3	7	2.6	0.6	3.2
Eupatorium coelestinum	22.2	11	1.7	1	2.8
Solanum americanum	22.2	12	1.7	1.1	2.8
Mimulus alatus	11.1	20	0.9	1.8	2.7
Cynanchum laeve	22.2	10	1.7	0.9	2.6
Phytolacca americana	22.2	10	1.7	0.9	2.6
Sedum sp.	11.1	15	0.9	1.3	2.2
Amorpha fruticosa	22.2	4	1.7	0.4	2.1
Conyza canadensis var. canadensis	22.2	3	1.7	0.3	2
Cyperus strigosus	22.2	2	1.7	0.2	1.9
Eupatorium perfoliatum var. perfoliatum	22.2	2	1.7	0.2	1.9
Leersia virginica	22.2	2	1.7	0.2	1.9
Rorippa sylvestris	22.2	2	1.7	0.2	1.9
Amphicarpaea bracteata	11.1	10	0.9	0.9	1.8
Humulus japonicus	11.1	10	0.9	0.9	1.8
Scutellaria incana	11.1	10	0.9	0.9	1.8
Bidens laevis	11.1	5	0.9	0.4	1.3
Impatiens capensis	11.1	5	0.9	0.4	1.3
Lobelia siphilitica	11.1	5	0.9	0.4	1.3
Penthorum sedoides	11.1	5	0.9	0.4	1.3
Stachys sp.	11.1	5	0.9	0.4	1.3
Verbesina alternifolia	11.1	5	0.9	0.4	1.3
Parthenocissus quinquefolia	11.1	3	0.9	0.3	1.2
Polygonium persicaria	11.1	2	0.9	0.2	1.1
Acalypha virginica var. rhomboidea	11.1	1	0.9	0.1	1
Artesmisia vulgaris	11.1	1	0.9	0.1	1
Chamaesye maculata	11.1	1	0.9	0.1	1
Cyperus sp.	11.1	1	0.9	0.1	1
Cyperus squarrosus	11.1	1	0.9	0.1	1
Daucus carota	11.1	1	0.9	0.1	1
Eupatorium purpureum var. purpureum	11.1	1	0.9	0.1	1
Lamium purpureum	11.1	1	0.9	0.1	1
Leucanthemum vulgare	11.1	1	0.9	0.1	1
Ludwigia leptocarpa	11.1	1	0.9	0.1	1
Lycopus americanus	11.1	1	0.9	0.1	1
Total	1299.1	1131	100.4	100.6	201

Table 8: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height on the floodplain of Glenwood Bend Site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Glechoma hederacea	100	170	17.6	38.5	56.1
Impatiens capensis	100	115	17.6	26	43.6
Galium sp.	100	50	17.6	11.3	28.9
Rudbeckia laciniata	100	12	17.6	2.7	20.3
Verbesina alternifolia	66.7	35	11.8	7.9	19.7
Silphium perfoliatum	33.3	40	5.9	9	14.9
Urtica dioica	33.3	15	5.9	3.4	9.3
Juglans nigra	33.3	5	5.9	1.1	7
Total	566.6	442	99.9	99.9	199.8

Table 9: Density (D), Frequency (F), Relative Density (RD), Relative Frequency (RF) and Importance Value for tree species having diameters greater than 1 inch and less than 4 inches and shrubs greater than 1 meter in height at the Glenwood Bend site.

SPECIES	D Stems/Acre	F % Occ.	RD	RF	IV
Salix exigua	850	50	70.8	37.5	108.3
Acer saccharinum	166.7	33.3	13.9	25	38.9
Acer negundo	133.3	33.3	11.1	25	36.1
Amorpha fruticosa	50	16.7	4.2	12.5	16.7
Total	1200	133.3	100	100	200

Table 10: Density (D), Frequency (F), Basal Area (BA), Relative Density (RD), Relative Frequency (RF), Relative Basal Area (RBA) and Importance Value (IV) for tree species having diameters greater than 4 inch at breast height at the Glenwood Bend site.

SPECIES	D	F	BA	RD	RF	RBA	IV
	Stems/Acre	% Occ.	Ft2/Acre				
Acer negundo var. negundo	40	100	37.5	25.8	25	34.8	85.6
Salix exigua	60	50	23.8	38.7	12.5	22.1	73.3
Acer saccharinum	20	100	24.8	12.9	25	23.2	61.1
Populus deltoides	25	50	14.5	16.1	12.5	13.5	42.1
Plantanus occidentalis	5	50	4.7	3.2	12.5	4.4	20.1
Salix nigra	5	50	2.4	3.2	12.5	2.2	17.9
Total	155	400	107.7	99.9	100	100.2	300.1

Table 11: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo), and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height along the flats of the Ashton Campground site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Digitaria sanguinalis	100	191	11.1	32.9	44
Eragrostis pectinacea	100	126	11.1	21.7	32.8
Justicia americana	37.5	70	4.2	12	16.2
Amorpha fruticosa	62.5	37	6.9	6.4	13.3
Chamaesyce maculata	75	19	8.3	3.4	11.7
Salix exigua	62.5	18	6.9	3.2	10.1
Eupatorium serotinum	25	40	2.8	6.9	9.7
Eleocharis sp.	37.5	30	4.2	5.2	9.4
Mollugo verticillata	50	4	5.6	0.7	6.3
Chamaecrista nictitans var nictitans	37.5	3	4.2	0.5	4.7
Setaria sp.	37.5	3	4.2	0.5	4.7
Leersia virginica	12.5	16	1.4	2.8	4.2
Cyperus esculentus	25	4	2.8	0.7	3.5
Cyperus strigosus	25	2	2.8	0.3	3.1
Ipomoea pandurata	25	2	2.8	0.3	3.1
Muhlenbergia frondosa	25	2	2.8	0.3	3.1
Spermacoce glabra	25	2	2.8	0.3	3.1
Apocynum cannabinum	12.5	2	1.4	0.3	1.7
Cucurbita sativus	12.5	1	1.4	0.2	1.6
Cyperus squarrosus	12.5	1	1.4	0.2	1.6
Eleusine indica	12.5	1	1.4	0.2	1.6
Lespedeza cuneata	12.5	1	1.4	0.2	1.6
Platanus occidentalis	12.5	1	1.4	0.2	1.6
Populus deltoides	12.5	1	1.4	0.2	1.6
Rorippa sylvestris	12.5	1	1.4	0.2	1.6
Sida spinosa	12.5	1	1.4	0.2	1.6
Strophostyles helvola	12.5	1	1.4	0.2	1.6
Asteraceae seedling	12.5	1	1.4	0.2	1.6
TOTAL	900	581	100.3	100.4	200.7

Table 12: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo), and Importance Value (IV) for herbaceous plants, tree seedlings, and shrubs less than one meter in height along the banks of the Ashton Campgroud site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Muhlenbergia frondosa	84.6	398	8.6	24.9	33.5
Arthraxon hispidus	46.2	164	4.7	10.2	14.9
Glechoma hederacea	53.8	147	5.5	9.2	14.7
Verbesina alternifolia	46.2	96	4.7	6	10.7
Lonicera japonica	30.8	120	3.1	7.5	10.6

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Ageratina altissima var. altissima	30.8	107	3.1	6.7	9.8
Eupatorium serotinum	61.5	52	6.2	3.2	9.4
Leersia virginica	30.8	100	3.1	6.2	9.3
Amorpha fruticosa	53.8	43	5.5	2.7	8.2
Digitaria sanguinalis	15.4	105	1.6	6.6	8.2
Toxicodendron radicans ssp. radicans	30.8	48	3.1	3	6.1
Apios americana	38.5	32	3.9	2	5.9
Lycopus virginicus	30.8	15	3.1	0.9	4
Boehmeria cylindrica	30.8	11	3.1	0.7	3.8
Vitis riparia	23.1	17	2.3	1.1	3.4
Salix exigua	23.1	16	2.3	1	3.3
Sorghum halepense	15.4	17	1.6	1.1	2.7
Oxalis stricta	23.1	5	2.3	0.3	2.6
Eupatorium purpureum var. purpureum	15.4	15	1.6	0.9	2.5
Acer saccharinum	23.1	3	2.3	0.2	2.5
Ulmus rubra	23.1	3	2.3	0.2	2.5
Cynanchum laeve	15.4	11	1.6	0.7	2.3
Solidago canadensis var. canadensis	15.4	10	1.6	0.6	2.2
Apocynum cannibinum	15.4	2	1.6	0.1	1.7
Dichanthelium clandestinum	7.7	10	0.8	0.6	1.4
Vernonia altissima	7.7	10	0.8	0.6	1.4
Cornus amomum	7.7	5	0.8	0.3	1.1
Parthenocissus quinquefolia	7.7	5	0.8	0.3	1.1
Polygonum virginianum	7.7	5	0.8	0.3	1.1
Solidago canadensis var. scabra	7.7	5	0.8	0.3	1.1
Acer negundo	7.7	1	0.8	0.1	0.9
Allium vineale	7.7	2	0.8	0.1	0.9
Amaranthus hybridus	7.7	1	0.8	0.1	0.9
Aster pilosus	7.7	1	0.8	0.1	0.9
Bidens vulgata	7.7	1	0.8	0.1	0.9
Carex sp.	7.7	2	0.8	0.1	0.9
Chamaesyce maculata	7.7	1	0.8	0.1	0.9
Commelina communis	7.7	1	0.8	0.1	0.9
Echinochloa crus-galli	7.7	1	0.8	0.1	0.9
Physalis longifolia var. subglabrata	7.7	1	0.8	0.1	0.9
Pilea pumila	7.7	1	0.8	0.1	0.9
Poaceae sp.	7.7	1	0.8	0.1	0.9
Polygonum persicaria	7.7	1	0.8	0.1	0.9
Ranunculus abortivus	7.7	1	0.8	0.1	0.9
Scutellaria lateriflora	7.7	1	0.8	0.1	0.9
Setaria lutensina	7.7	1	0.8	0.1	0.9
Setaria sp.	7.7	1	0.8	0.1	0.9
Spermacoce glabra	7.7	1	0.8	0.1	0.9
Strophostyles helvola	7.7	1	0.8	0.1	0.9

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Unknown seedling	7.7	1	0.8	0.1	0.9
Xanthium strumarium var canadense	7.7	2	0.8	0.1	0.9
TOTAL	985.2	1601	100.4	100.6	201

Table 13: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo), and Importance Value for herbaceous plants , tree seedlings and shrubs less than one meter in height along the floodplain of the Ashton Campground site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Poaceae sp.	100	95	12.5	67	79.5
Glechoma hederacea	100	35	12.5	25	37.5
Duchesnea indica	100	3	12.5	2.1	14.6
Muhlenbergia frondosa	100	3	12.5	2.1	14.6
Erigeron philadelphicus	100	2	12.5	1.4	13.9
Robinia pseudoacacia	100	2	12.5	1.4	13.9
Oxalis stricta	100	1	12.5	0.7	13.2
Rumex obtusifolius	100	1	12.5	0.7	13.2
TOTAL	800	142	100	100.4	200.4

Table 14: Density (D), Frequency (F), Relative Density (RD), Relative Frequency (RF), and Importance Value (IV) for tree species having diameters greater than 1 inch and less than 4 inches and shrubs greater than one meter in height at the Ashton Campground site.

SPECIES	D Stems/Acre	F % Occ.	RF	RD	IV
Salix exigua	966.7	66.6	30.8	47.9	78.7
Amorpha fruticosa	716.7	66.6	30.8	35.5	66.3
Acer saccharinum	216.7	33.3	15.4	10.7	26.1
Robinia pseudoacacia	100	33.3	15.4	5	20.4
Fraxinus lanceolata	16.7	16.7	7.7	0.8	8.5
TOTAL	2016.8	216.5	100.1	99.9	200

Table15: Density (D), Frequency (F), Basal Area (BA), Relative Density (RD), Relative Frequency (RF), Relative Basal Area (RBA), and Importance VAlue (IV) for tree species greater than 4 inches in diameter at breast height at the Ashton Campground site.

Species	D Stems/Acre	F % Occ.	BA Ft2/Acre	RF	RD	RBA	IV
Acer saccharinum	80	50	79.9	33.3	57.1	67.6	158
Celtis occidentalis	5	50	2.4	33.3	3.6	2	103
Robinia pseudoacacia	55	50	35.9	33.3	39.3	30.4	38.9
Total	140	150	118.2	99.9	100	100	299.9

Table 16: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height at the Crab Creek Site along the banks.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Lonicera japonica	100	195	8.9	33.7	42.6
Rosa multiflora	100	110	8.9	19	27.9
Toxicodendron radicans ssp. radicans	100	45	8.9	7.8	16.7
Boehmeria cylindrica	75	50	6.7	8.7	15.4
Verbesina alternifolia	100	33	8.9	5.7	14.6
Festuca pratensis	50	52	4.4	9	13.4
Celtis occidentalis	50	30	4.4	5.2	9.6
Amorpha fruticosa	50	11	4.4	1.9	6.3
Plantago rugelii	50	10	4.4	1.7	6.1
Cornus amomum	50	6	4.4	1	5.4
Allium vineale	50	3	4.4	0.5	4.9
Oxalis stricta	50	3	4.4	0.5	4.9
Campsis radicans	25	15	2.2	2.6	4.8
Cuscuta gronovii	25	2	2.2	0.3	2.5
Geum rivale	25	2	2.2	0.3	2.5
Phytolacca americana	25	2	2.2	0.3	2.5
Strophostyles helvola	25	2	2.2	0.3	2.5
Acer negundo var. negundo	25	1	2.2	0.2	2.4
Carex sp.	25	1	2.2	0.2	2.4
Cynanchum laeve	25	1	2.2	0.2	2.4
Equisetum arvense	25	1	2.2	0.2	2.4
Lycopus veriginicus	25	1	2.2	0.2	2.4
Poaceae sp.	25	1	2.2	0.2	2.4
Vitis riparia	25	1	2.2	0.2	2.4
Total	1125	578	99.5	99.9	199.4

Table 17: Frequency (F), Dominance (Do), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) for herbaceous plants, tree seedlings and shrubs less than one meter in height at the Crab Creek Site along the floodplain.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Acalypha virginica var. rhomboidea	100	90	9.5	25.2	34.7
Zea mays	50	75	4.8	21	25.8
Festuca pratensis	50	50	4.8	14	18.8
Digitaria sanguinalis	100	32	9.5	9	18.5
Solanum americanum	100	30	9.5	8.4	17.9
Sorghum halepense	100	30	9.5	8.4	17.9
Phytolacca americana	50	30	4.8	8.4	13.2
Oxalis stricta	100	7	9.5	2	11.5
Rumex obtusifolius	50	5	4.8	1.4	6.2
Lobelia inflata	50	2	4.8	0.7	5.5
Acer saccharinum	50	1	4.8	0.3	5.1
Brassica napus	50	1	4.8	0.3	5.1
Campsis radicans	50	1	4.8	0.3	5.1
Cyperus esculentus	50	1	4.8	0.3	5.1
Desmodium sp.	50	1	4.8	0.3	5.1
Glechoma hederacea	50	1	4.8	0.3	5.1
Total	1050	357	100.3	100.3	200.6

Table 18: Density (D), Frequency (F), Relative Density (RD), Relative Frequency (RF) and Importance Value (IV) for tree species having diameters greater than 1 inch and less than 4 inches and shrubs greater than 1 meter in height at the Crab Creek site.

SPECIES	D Stems/Acre	F % Occ.	RD	RF	IV
Robinia pseudacacia	600	100	35.3	33.3	68.6
Amorpha fruticosa	700	50	41.2	16.7	57.9
Acer negundo var. negundo	250	50	14.7	16.7	31.4
Rhus hirta	100	50	5.9	16.7	22.6
Acer saccharinum	50	50	3	16.7	19.7
Total	1700	300	100.1	100.1	200.2

Table 19: Density (D), Frequency (F), Basal Area (BA), Relative Density (RD), Relative Frequency (RF), Relative Basal Area (RBA) and Importance Value (IV) for tree species greater than 4 inches in diameter at breast height at the Crab Creek Site.

SPECIES	D	F	BA	RD	RF	RBA	IV
	Stems/Acre	% Occ.	ft 2/Acre				
Robinia pseudoacacia	40	100	21	100	100	100	300

Table 20: Frequency (F), Dominance (Do), Relative Frequency (RF), and Importance Value (IV) for herbaceous plants, tree seedlings, and shrubs less than one meter in height along the bank of the Mason-Pomeroy site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Muhlenbergia frondosa	66.7	131	12.1	23.6	35.7
Glechoma hederacea	83.3	107	15.1	19.3	34.4
Dichanthelium clandestinum	33.3	100	6.1	18.1	24.2
Artemisia vulgaris	33.3	90	6.1	16.2	22.3
Poaceae sp.	50	17	9.1	3.1	12.2
Equisetum arvense	50	5	9.1	0.9	10
Lindernia dubia	33.3	11	6.1	2	8.1
Calystegia sepium ssp. sepium	33.3	10	6.1	1.8	7.9
Echinochloa crus-galli	16.7	25	3	4.5	7.5
Verbesina alternifolia	16.7	25	3	4.5	7.5
Salix exigua	33.3	4	6.1	0.7	6.8
Phytolacca americana	16.7	15	3	2.7	5.7
Humulus japonicus	16.7	10	3	1.8	4.8
Acer saccharinum	16.7	1	3	0.2	3.2
Bidens frondosa	16.7	1	3	0.2	3.2
Setaria glauca	16.7	1	3	0.2	3.2
Unknown Asteraceae seedling	16.7	1	3	0.2	3.2
TOTAL	550.1	554	99.9	100	199.9

Table 21: Frequency (F), Dominance (Do), Relative Frequency (RF), and Importance Value (IV) for herbaceous plants, tree seedlings, and shrubs less than one meter in height along the floodplain of the Mason-Pomeroy site.

SPECIES	F % Occurrence	Do % Cover	RF	RDo	IV
Panicum clandestinum	100	135	20	50.9	70.9
Glechoma hederacea	100	65	20	24.5	44.5
Silphium perfoliatum	100	40	20	15.1	35.1
Humulus japonicus	100	15	20	5.7	25.7
Artemisia vulgaris	50	5	10	1.9	11.9
Phytolacca americana	50	5	10	1.9	11.9
TOTAL	500	265	100	100	200

Table 22: Density (D), Frequency (F), Relative Density (RD), Relative Frequency (RF), and Importance Value (IV) for tree species having diameters greater than 1 inch and less than four inches and shrubs greater than one meter in height at the Mason-Pomeroy site.

SPECIES	D	F	RD	RF	IV
	Stems/Acre	% Occ.			
Salix exigua	633.3	66.7	95	66.7	161.7
Acer saccharinum	33.3	33.3	5	33.3	38.3
TOTAL	666.6	100	100	100	200

Table 23: Density (D), Frequency (F), Basal Area (BA), Relative Density (RD), Relative Frequency (RF), Relative Basal Area (RBA), and Importance Values (IV) for tree species greater than four inches in diameter at breast height at the Mason-Pomeroy site.

SPECIES	D	F	BA	RD	RF	RBA	IV
	Stems/Acre	% Occ.	Ft2/Acre				
Salix exigua							
Acer saccharinum	15	50	3.6	18.8	50	17.8	86.6
TOTAL	80	100	20.2	100.1	100	100	300.1

APPENDIX II.

Checklist of plants for the five study sites along the middle Ohio River.

Table 25 : Plant list for sites including plant community study and floristic study.

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Acalypha virginica L. var. *rhomboidea* (Raf.) Cooperrider	X	X		X		
Acer negundo L. var. *negundo*		X	X	X		
Acer saccharinum L.	X	X	X	X	X	
Ageratina altissima (L.) King & H.E. Robins. var. *altissima*		X	X			
Agrostis stolonifera L.			X			*
Ailanthus altissima (Mill.) Swingle	X					*
Allium vineale L.			X	X		*
Amaranthus hydbridus L.	X	X	X	X		
Ambrosia trifida L.	X					
Ammannia coccinea Rottb.		X				*
Amorpha fruticosa L.	X	X	X	X		
Amphicarpaea bracteata (L.) Fern.		X				
Apios americana Medik.		X	X			
Apocynum cannabinum L.	X		X			
Artesmisia vulgaris L.	X	X			X	*

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Arthraxon hispidus (Thunb.) Makino			X			*
Asclepias incarnata L. ssp. *incarnata*			X			
Asteraceae seedling			X			
Aster lateriflorus (L.) Britt. var. *lateriflorus*					X	
Aster pilosus Willd. var. *pilosus*	X	X	X			
Bidens aristosa (Michx.) Britt.	X					*
Bidens cernua L.	X					
Bidens frondosa L.		X			X	
Bidens laevis (L.) BSP.		X				
Bidens vulgata Greene			X			
Boehmeria cylindrica (L.) Sweet	X	X	X	X		
Brassica napus L.				X		*
Calystegia sepium (L.) R. Br. ssp. *sepium*	X	X	X	X	X	
Campsis radicans (L.) Seeman ex Bureau	X			X		
Carex sp.			X	X		
Catalpa bignonioides Walt.		X				*
Celtis occidentalis L.			X	X		

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Chamaecrista nictitans (L.) Moench var. *nictitans*			X			
Chamaesyce maculata (L.) Small	X	X	X	X		
Chasmanthium latifolium (Michx.) Yates			X			
Chenopodium album L.	X	X		X		*
Chenopodium ambrosioides L.	X	X	X			*
Cirsium vulgare (Savi) Ten.		X				*
Commelina communis L.			X			*
Conium maculatum L.					X	*
Conyza canadensis (L.) Cronq. var *canadensis*		X	X			
Cornus amomum Mill.			X	X		
Crepis pulchra L.			X			*
Cucumis sativus L.			X			
Cuscuta gronovii Willd. ex J. A. Schultes				X		
Cynanchum laeve (Michx.) Pers.		X	X	X		
Cyperaceae sp.		X				
Cyperus erythrorhizos Muhl.		X				
Cyperus esculentus L.			X	X		
Cyperus flavescens L.		X				

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Cyperus odoratus L.	X	X	X			
Cyperus squarrosus L.		X	X			
Cyperus strigosus L.		X	X			
Datura stramonium L.		X	X			*
Daucus carota L.		X				*
Desmodium sp.	X			X		
Dichanthelium clandestinum (L.) Gould			X		X	
Digitaria sanguinalis (L.) Scop.	X	X	X	X		
Diodia virginiana L.		X	X			
Duchesnea indica (Andr.) Focke		X	X			*
Echinochloa crus-galli (L.) Beauv.	X	X	X		X	
Eclipta prostrata (L.) L.	X	X	X	X		
Eleocharis obtusa (Willd.) J. A. Schultes		X				
Eleocharis sp.			X			
Eleusine indica (L.) Gaertn.			X			*
Elymus canadensis L.		X			X	
Equisetum arvense L.		X		X	X	
Eragrostis capillaris (L.) Nees		X				

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Eragrostis hypnoides (Lam.) BSP.	X	X				
Eragrostis pectinacea (Michx.) Nees		X	X			
Erigeron philadelphicus L.	X	X	X			
Eupatorium coelestinum L.		X	X	X		
Eupatorium perfoliatum L. var. *perfoliatum*		X	X			
Eupatorium purpureum L. var *purpureum*		X	X			
Eupatorium serotinum Michx.		X	X			
Festuca pratensis Huds.				X		*
Fimbristylis autumnalis (L.) Roemer & J. A. Schultes		X				
Fraxinus lanceolata Borkh.			X			
Galinsoga quadriradiata Ruiz & Pavin		X				*
Galium sp.		X				
Geum rivale L.				X		
Glechoma hederacea L.	X	X	X	X	X	*
Helianthus tuberosus L.					X	
Hibiscus moscheutos L.			X			
Humulus japonicus Sieb. & Zucc.		X			X	*

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Hypericum mutilum L.	X	X				
Impatiens capensis Meerb.		X	X			
Ipomoea hederacea Jacq.			X			*
Ipomoea pandurata (L.) G. F. W. Mey.	X		X			
Juglans nigra L.		X				
Juncus tenuis Willd.		X				
Justicia americana (L.) Vahl			X			
Kyllinga pumila Michx.		X				
Lactuca canadensis L.			X			
Lamium purpureum L.		X				*
Laportea canadensis (L.) Wedd.		X				
Leersia oryzoides (L.) Sweet		X				
Leersia virginica Willd.		X	X			
Lespedeza cuneata (Dum.-Cours.) G. Don			X			*
Leucanthemum vulgare Lam.		X				*
Linaria vulgaris Mill.	X					*
Lindernia dubia (L.) Pennell		X			X	
Lobelia inflata L.				X		

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Lobelia siphilitica L.		X	X			
Lonicera japonica Thunb.			X	X		*
Ludwigia alternifolia L.		X				
Ludwigia decurrens Walt.		X				
Ludwigia leptocarpa (Nutt.) Hara		X				
Ludwigia palustris (L.) Ell.	X					
Lycopus americanus Muhl. ex W. Bart		X				
Lycopus virginicus L.	X	X	X	X		
Lythrum salicaria L.			X			*
Mimulus alatus Ail.		X				
Mollugo verticillata L.		X	X			*
Muhlenbergia frondosa (Poir.) Fern.		X	X		X	
Nicandra physalodes (L.) Pers.		X				*
Oenothera biennis L.	X	X				
Oenothera parviflora L.		X				
Oxalis stricta L.	X	X	X	X	X	
Panicum capillare L.		X				
Panicum dichotomiflorum Michx.		X				
Panicum virgatum L.			X			

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Parthenocissus quinquefolia (L.) Planch.		X	X			
Paspalum fluitans (Ell.) Kunth		X				*
Penthorum sedoides L.		X				
Phalaris arundinacea L.	X					
Phyla lanceolata (Michx.) Greene	X					
Physalis longifolia Nutt. var. *subglabrata* (Mackenzie &Bush) Cronq.	X		X	X		
Physalis virginiana P. Mill.			X			
Phytolacca americana L.	X	X		X	X	
Pilea pumila (L.) Gray		X	X		X	
Plantago lanceolata L.			X			*
Plantago major L.	X					*
Plantago rugelii Dcne.		X		X		
Platanus occidentalis L.		X	X		X	
Poaceae sp.		X	X	X	X	
Polygonum cespitosum Blume			X		X	*
Polygonum cuspidatum Sieb. & Zucc.	X					*
Polygonum lapathifolium L.	X					

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Polygonum pensylvanicum L.	X		X			
Polygonum persicaria L.		X	X			*
Polygonum scandens L.					X	
Polygonum virginianum L.			X			
Populus deltoides Bartr. ex Marsh	X	X	X			
Ranunculus abortivus L.			X			
Raphanus sativus L.			X			*
Rhus hirta (L.) Sudworth				X	X	
Robinia pseudoacacia L.	X		X	X	X	
Rorippa islandica (Oeder) Borbas		X				
Rorippa sylvestris (L.) Bess	X	X	X			*
Rosa mutiflora Thunb. ex Murr.				X		*
Rudbeckia laciniata L.		X			X	
Rumex obtusifolius L.	X		X	X		*
Salix exigua Nutt.	X	X	X		X	
Salix nigra Marsh.		X	X			
Sambucus canadensis L.		X				
Samolus valerandi L. ssp. *parviflorus* (Raf.) Hulten		X				

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Scirpus cyperinus (L.) Kunth			X			
Scrophulariaceae sp.		X				
Scutellaria incana Biehler		X				
Scutellaria lateriflora L.		X	X			
Sedum sp. L.		X				
Setaria glauca (L.) Beauv.			X		X	*
Setaria parviflora (Poir.) Kerguelen					X	
Setaria sp.			X			
Sicyos angulatus L.			X			
Sida spinosa L.	X		X	X		*
Silphium perfoliatum L. var. *perfoliatum*		X		X	X	
Solanum americanum P. Mill.	X	X			X	
Solanum carolinense L.	X					
Solidago canadensis L. var. *canadensis*		X	X		X	
Solidago canadensis L. var. *scabra* Torr. & Gray		X	X			
Sorghum halepense (L.) Pers.	X	X	X	X	X	*
Spermacoce glabra Michx.		X	X			
Stachys sp.		X				

SPECIES	INDIAN GUYAN	GLENWOOD BEND	ASHTON	CRAB CREEK	MASON-POMEROY	NON-NATIVE
Strophostyles helvola (L.) Ell.			X	X		
Toxicodendron radicans L. ssp. *radicans*			X	X	X	
Ulmus rubra Muhl.	X		X			
Unknown seedling			X			
Urtica dioica L.	X	X				*
Verbena urticifolia L.		X				
Verbesina alternifolia (L.) Britt. ex Kearney	X	X	X	X	X	
Vernonia gigantea (Walt.) Trel. ssp. *gigantea*			X			
Vitis riparia Michx.		X	X	X		
Xanthium strumarium L. var. *canadense* (Mill.) Torr. & Gray	X	X	X	X		
Zea mays L.				X		*
Total 186	54	109	102	46	35	47