FIELD INVESTIGATION OF WETLANDS ASSOCIATED WITH THE MOSS-AMERICAN SUPERFUND SITE

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PROJECT SUMMARY

A field investigation of wetlands along the Little Menomonee River (LMR) was conducted by Douglas Beltman and Eileen Helmer of U.S. EPA Region V Superfund Technical Support Unit on September 17-19, 1990. LMR sediments have been contaminated by PAHs released from the Moss-American site. The contamination occurs from the site to the confluence of LMR with the Big Menomonee River, a distance of 5.6 miles. A river re-channelization along this 5.6 mile stretch has been proposed to protect human health and the environment.

The objectives of our field work were to field-check wetlands listed in the Wisconsin Wetlands Inventory and to qualitatively assess the wetlands along the LMR. We used the definition of wetlands as given in the "Federal Manual for Identifying and Delineating Wetlands" to identify wetlands.

We found that more wetlands occur along the LMR than indicated by previous estimates based on the Wisconsin Wetlands Inventory. Wetlands occur along this entire stretch of the LMR, with wetland widths generally varying between 200 feet and 700 feet. A previous study estimated that 48 acres of wetlands would be directly impacted by construction of the new river channel. Our field work indicates that a more accurate estimate is 67 acres of wetlands directly impacted.

Wetlands along the LMR serve a variety of important functions. They are important in flood mitigation, erosion and siltation reduction, as habitat for plants and animals, and as recreational areas. Wildlife habitat classifications for the study area developed by the Wisconsin Department of Natural Resources and the Southeastern Wisconsin Regional Planning Commission were used to assess wildlife habitat values. Several fairly large wetland forests that occur along the LMR are particularly valuable natural resources, because they provide important habitat, contain valuable ephemeral ponds, and will take much longer to regenerate than emergent or scrub-shrub wetlands.

All wetlands along the LMR depend on seasonal flooding to establish wetlands hydrology. If re-channelization limits this flooding, all of these wetlands, estimated at 273 acres, will be significantly affected through hydrology alteration.

INTRODUCTION

The Moss-American site, located in Milwaukee, WI, is a former wood preserving facility that treated railroad ties with creosote and fuel oil from 1921 to 1976. Soon after closure in 1976 the facility was demolished. During its operation soils on site became contaminated with various polyaromatic hydrocarbons (PAHs). The facility also discharged liquid wastes into settling ponds that ultimately drained into the Little Menomonee River (LMR), resulting in contaminated river sediments. Numerous investigative studies in the last 20 years have documented the PAH contamination in LMR sediments, including the site remediation studies conducted for the U.S. Environmental Protection Agency and presented in the January, 1990 Remedial Investigation Report.

River re-channelization has been proposed as a remediation measure to deal with contaminated sediments. The river course would be re-routed through a new channel, and the present channel would be filled with material removed to make the new channel. As part of an environmental assessment of the site, Douglas Beltman and Eileen Helmer of the U.S. EPA Office of Superfund Technical Support Unit conducted a field investigative study of wetlands along the LMR that may be impacted by river re-channelization or other remedial activities.

Study Area Location and Description

The 88 acre Moss-American site is located south of Brown Deer Road and west of 91st Street in the northwest part of the City of Milwaukee, Milwaukee County, Wisconsin (see Figure 1). The site is bounded on the north by the Chicago and North Western Railroad tracks and on the south by the Wisconsin and Southern Railroad tracks. The Little Menomonee River (LMR) runs through the site (north to south) and discharges to the Menomonee River approximately 5.6 miles downstream. Although located in a heavily residential and commercial area, the lands immediately adjacent to the LMR for this 5 mile stretch are mostly county-owned and undeveloped. Privately owned property fronts the river in very few locations, and a natural vegetation corridor of varying width runs parallel to the river on both sides. Throughout these 5.6 miles the river has been altered by past channelizations for drainage and flood control purposes.

Where the LMR crosses the Moss-American site, the river channel has a top width of 25 to 35 feet, bottom width of 5 to 10 feet, channel depth of 5 to 10 feet, and base flow water depth of 1 to 2 feet (from January, 1990 Remedial Investigation Report, CH2M Hill). The low-flow channel capacity of the river along the 5 mile stretch is estimated to be 330 cfs, the average bottom slope to be about 3.5 feet/mile, the average channel velocity at

bank-full capacity to be about 2.7 feet per second, and the average annual stream flow at the confluence with the Menomonee River to be about 17 cfs (January, 1990 Remedial Investigation Report, CH2M Hill). A Federal Emergency Management Agency (FEMA) study in 1987 estimated peak flow rates of the LMR at the Brown Deer Road Bridge as 330 cfs for 10-year peak, 500 cfs for 50-year peak, 580 cfs for 100-year peak, and 770 cfs for 500-year peak.

Soils along this stretch of the LMR are varied. They include Matherton silt loam, 1-3 percent slopes, Sebewa silt loam, Colwood silt loam, Ashkum silty clay loam, 0-3 percent slopes, Pistakee silt loam, 1 percent slopes, Wet alluvial land, Pella silt loam, moderately shallow variant, and Mequon silt loam, 1-3 percent slopes.

METHODS

One of the objectives of this study was to document wetlands along the LMR that may be impacted by river rechannelization. Wetlands have previously been documented in the Wisconsin Wetlands Inventory (WWI), produced in this region by the Wisconsin Department of Natural Resources and the Southeastern Wisconsin Regional Planning Commission (SWRPC). This wetlands inventory maps wetlands based on aerial photography. Photographic interpreters look for such landscape features as vegetation, water and soil characteristics, and topography in identifying wetlands. Wetlands are defined as areas "where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions" (Section 23.32(1) of the Wisconsin Statutes). The inventory also characterizes wetland areas according to vegetation cover type (i.e. plant community) and flooding regime.

Although this inventory is very useful, its mapping is not always accurate, and field checking of wetlands is usually necessary. Errors in photo interpretation, poor photograph resolution, omission of small wetlands, and changes in the land since the date of photography can all contribute to misclassifications in the wetlands inventory. For instance, the WWI for the area along the LMR is based on 1980 aerial photographs, so changes in land use and hydrology in the past 10 years are not reflected.

To identify wetlands in the field we used the wetlands definition given in the "Federal Manual for Identifying and Delineating Wetlands", Federal Interagency Committee for Wetland Delineation, 1989. This widely-accepted manual establishes three criteria to be used in classifying areas as wetland. These criteria are that at least 50% of the dominant plant species are hydrophytic species, that the soils are hydric soils, and that the area has wetland hydrology indicators. Hydrophytic plant species are

species that are specially adapted to wet conditions. The U.S. Fish and Wildlife has compiled a list of hydrophytic plant species for the midwest based on the growing conditions in which species are most commonly found. This list, called the "National List of Plant Species That Occur in Wetlands, Region III" is a commonly used reference for determining hydrophytic vegetation. Vegetation is classified as Wetland Obligate, Facultative Wetland, Facultative, Facultative Upland, or Upland (see Appendix A for definitions). Hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part ("Hydric Soils of the United States", U.S.D.A. Soil Conservation Service, 1987). The Milwaukee County Soil Survey was used as a baseline reference for examining soils along the LMR. Wetland hydrology indicators are indicators of at least a seasonal abundance of water. All three criteria must be met in an area in order for it to be classified a wetland.

To update the WWI we needed to determine whether WWI wetland/upland designations were correct. We limited our work to areas right along the river, as these areas will be directly impacted by river re-channelization. Our method for field-checking the WWI was to walk along the LMR, note the different plant communities (i.e. cover types), and relate these communities to the WWI. Dominant vegetation, soils, and site hydrology were examined in the different plant communities, and each community was designated as wetland or upland based on these three criteria. Plant species dominance was estimated based on the community walk-throughs; no sample plots were used. Vegetation cover type classifications were determined for each area, and plant species lists were compiled. Soils were examined at points in the different vegetation cover types that looked representative of the whole community.

This plant community approach we used is very similar to the "Routine Plant Community Assessment" method detailed in the "Federal Manual for Identifying and Delineating Wetlands". However, in the Routine Plant Community Assessment, wetland/non-wetland boundaries are delineated on all sides of wetlands. We did not do such a wetland boundary delineation, particularly on the upland edges of wetlands away from the river. We felt that at this preliminary stage it was not necessary to delineate wetland/non-wetland boundaries beyond about 150 feet from the river, for river rechannelization will likely not directly impact these areas. Also the logistics of delineating these edges along both sides of the 5.6 mile river stretch made such a delineation not practicable. Therefore, wetland/non-wetland edges beyond about 150 feet from the river could only be estimated based on WWI wetland mapping, field observations, and aerial photographs.

RESULTS

Figures 2 through 6 show the results of our field study. These five figures each depict a different mile-long segment of the LMR. Figure 2 is the northernmost segment, and part of the Moss-American site is visible in the upper left portion of the figure. These figures are taken from 1985 SWRPC aerial photographs at a scale of 1:4800. Wetlands designated in the WWI and additional field-identified wetlands are shown in these figures, and vegetation communities are designated as either broad-leaved deciduous forest, broad-leaved deciduous scrub-shrub, or persistent emergent.

Wetland Acreage Along the LMR

Wetlands occur along this entire stretch of the LMR. No areas bordering the LMR, except for road, railroad, and bike trail crossings, fail to meet the three wetland criteria. The WWI wrongly designates several segments along the LMR as upland. However, the wetlands shown on the WWI along the LMR are all correctly designated; no areas designated as wetland were found to be upland. Therefore Figures 2 through 6, which show WWI-classified wetlands and additional field-identified wetlands, describe fairly accurately the general outline of wetlands along the LMR. Based on these figures the wetland strip bordering the river generally is between 200 and 700 feet in width, though some areas are wider and some narrower. A total of 273 acres of wetlands occur along the LMR, based on these figures. These are estimates only, for precise wetland/upland boundaries were not determined.

Our field work shows that more wetlands will be directly affected by re-channelization than previously estimated. The May, 1990 Feasibility Study Report by CH2M Hill included an estimate of wetland acreage that will be disturbed as a result of new river channel construction, based on the WWI. It was estimated that 48 acres of wetlands would be directly impacted, assuming that the construction corridor for the re-channelization will be 100 feet wide. Using this same assumption and including the additional field-identified wetlands along the LMR, a more accurate estimate is that 67 acres of wetland will be directly impacted.

Wetland Classification

Wetlands were classified using the system described in "Classification of Wetlands and Deepwater Habitats of the United States", U.S. Fish and Wildlife Service, 1979. All areas along the LMR are classified in the Palustrine System, which includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that

occur in tidal areas with low salinity. Within the Palustrine System three different plant community types occur along the LMR: (1) Emergent Persistent, which is characterized by erect, rooted, herbaceous hydrophytes, most of which are perennial and normally remain standing at least until the beginning of the next growing season; (2) Broad-leaved Deciduous Scrub-Shrub, which is dominated by deciduous broad-leaved woody vegetation less than 6 m tall; (3) Broad-leaved Deciduous Forest, dominated by broad-leaved deciduous vegetation more than 6 m tall. These designations are roughly shown in Figures 2 through 6. Community boundaries are not shown, for not all boundaries were determined, particularly along upland edges away from the river.

Almost all of these plant community types along the LMR were dry at the time of this field study (September 17-19, 1990). Surface inundation occurred at only a few small locations, and almost all soil pits, which were 16 inches deep, had no standing water. Many signs of flooding were observed along the river, including drift lines, water-stained vegetation, surface scoured areas, flood-deposited debris, water marks, and surface soil cracking. Although detailed knowledge of the duration and timing of flooding is not available, based on the low water table these wetlands are most likely classified as Temporarily Flooded, in which surface water is present for brief periods during the growing season and the water table normally lies well below the surface at other times.

The Emergent Persistent Wetlands along LMR typically include Reed Canary Grass (Phalaris arundinacea) and/or Kentucky Bluegrass (Poa pratensis) as dominant species. Other species that achieve dominance in at least one Emergent Wetland and are often fairly common in others include Giant Goldenrod (Solidago gigantea), New England Aster (Aster novae-angliae), Marsh Aster (Aster simplex), Jewelweed (Impatiens biflora), Tall Boneset (Ageratinum altissimum), and Tall Goldenrod (Solidago altissima). A more complete plant species list for the Emergent Persistent Wetland communities along LMR is given in Table 1.

Broad-leaved Deciduous Scrub-shrub communities along the LMR are typically dominated by Sandbar Willow (Salix exigua) and/or American Elm (Ulmus americana) in the shrub stratum, and by Reed Canary Grass and Kentucky Bluegrass in the herb stratum. Other common shrub species include Hawthorn (Crataegus sp.), Green Ash (Fraxinus pennsylvanica), Buckthorn (Rhamnus cathartica), and Black Willow (Salix nigra). Table 2 contains a more complete plant species list for the Scrub-shrub communities along LMR.

The Broad-leaved Deciduous Forested communities along LMR are all second growth forests. Every sizable Forest Wetland includes American Elm (Ulmus americana) and/or Green Ash (Fraxinus pennsylvanica) as dominant tree species. Boxelder (Acer negundo) and Swamp White Oak (Quercus bicolor) are also fairly common

throughout and reach dominance in several of the stands. The shrub stratum is typically dominated by Hawthorn, Buckthorn, and saplings of the dominant tree species. Common herb stratum species include Reed Canary Grass, Kentucky Bluegrass, and Marsh Aster. Table 3 lists species encountered in the Forest Wetland communities along LMR. Most of these forests are fairly mature, with mostly closed canopies and relatively open understories. However, some of the stands are less mature and have fairly open canopies and dense understories. Ephemeral ponds, which are areas where ponded water collects during the growing season, are common in these Forest Wetland communities along the LMR. These ephemeral ponds are commonly lined with Lake Sedge (Carex lacustris), Iris (Iris sp.), and Reed Canary Grass.

Not shown in Figures 2 through 6 is a narrow strip of Broad-leaved Deciduous Forest Wetland that lines the LMR for almost its entire length through the study area. Where Emergent or Scrub-shrub communities appear to border the river, a narrow strip of forest typically dominated by Boxelder and Green Ash actually lines the river.

No federal- or state-designated threatened or endangered species were observed during the field study in any of the communities.

QUALITATIVE ASSESSMENT

A qualitative wetlands assessment is a means of assessing wetlands functions and values for comparative purposes. We can qualitatively assess the wetlands along the LMR in order to better understand any important and valuable functions they serve. This qualitative assessment is not rigorous, but provides a conceptual understanding of the value of the LMR wetlands. Also, it can help identify particularly valuable wetland areas along the LMR that should receive special attention.

Wetland functions and values are many. They include flood mitigation, erosion control, improving water quality, ground water recharge/discharge, providing plant and animal habitat, and resources for education and recreation (Mitsch and Gosselink 1986).

The wetlands along the LMR are certainly important in flood mitigation. These temporarily flooded wetlands buffer peak water flows and change sharp runoff peaks to slower, longer discharges. Although no detailed peak water flow data is available, the ample evidence of temporary flooding in the wetlands signifies the important flood retention role they play. This decrease in peak water flow is also important in reducing erosion. As water floods the wetlands, water velocity and thus eroding power drops. In addition, this reduction in water velocity during flooding

causes silt to settle out of the water and onto the wetlands, thereby increasing water quality. No good indicators of groundwater recharge in the wetlands are available, though some recharge may occur during floods. The rest of the year, when these floodplain wetlands are dry, groundwater recharge is likely not as important.

These functional values, flood mitigation, erosion control, improving water quality, and groundwater recharge, are assumed to be more or less constant for all wetlands along the LMR. Although this assumption is not strictly correct, the assumption is valid for the level of investigation in this study. Likewise, none of the wetlands along the LMR currently have any significant value as fisheries.

However other values, most notably providing plant and animal habitat, are not constant. The Wisconsin Department of Natural Resources and SWRPC in 1985 categorized wildlife habitat areas in southeastern Wisconsin, including those along the LMR. Areas are categorized as either Class I (High Value), Class II (Medium Value), or Class III (Good Value). Class I areas (1) contain a good diversity of wildlife areas, (2) contain wildlife areas adequate in size to meet the habitat requirements of the species concerned, and (3) are generally located in proximity to other wildlife habitat areas. Class II areas generally lack one of the three Class I criteria but have good plant and animal diversity. Class III areas generally lack two of the criteria but may be important within the local landscape context if they are near other habitats, act as habitat corridors, or are the only habitat in an area. These wildlife habitat classes are applied to areas that may include a variety of wetland plant community types; they are not applied to the individual cover type classes, as indicated in the May, 1990 Feasibility Study Report. (Also, the Feasibility Study Report wrongly labels Classes I, II, and III as High, Medium, and Low, not High, Medium, and Good.)

This wildlife habitat evaluation by SWRPC and Wisconsin Department of Natural Resources classifies the following areas:

	Wildlife Habitat Class
Segment 1, Brown Deer Rd. to Bradley Rd. (Figure 2)	
Northernmost forest wetland shown on WWI	II
Remaining forest shown on WWI and all additional field ID'ed wetlands	I
Emergent wetland shown on WWI	II

	Wildlife Habitat Class
Segment 2, Bradley Rd. to Good Hope Rd. (Figure 3)	
All wetlands north of E-W road in middle of segment	II
All wetlands south of E-W road	III
Segment 3, Good Hope Rd. to Mill Rd. (Figure 4)	
All wetlands	I
Segment 4, Mill Rd. to Silver Spring Dr. (Figure 5)	
All wetlands	II
Segment 5, Silver Spring Dr. to Hampton Ave. (Figure 6)	
All wetlands	II

Class I: High wildlife habitat value
Class II: Medium wildlife habitat value
Class III: Good wildlife habitat value

These classifications are necessarily biased toward the pre-selected species of concern. In this case, species that utilize a variety of habitats and benefit from forest edges are favored, while species that may require a single habitat type not including edges are disfavored. Nevertheless, this habitat classification can provide a measure of habitat suitability for some animal species.

Reed Canary Grass is a dominant species in many areas along the LMR, particularly in many of the Persistent Emergent Wetlands. This extremely aggressive European invader can rapidly colonize disturbed areas, often forming dense, monotypic stands like those found along the LMR. It has little value to wildlife. Because of its low wildlife value and ability to rapidly recolonize disturbed areas, disturbance of Reed Canary Grass areas would not be a major impact, providing the functional values of flood retention, improving water quality, controlling erosion are maintained.

On the other hand, the Broad-leaved Deciduous Forest Wetlands along the LMR would take considerable time to recover. These forests provide valuable habitat to a variety of insects, amphibians, mammals, and birds. For instance, the numerous ephemeral ponds that occur in these forests are unique habitats that provide important breeding areas for insects, which serve as

important food sources for birds, amphibians, and reptiles. These fairly mature forests would take 50 to 60 years to recover following their removal for new channel construction. As this LMR corridor occurs in a highly urban area, mature forests like these are rare and valuable resources not only to the animals, insects, and plants which inhabit them but also to people in the area which use them for recreation. Superfund remedies are mandated to minimize impact on wetland areas, and construction through these Forest Wetlands should be minimized to minimize environmental impact.

Wetlands restoration has been proposed as a means of minimizing environmental impact along the LMR. However, wetlands restoration is far from an exact science. Much remains unknown about the intricacies of environmental and vegetation community factors involved in wetland restoration. Wetlands restoration should not be viewed as the equivalent of wetlands preservation, but as a "last resort" to mitigate wetlands destruction.

Several sizable lowland forest areas along the LMR should receive special attention. These forests are large enough to provide good habitat for many forest animal and plant species. These forests are: (1) Segment 1 (Figure 2), the area including the two WWI-listed wetland forests and the field-identified wetland forest between them, (2) Segment 2 (Figure 3), the large WWI-listed wetland forest just South of Bradley Rd., (3) Segment 3 (Figure 4), the WWI-listed wetland forest in the middle of the segment, (4)? the WWI-listed wetland forest, particularly that which is north of the field-identified wetland forest, and (5) Segment 5 (Figure 6), The WWI-listed and field-identified wetland forest north of the bike path bridge across LMR.

Since all wetlands along the LMR are temporarily flooded, the spring flush of water is essential to maintain their hydrology and wetland character. Without this flooding, these areas would likely lose their wetland character. Therefore, consideration should be given the potential affects that rechannelization will have on these floodplain areas. If high water flow is contained within the new channel, these wetlands likely will be changed to uplands. Thus approximately 273 acres of wetlands would be significantly affected by the river re-channelization.

Potential ARARs

The EPA publication "CERCLA Compliance with Other Laws Manual" (EPA/540/g-89/006) outlines federal applicable or relevant and appropriate requirements (ARARs) related to wetlands (see Section 3.4 of the publication). Potential ARARs include:

1. Section 404 of the Clean Water Act, which regulates disposal of dredged or fill material in waters of the United States, including wetlands. Section 404 applies if remedial actions anticipate one of the following: a) disposal of dredged or waste materials in wetlands or surface waters; b) capping; or c) construction of berms or levees. Section 404 generally applies to wetlands larger than 5 acres.

2. 40 CFR Part 6, Appendix A, which contains regulations requiring any Federal agency's actions to avoid, to the extent possible, adverse impacts on wetlands, and to preserve and enhance the natural values of wetlands and floodplains. Where avoidance of impacts is not practicable, potential harm to wetlands must be minimized. Federal actions include dredge and fill activities or the destruction or modification of wetlands.

Under CERCLA §121(e), CWA §404 permits are not required for dredge and fill activities conducted entirely on-site. However, the Corps' assessment of public interest factors could contribute to the overall quality of the CERCLA response action, and the Regional §404 office should be consulted when remedies are selected which may affect wetlands.

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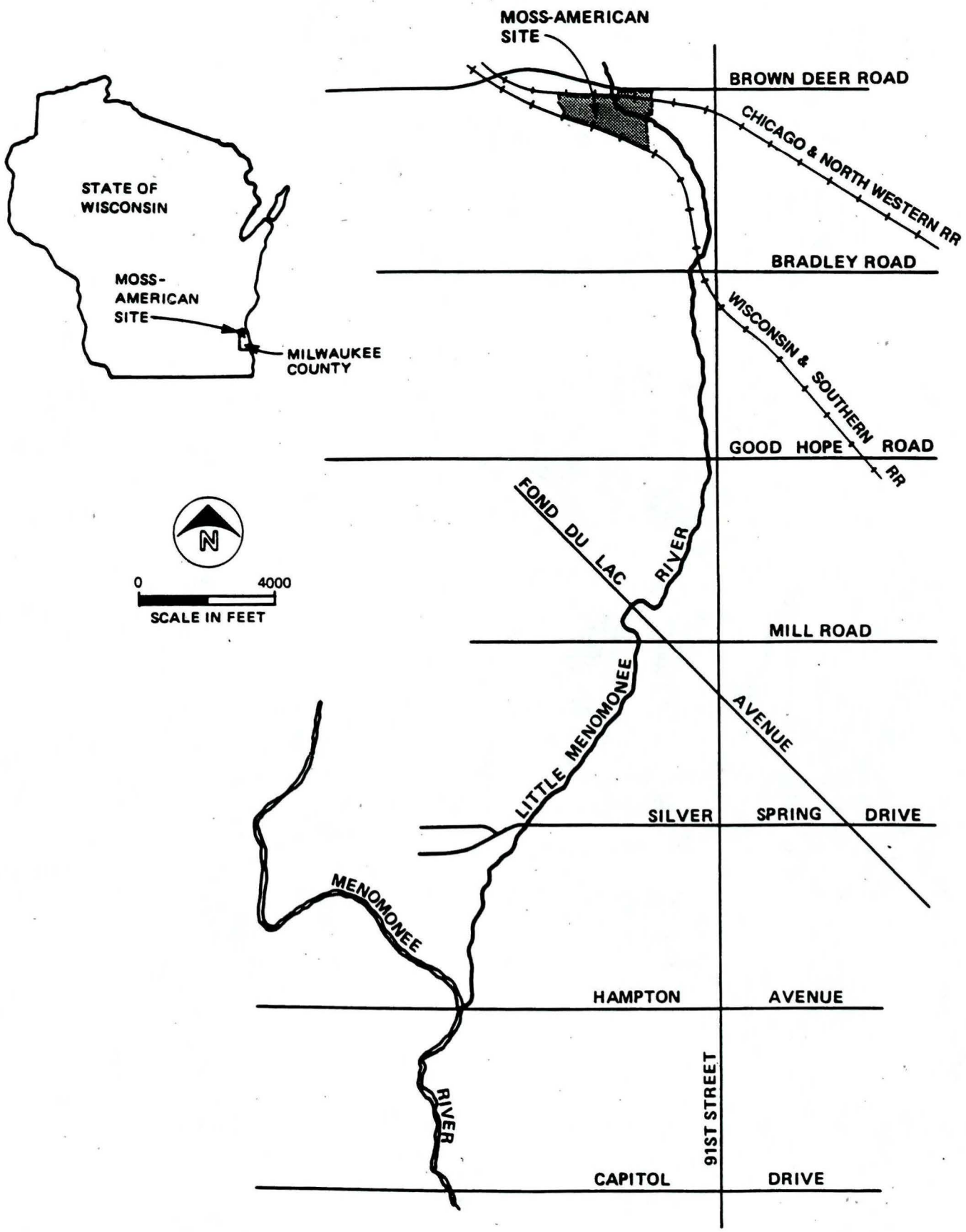

From May, 1990 Feasibility Study Report, CH2M Hill.

FIGURE 1
LOCATION MAP
MOSS-AMERICAN FS

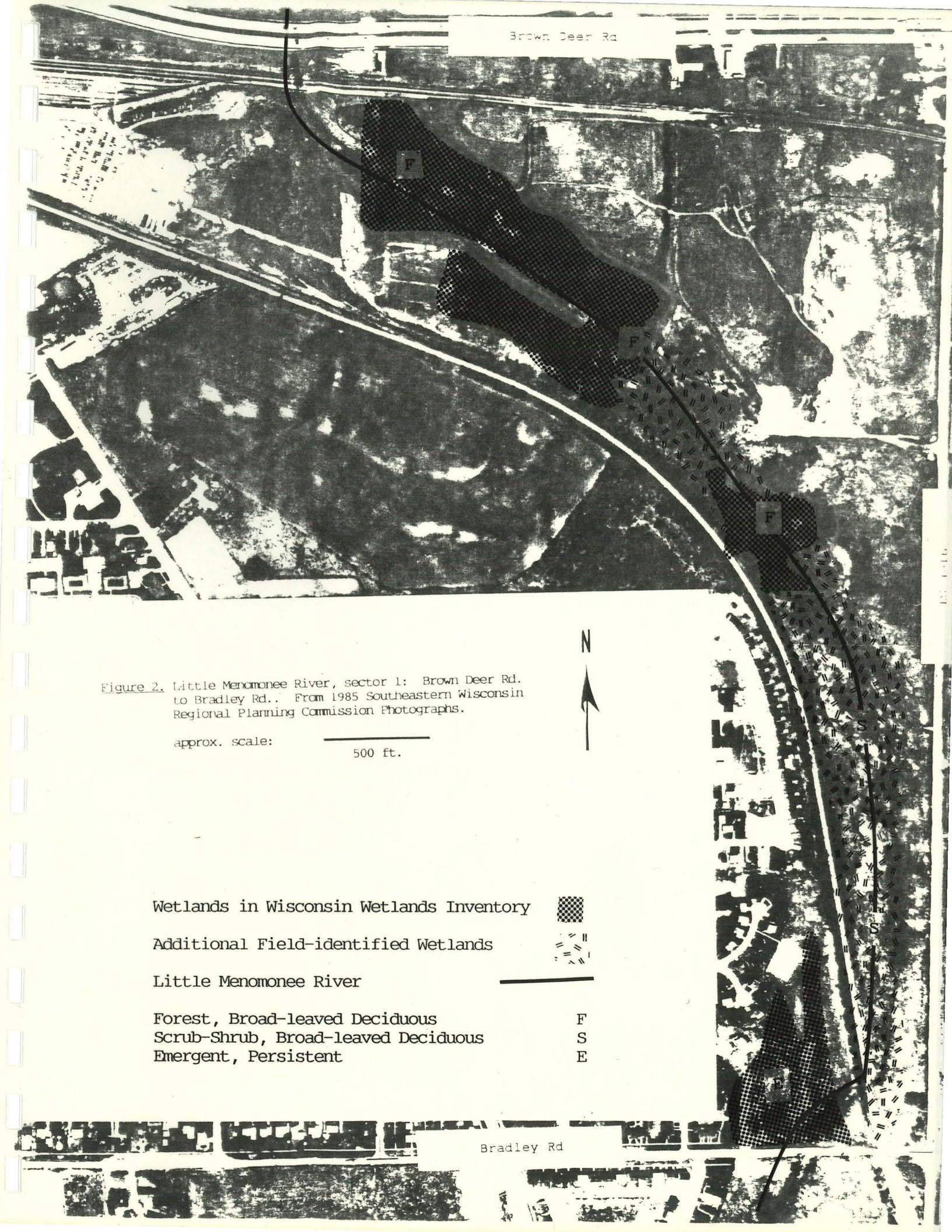

Figure 2. Little Menomonee River, sector 1: Brown Deer Rd. to Bradley Rd.. From 1985 Southeastern Wisconsin Regional Planning Commission Photographs.

approx. scale: 500 ft.

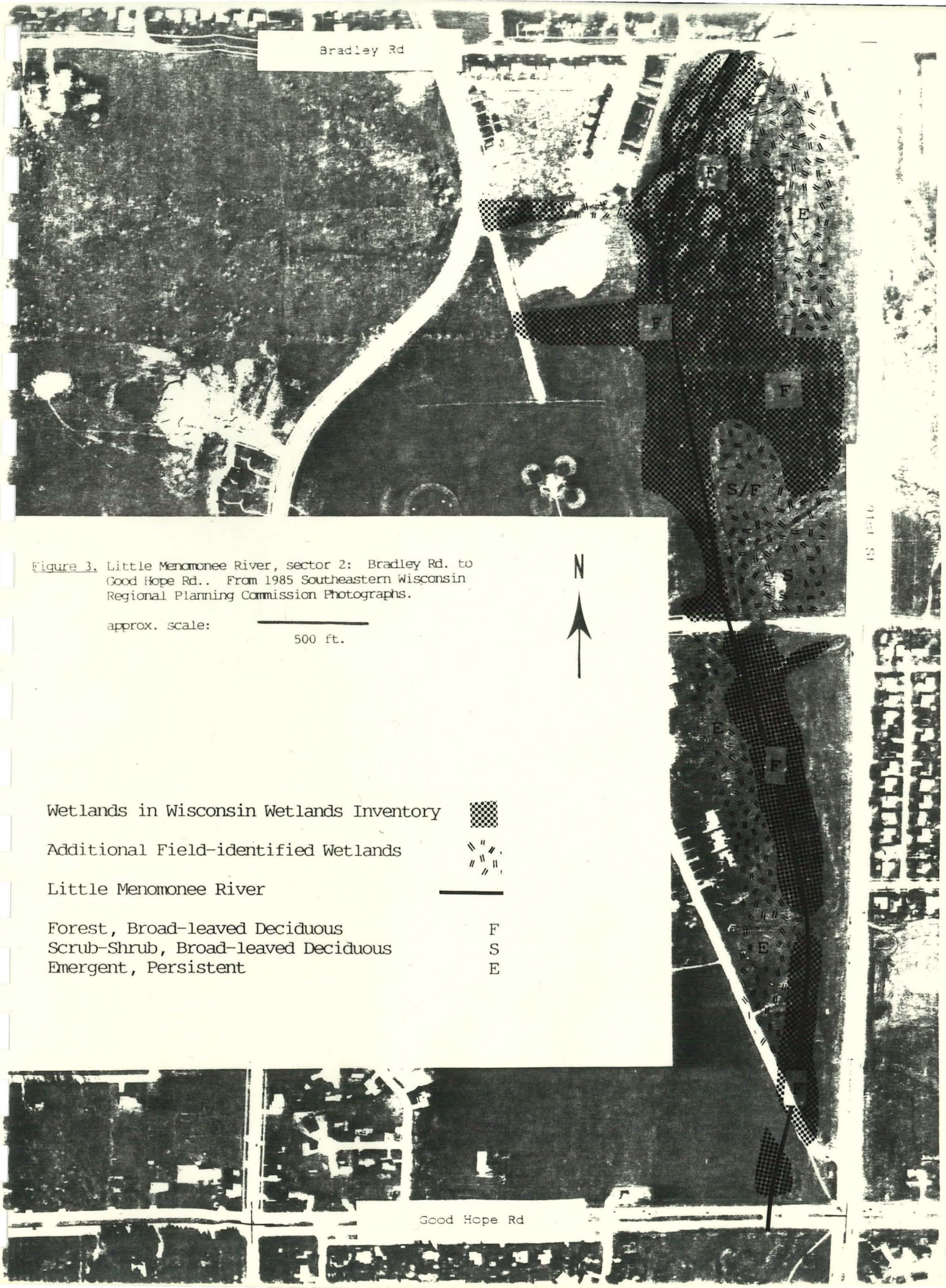

Figure 3. Little Menomonee River, sector 2: Bradley Rd. to Good Hope Rd.. From 1985 Southeastern Wisconsin Regional Planning Commission Photographs.

approx. scale: 500 ft.

N

Wetlands in Wisconsin Wetlands Inventory

Additional Field-identified Wetlands

Little Menomonee River

Forest, Broad-leaved Deciduous	F
Scrub-Shrub, Broad-leaved Deciduous	S
Emergent, Persistent	E

Figure 4. Little Menomonee River, sector 3: Good Hope Rd. to Mill Rd.. From 1985 Southeastern Wisconsin Regional Planning Commission Photographs.

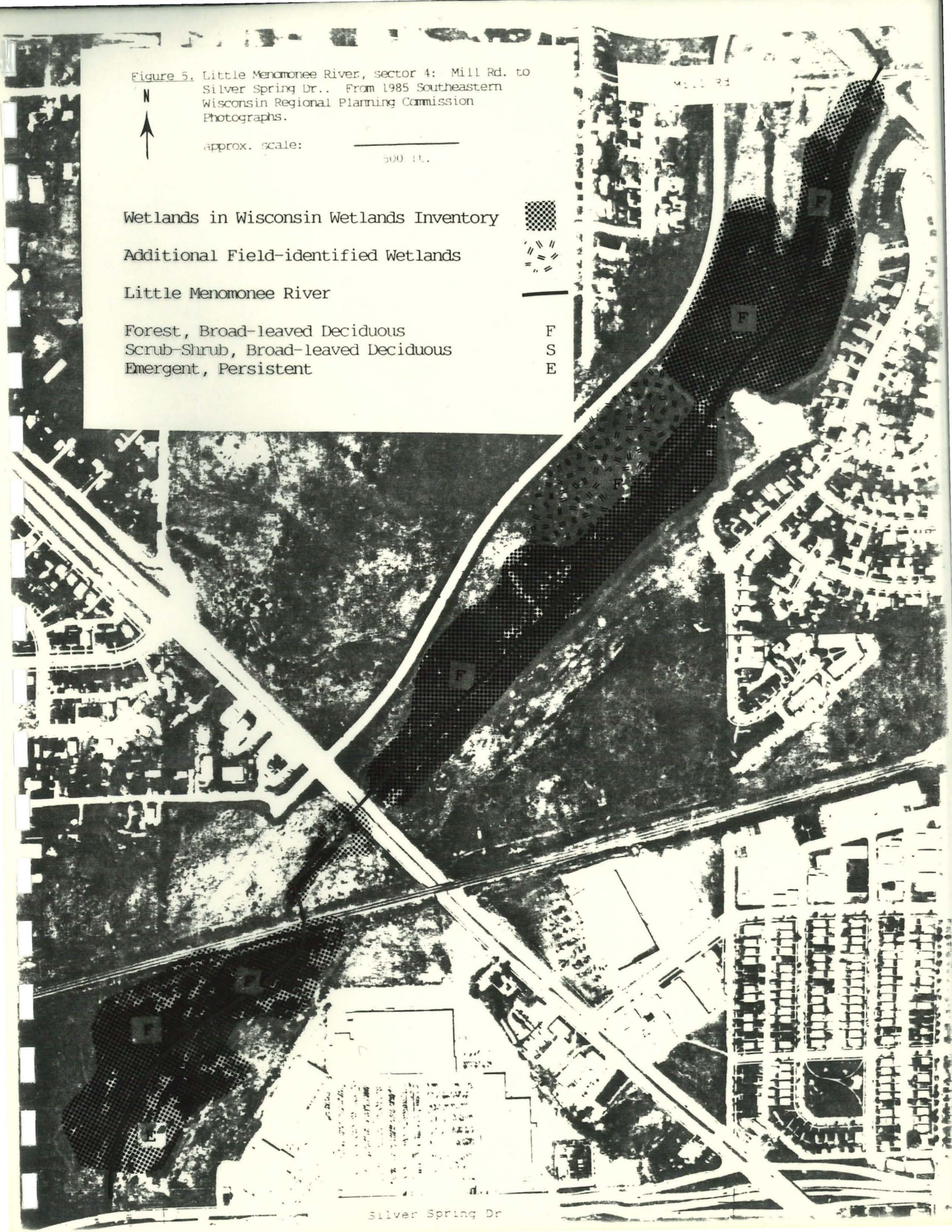

Figure 5. Little Menomonee River, sector 4: Mill Rd. to Silver Spring Dr.. From 1985 Southeastern Wisconsin Regional Planning Commission Photographs.

N

Approx. scale: 500 ft.

Wetlands in Wisconsin Wetlands Inventory

Additional Field-identified Wetlands

Little Menomonee River

Forest, Broad-leaved Deciduous	F
Scrub-Shrub, Broad-leaved Deciduous	S
Emergent, Persistent	E

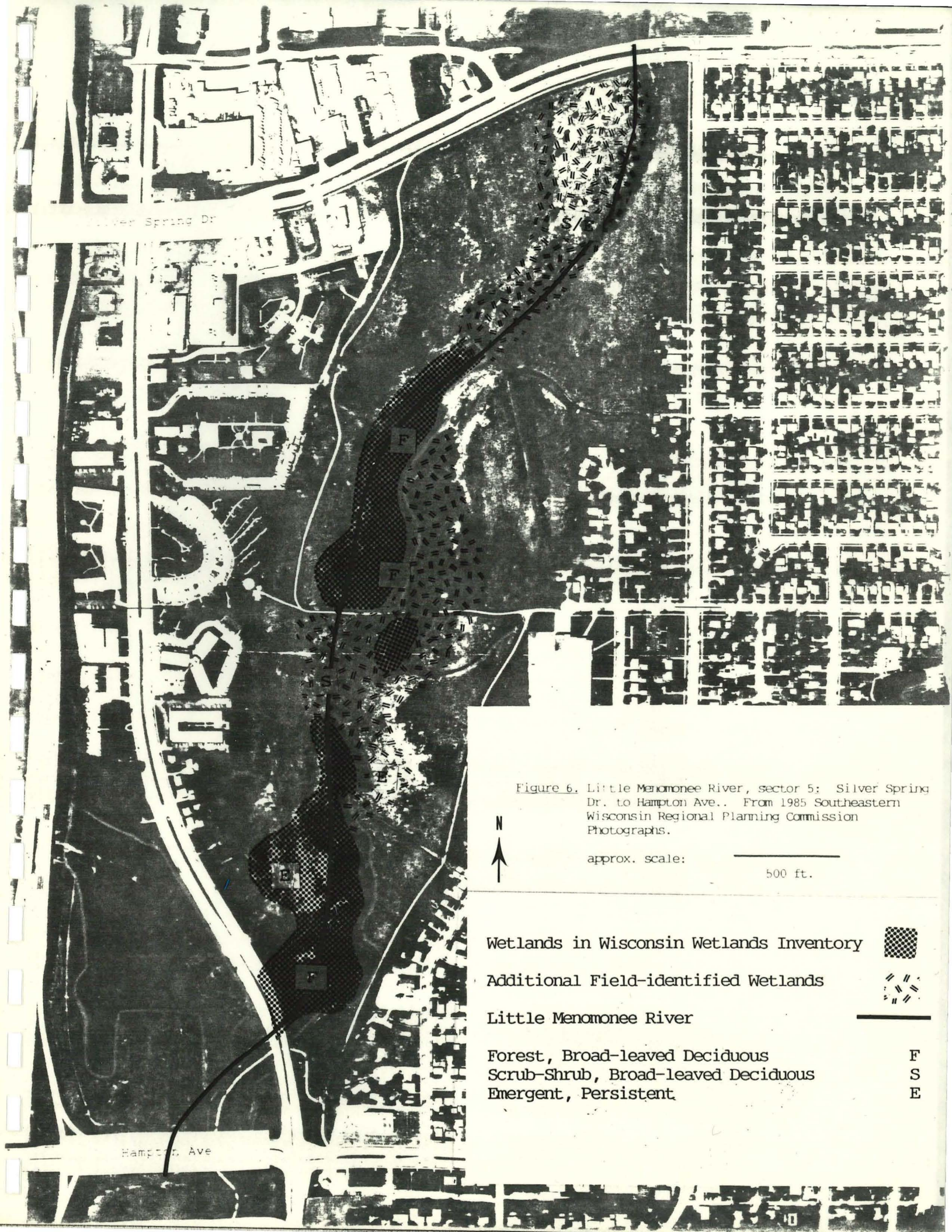

Figure 6. Little Menomonee River, sector 5: Silver Spring Dr. to Hampton Ave.. From 1985 Southeastern Wisconsin Regional Planning Commission Photographs.

Table 1. Plant Species List for Persistent Emergent Wetlands along Little Menomonee River.

		Indicator Status*
Acer negundo	Box-elder	FACW
Ageratina altissimum	Tall Boneset	FACU
Angelica atropurpurea	Purple-stem Angelica	OBL
Aster lateriflorus	Calico Aster	FACW
Aster novai-angliae	New England Aster	FACW
Aster simplex	Panicled Aster	FACW
Brassica nigra	Black Mustard	UPL
Carex stricta	Tussock Sedge	OBL
Cirsium sp.	Thistle	
Impatiens capensis	Spotted Touch-me-not	FACW
Mentha arvensis	Field Mint	FACW
Phalaris arundinacea	Reed Canary Grass	FACW
Poa pratensis	Kentucky Bluegrass	FAC
Salix exigua	Sandbar Willow	OBL
Scirpus atrovirens	Green Bulrush	OBL
Solidago altissima	Tall Golden-rod	FACU
Solidago gigantea	Giant Golden-rod	FACW
Typha latifolia	Broad-leaf Cattail	OBL
Ulmus americana	American Elm	FACW

*Indicator status abbreviations:
OBL= Obligate
FACW= Facultative Wetland
FAC= Facultative
FACU= Facultative Upland
UPL= Upland

(See Appendix A for indicator status definitions.)

Table 2. Plant Species List for Scrub-Shrub, Broad-leaved Deciduous Wetlands along Little Menomonee River.

		Indicator Status*
Acer negundo	Box-elder	FACW
Asclepias sp.	Milkweed	
Aster novae-angliae	New England Aster	FACW
Aster simplex	Panicled Aster	FACW
Cichorium Intybus	Chicory	UPL
Cirsium sp.	Thistle	
Cornus amomum	Silky Dogwood	FACW
Cornus stolonifera	Red-osier Dogwood	FACW
Crataegus sp.	Hawthorn	
Daucus carota	Queen Anne's Lace	UPL
Fraxinus pennsylvanica	Green Ash	FACW
Impatiens capensis	Spotted Touch-me-not	FACW
Iris sp.	Iris	
Linaria vulgaris	Butter-and-eggs	UPL
Lycopus americanus	American Bugleweed	OBL
Phalaris arundinacea	Reed Canary Grass	FACW
Poa pratensis	Kentucky Bluegrass	FAC
Polygonum pensylvanicum	Pennsylvania Smartweed	FACW
Populus deltoides	Eastern Cottonwood	FAC
Rhamnus cathartica	Common Buckthorn	FACU
Salix exigua	Sandbar Willow	OBL
Salix nigra	Black Willow	OBL
Scirpus atrovirens	Green Bulrush	OBL
Solidago altissima	Tall Golden-rod	FACU
Ulmus americana	American Elm	FACW

*Indicator status abbreviations:
OBL= Obligate
FACW= Facultative Wetland
FAC= Facultative
FACU= Facultative Upland
UPL= Upland

(See Appendix A for indicator status definitions.)

Table 3. Plant Species List for Palustrine Forest, Broad-leaved Deciduous Wetlands

		Indicator Status (See App.A)
Acer negundo	Box-elder	FACW
Acer saccharinum	Silver Maple	FACW
Ambrosia trifida	Great Ragweed	FAC
Anemone canadensis	Canada Thimble-weed	FACW
Aquilegia canadensis	Wild Columbine	FAC
Asarum canadense	Wild Ginger	UPL
Aster lateriflorus	Calico Aster	FACW
Aster novae-angliae	New England Aster	FACW
Aster simplex	Panicled Aster	FACW
Bidens frondosa	Devil's Beggar-ticks	FACW
Carex lacustris	Lake Sedge	OBL
Circaea lutetiana	Enchanter's Nightshade	FACU
Cirsium sp.	Thistle	
Cornus amomum	Silky Dogwood	FACW
Cornus stolonifera	Red-osier Dogwood	FACW
Crataegus sp.	Hawthorn	
Fraxinus pennsylvanica	Green Ash	FACW
Geum canadense	White Avens	FAC
Geum laciniatum	Rough Avens	FACW
Helenium sp.	Sneezeweed	
Impatiens capensis	Spotted Touch-me-not	FACW
Iris sp.	Iris	
Oxalis sp.	Wood-sorrel	
Phalaris arundinacea	Reed Canary Grass	FACW
Plantago sp.	Plantain	
Poa pratensis	Kentucky Bluegrass	FAC
Populus alba	White Poplar	UPL
Populus deltoides	Eastern Cottonwood	FAC
Populus tremuloides	Quaking Aspen	FAC
Prunus serotina	Black Cherry	FACU
Quercus bicolor	Swamp White Oak	FACW
Rhamnus cathartica	Common Buckthorn	FACU
Ribes sp.	Gooseberry	
Rudbeckia laciniata	Green-headed Coneflower	FAC
Salix babylonica	Weeping Willow	FACW
Salix nigra	Black Willow	OBL
Smilicina racemosa	False Solomon's-seal	FACU
Solanum dulcamara	Climbing Nightshade	FAC
Solidago altissima	Tall Golden-rod	FACU
Solidago gigantea	Giant Golden-rod	FACW
Tilia americana	American Basswood	FACU
Typha angustifolia	Narrow-leaf Cattail	OBL
Typha latifolia	Broad-leaf Cattail	OBL
Ulmus americana	American Elm	FACW
Viburnum sp.	Viburnum	
Vitis sp.	Wild Grape	

Table 4. Soil Sample Characteristics.

Soil Sample Location	Matrix Color[1]	Gleyed or Mottled?	On Hydric Soils List?
Segment 2 (Figure 3)			
Emergent wetland near corner of Bradley and 91st St.	10YR 3/1	G,M	Y
Forest "peninsula" 1/4 mi. S of Bradley Rd., W of LMR	10YR 3/3		Y
Large forest E of LMR, 1/4 mi. S of Bradley Rd.	10YR 2/2.5	G,M	Y
Scrub-shrub/forest wetland just S of large forest	10YR 3/1		Y
Forest along LMR, app. 500 ft. N of Good Hope Rd.	10YR 3/1	M	Y
Segment 3 (Figure 4)			
Scrub-shrub just S of Good Hope Rd., W of LMR	10YR 3/1.5	G,M	Y
Emergent wetland just S of above, W side of LMR	10YR 4/2 fill present	G	Y
Forest near middle of segment, east side of LMR	10YR 3/1	G,M	Y
Emergent W of LMR, app. 1/4 mi. N of Mill Rd.	10YR 3/2	G,M	Y
Segment 4 (Figure 5)			
WWI-listed forest NE of field-identified wetland, W of LMR	10YR 2.5/1	G,M	Y
Field-identified forest wetland	10YR 3/1	G,M	Y
Segment 5 (Figure 6)			
Scrub-shrub/emergent wetland just S of Silver Spring Dr., W of LMR	10YR 3/1	G,M	Y
Same as above, E of LMR	10YR 4/1	G,M	Y

Other soils were cored with a soil auger and qualitatively examined for soil characteristics. No data were taken.

APPENDIX A
Definitions of Plant Indicator Status

Abbreviation	Plant Indicator Status	Frequency of Occurrence in Wetlands
OBL	Obligate Wetland	>99%
FACW	Facultative Wetland	67-99%
FAC	Facultative	34-66%
FACU	Facultative Upland	1-33%
UPL	Upland	<1%

Reference:

Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Indentifying and Delineating Jurisdictional Wetlands, U.S. Army corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S.D.A. Soil conservation Service, Washington, D.C. Cooperative technical publication.