WETLANDS AND OTHER WATERS DELINEATION REPORT

APPROXIMATELY 3 MILES OF THE CUYAHOGA RIVER (RM 23.4 TO RM 20.6) AND 0.2 MILES OF CHIPPEWA CREEK (RM 0.2-0.0) IN BRECKSVILLE AND SAGAMORE HILLS SUMMIT AND CUYAHOGA COUNTIES, OHIO

Project # 1443-3137

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STATEMENT OF CERTIFICATION

The analyses, opinions and conclusions in this report are based entirely on EnviroScience's unbiased, professional judgment. EnviroScience's compensation is not in any way contingent on any action or event resulting from this study. Neither EnviroScience nor any EnviroScience employee has any vested interest in the property examined in this study.

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EXECUTIVE SUMMARY

EnviroScience, Inc. performed a delineation and functional assessment of wetlands and other waters during September 2009 for the Friends of the Crooked River on riverine wetlands upstream and downstream of the Brecksville Dam on the Cuyahoga River. The dam is located at RM 20.685 in Summit and Cuyahoga Counties, Ohio. This project will include a full delineation of all jurisdictional wetlands and other waters (streams and ponds) within the site. Since the report was completed for use of both Friends of the Crooked River and the National Park Service, wetlands within the boundaries of the Cuyahoga River were defined using both the Corps of Engineers Wetlands Delineation Manual (1987) and the Cowardin et al. (1979) method required by the National Park Service Procedural Manual #77-1 (as reissued February 2008).

The study area will include the Cuyahoga River from approximately Vaughn Road/Highland Road to approximately 0.1 mile past the SR 82 bridge piers, and Chippewa Creek from RM 0.2 to its confluence with the Cuyahoga River. The study area will include the Cuyahoga River and any wetland areas within the banks of the river or in its immediate vicinity. Islands within the Cuyahoga River are also included. The study area boundaries will not extend more than 25 feet in width past the Ordinary High Water Mark of the Cuyahoga River or Chippewa Creek.

A significant portion of the study consists of agricultural land. The remaining natural vegetational communities consist of several successional stages from old field in recently disturbed areas to mature forest along riparian corridors. Seven distinct communities were identified within the study area, including two wetland communities.

Forty-six wetlands accounting for 8.143 acres were delineated under the USACE definition. Using the Cowardin definition which includes unvegetated sandbars, 71 wetlands occupied a total of 12.305 acres within the study area. Twelve streams were located within the study area, including the Cuyahoga River and Chippewa Creek. These wetlands, deepwater aquatic habitats and other waters are under the jurisdiction of the Ohio EPA or Corps. No filling may occur within these areas without their written permission. Please contact the Ohio EPA Division of Surface Water at (614) 644-2001 or the Buffalo District, U.S. Army Corps of Engineers, at (716) 879-4329 before working in these areas.

1.0 INTRODUCTION AND SITE DESCRIPTION

EnviroScience, Inc. performed a delineation and functional assessment of wetlands and other waters during September 2009 for the Friends of the Crooked River on riverine wetlands upstream and downstream of the Brecksville Dam on the Cuyahoga River. The dam is located at RM 20.685 in Summit and Cuyahoga Counties, Ohio. This project included a full delineation of all jurisdictional wetlands and other waters (streams and ponds) within the site. Since the report was completed for use of both Friends of the Crooked River and the National Park Service, wetlands within the boundaries of the Cuyahoga River were defined using both the Corps of Engineers Wetlands Delineation Manual (1987) and the Cowardin et al. (1979) method required by the National Park Service Procedural Manual #77-1 (as reissued February 2008).

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Seven distinct communities were identified within the study area, including two wetland communities.

The site is located in the Cuyahoga River drainage basin (hydrologic # 04110002) which drains approximately 809 sq mi of northeastern Ohio. It is also within the Glaciated Allegheny Plateau phytogeographic region (Schaffner 1932) and Erie/Ontario Drift and Lake Plain ecoregion (Woods et al. 1998) of Ohio.

2.0 METHODS

Government agencies regulate coastal and inland waters for commerce, flood control and water quality. These water bodies provide numerous functions and values necessary to protect and sustain our quality of life. Wetlands comprise a significant portion of regulated waters. The U.S. Army Corps of Engineers (Corps) and Environmental Protection Agency (EPA) jointly define wetlands as:

“Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”

The remaining deepwater aquatic habitats (open waters) are defined by the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) as:

". . . areas that are permanently inundated at mean annual water depths >6.6 ft or permanently inundated areas □6.6 ft in depth that do not support rooted emergent or woody plant species."

The methods used for determining and delineating wetlands and open waters strictly adhere to those found in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987). USACE-jurisdiction wetlands and open water boundaries were determined by the disappearance of one or more of their diagnostic characteristics. Ordinary high water marks (OHWM) defined the outermost regulatory boundaries of ephemeral and open waters.

Since the report was completed for use of both Friends of the Crooked River and the National Park Service, wetlands within the boundaries of the Cuyahoga River were defined using both the Corps of Engineers Wetlands Delineation Manual (1987) and the Cowardin et al. (1979) method required by the National Park Service Procedural Manual #77-1 (as reissued February 2008).

Each sample plot, and the perimeter of each wetland and other water was surveyed using a global positioning system (GPS) with submeter accuracy. GPS data were used in conjunction with aerial photography and topographic maps, for the survey. Computer Aided Design (CAD) and ArcGIS software were used to determine wetland dimensions and produce a map of the site showing wetlands and other waters.

2.1 WETLANDS

2.1.1 Determination-USACE Method

A review of secondary literature sources was performed to find known wetlands and other significant ecological resources and areas with high potential for wetlands in or near the proposed project area. Resources included some or all of the following:

1. U.S. Geological Survey (USGS) topographic maps;
2. National Wetlands Inventory (NWI) maps;
3. Soil Survey Data (Web Soil Survey);
4. Ohio Department of Natural Resources (ODNR) Natural Heritage data; and
5. Aerial Photographs.

A field inspection of the site was then completed to identify major plant communities and to visually locate potential wetlands. The routine, onsite (Level 2) wetland determination was used to perform the delineation. Wetland communities were classified according to the classification scheme of Cowardin et al. (1979). Mature nonwetland communities that had reached a stable equilibrium were classified according to Anderson (1982) and Gordon (1966, 1969). Disturbed and successional nonwetland communities were classified as one of the categories described in Table 1.

Table 1. Nonwetland Communities.

Community		Description
Disturbed	Urban	regularly maintained land; residential; industrial
	Agricultural	land used for producing crops or raising livestock; cropland; pastureland
	Cleared	disturbed areas devoid of most vegetation from recent clearing, grading or filling
Successional	Open Field	herbaceous community without woody vegetation
	Old Field	herbaceous community having woody vegetation coverage of <50%
	Scrub Shrub	community dominated by woody vegetation <6 m (20 ft) tall
	Forest	community dominated by woody vegetation >6 m (20 ft) tall

Sample plots were established within each natural community and potential wetland within the survey area. Complete data for each sample plot were collected and recorded on the Corps' Routine Wetland Determination Data Forms. Vegetation, hydrology and soils were evaluated at each sample plot.

2.1.1.1 Vegetation

To detect the presence or absence of hydrophytic vegetation, four plant strata were evaluated within specific radii of the plot center. Each stratum was ranked by aerial cover in descending order of abundance. Table 2 provides information on each.

Table 2. Vegetative Strata.

Stratum	Definition	Survey Area
Canopy	woody plants >6 m (20 ft) tall	10-m (33-ft) radius
Shrubs/understory	woody plants 1-6 m (20 ft) tall	10-m (33-ft) radius
Groundcover	herbs and woody plants <1 m (3 ft) tall	3-m (10-ft) radius

Dominant species are those which cumulatively totaled in order of abundance, immediately exceed 50% and also include any individual species with an abundance of 20% or more. Dominant taxa were identified using recognized local guides: nomenclature follows the National List of Scientific Plant Names (1982). All dominant species within each stratum were assigned an indicator status according to Reed (1988) and Tiner et al. (1995). Table 3 summarizes the indicators.

Table 3. Plant Indicators.

Indicator	Category	Definition
OBL	Obligate Wetland	almost exclusively found in wetlands
FACW	Facultative	most likely found in wetlands
FAC	Facultative	equally likely found in wetlands or
FACU	Facultative	most likely found in nonwetlands
UPL	Obligate Upland	almost exclusively found in

Positive (+) and negative (-) symbols used with these indicators signify a higher or lower frequency of occurring in wetlands, respectively. An 'NI' (no indicator) designation represents species where not enough information is available to assign an indicator; an 'NL' (no listing) designation is given to species whose identification was not determined sufficiently enough to assign an indicator.

2.1.1.2 Hydrology

To detect presence or absence of wetland hydrology, surface and subsurface hydrologic indicators were evaluated at the sample plot and throughout the adjacent community. Sources of wetland hydrology include direct precipitation, headwater flooding, backwater flooding, ground water or any combination of these.

2.1.1.3 Soils

The upper horizons of the soil at each sample plot were examined to detect the presence or absence of hydric soils indicators. Soil matrix color and mottle characteristics for each horizon were determined by comparing a moist sample with EarthColors, Soil Color Book (Color Communications, Inc. 1997).

2.1.2 Cowardin et al. Method

In addition to the USACE method, the Cowardin et al. (1979) method of wetland identification is required by the National Park Service Procedural Manual #77-1 (as reissued February 2008). The Cowardin et al. classification system has a hierarchical structure. Major system types are shown in Table 4.

The major system types occurring in Ohio are Lacustrine, Riverine and Palustrine. Only the Riverine and Palustrine Systems occur within the study area. The major difference between the Cowardin et al. definition of wetlands and the USACE definition is that the under the Cowardin system, not all three characteristics (predominance of hydrophytes, hydric soils, or saturated/inundated substrate during some portion of the growing season) are required. An area would be considered wetland under the Cowardin classification system if it has only one of the three. Therefore, in this classification scheme, the term wetland includes

1) areas with hydrophytes and hydric soils
2) areas without hydrophytes but with hydric soils, such as mud flats
3) areas with hydrophytes but without hydric soils
4) areas without soils but with hydrophytes, such as algae-covered rocky beaches
5) areas without soils and without hydrophytes, such as gravel beaches or rocky shores without vegetation

Table 4. Cowardin et al. (1979) Systems, Subsystems and Classes.

System	Description	Subsystems	Classes
Marine	Open ocean overlying the continental shelf and its associated high-energy coastline	Subtidal Intertidal	Rock Bottom Unconsolidated Bottom Aquatic Bed Rocky Shore Unconsolidated Shore
Estuarine	Estuaries and Lagoons with salinities greater than 0.5%	Subtidal Intertidal	Rock Bottom Unconsolidated Bottom Aquatic Bed Reef Streambed Rocky Shore Unconsolidated Shore Emergent Wetland Scrub-Shrub Wetland Forested Wetland
Lacustrine	All wetlands and deepwater habitats >20 ac (8 ha) within topographic depressions or dammed river channels, excluding wetlands dominated by persistent vegetation	Limnetic Littoral	Rock Bottom Unconsolidated Bottom Aquatic Bed Rocky Shore Unconsolidated Shore Emergent Wetland (nonpersistent)
Riverine	All wetlands and deepwater habitats within a channel, excluding wetlands dominated by persistent vegetation, and habitats with salinities greater than 0.5%	Tidal Lower Perennial Upper Perennial Intermittent	Rock Bottom Unconsolidated Bottom Aquatic Bed Streambed Rocky Shore Unconsolidated Shore Emergent Wetland (nonpersistent)
Palustrine	All nontidal wetlands and tidal wetlands with salinities <0.5%, as well as deepwater habitats less than 20 ac (8 ha)	None	Rock Bottom Unconsolidated Bottom Aquatic Bed Unconsolidated Shore Moss-Lichen Wetland Emergent Wetland Scrub-shrub wetland Forested Wetland

2.1.3 ORAM Categorization

Each wetland system was categorized in accordance with version 5.0 of the Ohio EPA's Ohio Rapid Assessment Method for Wetlands (ORAM) (Mack 2001). Each form consists of a narrative rating and a quantitative rating. The narrative rating requires ODNR Natural Heritage data, and serves to alert the rater of certain qualities that may have an obvious effect on the wetland category. The quantitative rating is based on wetland characteristics such as size, buffers, hydrology, disturbance and habitat. Scores from the quantitative rating produce a wetland category of 1-3, based on Mack (2000).

Category 1 wetlands are considered very low quality and are generally considered not restorable. They represent small emergent wetlands, which often have a predominance of invasive/exotic species. Modified Category 2 wetlands are degraded systems that have potential to be restored, while straight Category 2 are medium quality systems which represent the majority of Ohio's wetlands. Category 3 wetlands are exceptional quality systems, such as large, undisturbed, forested wetlands, regionally significant ecosystems, and wetlands with known occurrences of endangered or threatened species.

2.1.4 Regulatory Jurisdiction of Wetlands

The USACE (2007) described how wetlands may (or may not) be considered jurisdictional under the Clean Water Act. According to USACE/USEPA joint guidance (2008), "the agencies will assert jurisdiction over the following types of wetlands:

- Wetlands adjacent to traditional navigable waters
- Wetlands that directly abut non-navigable Relatively Permanent Waters

The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

- Wetlands adjacent to non-navigable tributaries that are not relatively permanent
- Wetlands adjacent to but that do not directly abut a relatively permanent nonnavigable tributary

The agencies will apply the significant nexus standard as follows:

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of downstream traditional navigable waters
- Significant nexus includes consideration of hydrologic and ecologic factors

According to the National Park Service Procedural Manual #77-1 (as reissued February 2008) the National Park Service must evaluate its activities for effects on all wetlands, isolated or non-isolated, within its borders, as defined by Cowardin et al. 1979.

2.2 OTHER WATERS

Other waters include ephemeral and open waters. These waters are broken down into two categories: 1) ponds and lakes; and 2) streams and rivers.

2.2.1 Ponds and Lakes

Palustrine systems other than wetlands, and lacustrine waters are addressed as ponds and lakes, respectively. These non-linear open waters may harbor important aquatic communities such as vegetated shallows (aquatic bed) and mud flats. They are classified according to Cowardin et al. (1979).

2.2.2 Regulatory Jurisdiction of Ponds and Lakes

Although ponds and lakes are not specifically addressed in the USACE/USEPA joint guidance (2008), if the ponds and lakes are adjacent, abutting, or have a significant nexus with a Relatively Permanent Water, they can be considered jurisdictional. Isolated waters are not under the jurisdiction of the USACE.

According to the National Park Service Procedural Manual #77-1 (as reissued February 2008) the National Park Service must evaluate its activities for effects on all wetlands, isolated or non-isolated, within its borders, as defined by Cowardin et al. 1979. The Cowardin definition includes lacustrine and palustrine open water habitats.

2.2.3 Streams and Rivers

Riverine systems are linear flowing waters bounded by a channel. Cowardin et al. (1979) divides this system into four subsystems (Table 4). The USACE has two general types of descriptors for streams, one based on hydrology and one based on regulatory jurisdiction. The flow regime descriptors are shown below, and the regulatory descriptors are contained in the following section.

Table 5. Flow Regime Descriptors for Rivers and Streams.

Flow Regime Descriptors	Definition
Ephemeral	An ephemeral stream only conveys runoff precipitation and meltwater. It is permanently located above the water table and is most often dry.
Intermittent	An intermittent stream is located below the water table for parts of the year, but does have dry periods.
Perennial	A perennial stream typically has flowing water throughout the entire year.

2.2.4 Regulatory Jurisdiction of Streams and Rivers

The U.S. Army Corps of Engineers (USACE) (2007) described how streams and rivers may (or may not) be considered jurisdictional under the Clean Water Act. According to

USACE/ U.S. Environmental Protection Agency (USEPA) joint guidance (2008), the agencies will assert jurisdiction over the following types of streams and flowing waters:

- Traditional navigable waters
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months)

The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent

The agencies will apply the significant nexus standard as follows:

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of downstream traditional navigable waters
- Significant nexus includes consideration of hydrologic and ecologic factors

According to the National Park Service Procedural Manual #77-1 (as reissued February 2008) the National Park Service must evaluate its activities for effects on all wetlands, isolated or non-isolated, within its borders, as defined by Cowardin et al. 1979. The Cowardin definition includes riverine systems.

3.0 LITERATURE REVIEW

3.1 USGS TOPOGRAPHIC MAP

The site is located on the Northfield quadrangle (Figure 3; Appendix A) of the 7.5-minute series USGS topographical maps. The landscape slopes down to the Cuyahoga River, which is located within a broad valley and flows north toward Lake Erie. Elevations are approximately 640 ft above mean sea level within the valley. The Cuyahoga River and Chippewa Creek are both depicted on the map.

3.2 NWI MAP

A portion of the Northfield quadrangle NWI map is shown on Figure 4 of Appendix A. The map depicts several wetland or other aquatic systems within the study area or immediate vicinity. The Cuyahoga River is shown as a riverine, lower perennial system with an unconsolidated bottom and a permanent hydrologic regime (R2UBH). A large forested wetland is shown at the northern end of the study area, east of the Cuyahoga River. Other wetlands shown in the vicinity are deciduous forested wetlands (PFO1C) or forested/scrub shrub wetlands (PFO/SS1C) systems.

3.3 SOIL SURVEY DATA

The NRCS Web Soil Survey was used to examine the soil types within the study area and its immediate vicinity. See Figure 5 in Appendix A. Table 6 lists soils that are mapped within the study area.

Table 6. Soil Types Found in Study Area

Symbol	Soil Type	Status
Ch	Chagrin silt loam, occasionally flooded	Nonhydric
Ck	Chagrin silt loam, alkaline	Nonhydric
Ua	Udorthents, loamy	Nonhydric

The soils in the study area are all nonhydric. The majority of the study area consists of Chagrin silt loam, occasionally flooded (Ch) and Chagrin silt loam, alkaline (Ck), with smaller sections of Udorthents, loamy (Ua). The Cuyahoga River is shown on the map, and wetlands are indicated on the left descending bank at the southern end of the study area.

3.4 NATURAL HERITAGE DATABASE

The ODNR, Division of Natural Areas and Preserves, Natural Heritage Database was researched for records of rare or endangered species within or near the project area (Appendix B: ODNR 2009). One record of the golden-winged warbler (*Vermivora chrysoptera*), state endangered, is located within the project area. Additionally, eighteen known locations of threatened, endangered, species of interest or potentially threatened species listings occur within 1 mile of the project area. These records include a great blue heron rookery, the state threatened large-leaved mountain-rice (*Oryzopsis asperifolia*), and the state potentially threatened weak spear grass (*Poa saltuensis* ssp. *languida*), round-fruited pinweed (*Lechea intermedia*), Bebb's sedge (*Carex bebbii*), spotted coral-root (*Corallorhiza maculata*), lesser ladies'-tresses (*Spiranthes magnicamporum*), and Virginia meadow beauty (*Rhexia virginica*). None of these species were observed during the site visit.

The ODNR Natural Heritage maps were reviewed within a ten-mile radius of the project area for records of the Indiana bat. One Indiana bat capture is shown 1.3 miles west of the study area and two Indiana bat colonies and several captures are identified approximately 8.6 miles northeast of the site. Additionally, an unidentified bat colony is identified 8.8 miles southwest of the study area. Living or dead trees with shedding or peeling bark or cavities are important as summer maternity roosts for the Indiana bat. Several trees meeting the criteria of a suitable roosting habitat tree or maternity roosting tree were present within the project area and in the surrounding vicinity. Coordination with the USFWS is recommended prior to clearing any of these trees.

The entire study area is located within the Cuyahoga Valley National Park and the Brecksville Reservation (Cleveland Metroparks) is just south of the study area. No other unique ecological areas, geologic features, breeding or non-breeding animal concentrations, champion trees, forests, or wildlife areas were noted.

3.5 U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service states that there are three federally listed species whose known ranges include Summit County: the federally endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern monkshood (*Aconitum noveboracense*) and three federally listed species whose range includes Cuyahoga County: the federally endangered Indiana Bat (*Myotis sodalis*), the federal species of concern bald eagle (*Haliaeetus leucocephalus*), and the federally endangered piping plover (*Charadrius melodus*).

The northern monkshood occurs on cliffs, talus slopes, or cool streamside sites with cool soil conditions. This habitat type was not observed within the study area. The Indiana bat hibernates in caves or abandoned mines during the winter, but in summer feeds along stream corridors and roost in living or dead trees with cavities or peeling bark. The Cuyahoga River is suitable foraging habitat for the Indiana bat, and suitable potential roost trees were observed in the riparian corridor. No evidence of bald eagles or their nests was found during the site visit. Preferred habitat for the piping plover is wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands. Although there were areas of sandbars along the Cuyahoga River, these areas were not the wide, sandy beach of the type preferred by the species.

3.6 AERIAL PHOTOGRAPHY

An aerial photograph of the site is shown on Figure 6 in Appendix A. The area is shown as undeveloped forested and scrub-shrub areas along the river. Several sandbars are shown within the limits of the river.

3.7 FEMA FLOODPLAIN MAP

Panel 5 of the FIRM of Cuyahoga County, Ohio (FEMA 1981) and Panels 30 and 40 of the FIRM of Summit County, Ohio (FEMA 2009) show that the study area is located within the defined 100-year floodplain (Zone A) [Figure 7;Appendix A].

4.0 RESULTS

Twenty-three sample plots were established within seven natural communities. Two of these communities are considered wetlands. Table 7 summarizes the sample plot data.

Table 7. Sample Plot Results.

Sample Plot	Photo(s)*	Community	Hydrophytic Vegetation	Wetlands Hydrology	Hydric Soil	Status
1	1	Riparian Forest	X			non-wetland
2	2	Old Field				non-wetland
3	3	Disturbed Floodplain				non-wetland
4	4	New Field	X			wetland
5	5	PEM	X	X	X	wetland
6	6	PEM Sandbar	X	X	X	wetland
7	7	New Field			X	non-wetland
8	8	PEM	X	X	X	wetland
9	9	PEM Sandbar	X	X	X	wetland
10	10	PEM/PFO	X	X	X	wetland
11	11	PEM	X	X	X	wetland
12	12	PEM	X	X	X	wetland
13	13	New Field				non-wetland
14	14	Riparian Forest	X			non-wetland
15	15	PEM	X	X	X	wetland
16	16	Riparian Forest				non-wetland
17	17	New Field				non-wetland
18	18	PEM	X	X	X	wetland
19	19	Upland Sandbar				non-wetland
20	20	Riparian Forest				non-wetland
21	21	Riparian Forest				non-wetland
22	22	PEM Sandbar	X	X	X	wetland
23	23	Disturbed Floodplain				non-wetland

Each sample plot and the delineated wetlands and other waters are illustrated on Figure 8 (Appendix A). The following section describes general conditions found within each wetland community and summarizes relevant information from the data forms, located in Appendix D.

4.1 NONWETLANDS

The study area consists of new field, old field, disturbed floodplain dominated by invasives, and forested areas along the riparian corridor of the Cuyahoga River. The various nonwetland vegetative communities typically meet hydrophytic vegetation requirements for wetlands; however wetland hydrology and hydric soils are not present

within these areas. The soils are well-drained and typically comprised of sandy substrates with no evidence of sustained hydrology.

New field areas are common along the river. Many of the new field communities are dominated by monocultures of reed canary grass (*Phalaris arundinacea*, FACW+) and are characterized by Sample Plots 4 and 17. Although this grass is generally considered hydrophytic, it is also typically associated with disturbed sites. Soils within these fields are well-drained and non-hydric, and wetland hydrology does not exist. Other new fields communities are composed of mixed herbaceous vegetation such as sweet yellow clover (*Melilotus officinalis*, FACU-), Canada thistle (*Cirsium arvense*, FACU), common mugwort (*Artemisia vulgaris*, UPL), meadow fescue (*Festuca pratensis*, FACU-), and white snakeroot (*Eupatorium rugosum*, FACU-).

The old field vegetative community is represented by Sample Plot 2. Typical vegetation includes black walnut (*Juglans nigra*, FACU) and box-elder (*Acer negundo* , FAC+) in the canopy, box-elder and Allegheny blackberry (*Rubus allegheniensis*, FACU-) in the understory, and heath aster (*Aster ericoides*, FACU), white snakeroot, coltsfoot (*Tussilago farfara*, FACU), and poison ivy (*Toxicodendron radicans*, FAC) in the groundcover layer. Riverbank grape (*Vitis riparia*, FACW), multiflora rose (*Rosa multiflora*, FACU), and wingstem (*Verbesina alternifolia*, FAC) were also observed.

A common vegetative community along the river was a disturbed floodplain dominated by the invasive species *Polygonum cuspidatum* (Japanese knotweed, FACU-) and is represented by Sample Plots 3 and 23. These areas were typically dense monocultures of the herbaceous perennial with stems reaching up to 12 ft in height. Trees such as box-elder and sycamore (*Platanus occidentalis*, FACW-) were occasionally present, as well as white snakeroot along the borders of the patches.

Sample Plots 1, 14, 16, 20, and 21 represent the forested areas along the river. Sycamore and box-elder trees generally comprised the canopy layer within the riparian forests; however, black locust (*Robinia pseudoacacia*, FACU-), white willow (*Salix alba,* FACW), black cherry (*Prunus serotina*, FACU), and black walnut (*Juglans nigra*, FACU) were also observed. Dominant vegetation in the shrub layer is Tartarian honeysuckle (*Lonicera tatarica*, FACU) and dominant herbaceous vegetation includes reed canary grass, Kentucky blue grass, Virginia creeper (*Parthenocissus quinquefolia*, FACU), poison ivy, wingstem, goldenrod sp. (*Solidago* sp., NI), New England aster (*Aster novae-angliae*, FACW-), Indian grass (*Sorghastrum nutans*, UPL), big bluestem (*Andropogon gerardii*, FAC), riverbank rye (*Elymus riparius*, FACW), Virginia knotweed (*Tovara virginiana*, FAC), white snakeroot, rice cutgrass (*Leersia oryzoides*, OBL), and coltsfoot. The riparian forests typically meet hydrophytic vegetation requirements for wetlands; however wetland hydrology and hydric soils are not present within these areas. The soils are well-drained and typically comprised of sandy substrates and no evidence of wetland hydrology exists.

4.2 WETLANDS

Forty-six wetlands (USACE definition) were identified and delineated within the study area or immediate vicinity. When using the Cowardin definition, 71 wetlands were present within the study area or immediate vicinity. These were composed of PEM and mixed PEM/PFO communities. Each wetland system has been categorized using ORAM v. 5.0; scoring forms are included in Appendix E. Wetland results are given in Table 6 and each community is briefly described in the following sections. All wetlands were determined to have a connection to the Cuyahoga River due to their location.

Table 8. USACE-Jurisdictional Wetland Results.

Wetlands	Photo(s)*	Cowardin Classification	ORAM Score	ORAM Category	Total area, ac	Area within study limits, ac
3	26	PEM/FO	64.5	2 or 3 gray zone	46.689	1.985
4	27	PUS2	57.0	2	0.592	0.592
5	28	PEM/FO	71.0	3	18.607	0.355
6	29	PEM/US	61.5	2 or 3 gray zone	0.055	0.055
9	31	PEM	61.5	2 or 3 gray zone	0.022	0.022
12	34	PFO	61.0	2 or 3 gray zone	2.754	0.029
13	35	PUS2	61.5	2 or 3 gray zone	0.064	0.064
16	38	PEM	61.5	2 or 3 gray zone	0.009	0.009
17	39, 40	PFO	62.0	2 or 3 gray zone	4.288	0.363
20	43	PEM	61.5	2 or 3 gray zone	0.136	0.136
21	44	PEM	61.5	2 or 3 gray zone	0.652	0.652
22	45	PEM	61.5	2 or 3 gray zone	0.131	0.131
23	46	PEM	58.5	2	0.692	0.692
24	47	PEM	58.5	2	0.013	0.013
25	48	PEM	34.5	1 or 2 gray zone	2.040	0.076
27	49	PEM/FO	49.0	2	0.072	0.062
29	51	PEM/FO	52.0	2	0.044	0.016
31	53	PEM	63.5	2 or 3 gray zone	0.037	0.037
32	N/A	PEM	63.5	2 or 3 gray zone	0.014	0.014
33	54	PEM	63.5	2 or 3 gray zone	0.161	0.161
34	55	PEM	63.5	2 or 3 gray zone	0.156	0.156
35	N/A	PEM/FO	36.5	Modified 2	1.740	0.000
37	57	PEM	57.0	2	0.028	0.006
38	58	PSS/EM	71.0	3	22.630	0.374
39	59	PFO	61.0	2 or 3 gray zone	1.852	0.173
40	60	PEM	57.0	2	0.002	0.002
41	61	PEM	58.5	2	0.156	0.156
42	N/A	PEM	57.0	2	0.002	0.002
45	N/A	PFO	56.0	2	0.076	0.031
46	64	PEM	57.0	2	0.050	0.050
49	67	PEM	59.0	2	0.002	0.002
50	68	PEM	59.0	2	0.006	0.000
52	N/A	PFO	58.0	2	1.232	0.042
53	70	PFO	61.0	2	0.568	0.083
54	71	PEM	58.5	2	0.191	0.191
56	73	PEM	57.0	2	0.006	0.006
57	74	PFO/EM	61.0	2 or 3 gray zone	1.018	0.334
58	75	PFO	61.0	2 or 3 gray zone	0.914	0
59	76	PFO	71.0	3	14.332	0.243
60	77	PEM/US	58.5	2	0.280	0.280
61	78	PEM	58.5	2	0.058	0.058
62	79	PEM	58.5	2	0.039	0.039
63	80	PEM	58.5	2	0.470	0.407
64	N/A	PEM/SS	58.5	2	0.879	0
65	81	PEM/SS	58.5	2	1.126	0.001
68	84	PEM/FO	37.0	Modified 2	0.137	0.043
				TOTAL USACE WETLAND AREA	**125.022**	**8.143**

* photos are located in Appendix C

Table 9. National Park Service (Cowardin) Definition Wetland Results.

Wetland	Photo	Cowardin Classification	ORAM Score	ORAM Category	Total area, ac	Area within study limits, ac
1	24	PEM	20.0	1	0.078	0.011
2	25	PEM	22.0	1	0.083	0.040
3	26	PEM/FO	64.5	2 or 3 gray zone	46.689	1.985
4	27	PUS2	57.0	2	0.592	0.592
5	28	PEM/FO	71.0	3	18.607	0.355
6	29	PEM/US	61.5	2 or 3 gray zone	0.488	0.488
7	30	PUS2	61.5	2 or 3 gray zone	0.029	0.029
8	N/A	R2UB1	61.5	2 or 3 gray zone	0.042	0.042
9	31	PEM	61.5	2 or 3 gray zone	0.022	0.022
10	32	PUS2	61.5	2 or 3 gray zone	0.006	0.006
11	33	PUS2	61.5	2 or 3 gray zone	0.862	0.862
12	34	PFO/EM	61.0	2 or 3 gray zone	2.754	0.029
13	35	PUS2	61.5	2 or 3 gray zone	0.635	0.635
14	36	R2UB1	61.5	2 or 3 gray zone	0.062	0.062
15	37	PUS2	61.5	2 or 3 gray zone	0.458	0.458
16	38	PEM	61.5	2 or 3 gray zone	0.009	0.009
17	39, 40	PFO/EM	62.0	2 or 3 gray zone	4.444	0.520
18	41	PUS2	61.5	2 or 3 gray zone	0.136	0.136
19	42	PUS2	61.5	2 or 3 gray zone	0.022	0.022
20	43	PEM	61.5	2 or 3 gray zone	0.249	0.249
21	44	PEM	61.5	2 or 3 gray zone	0.652	0.652
22	45	PEM	61.5	2 or 3 gray zone	0.131	0.131
23	46	PEM	58.5	2	0.692	0.692
24	47	PEM	58.5	2	0.013	0.013
25	48	PEM	34.5	1 or 2 gray zone	2.040	0.076
26	N/A	PEM	61.5	2 or 3 gray zone	0.022	0.022
27	49	PEM/FO	49.0	2	0.072	0.062
28	50	PUS2	63.5	2 or 3 gray zone	0.514	0.514
29	51	PEM/FO	52.0	2	0.044	0.016
30	52	PUS2	63.5	2 or 3 gray zone	0.007	0.007
31	53	PEM	63.5	2 or 3 gray zone	0.037	0.037
32	N/A	PEM	63.5	2 or 3 gray zone	0.014	0.014
33	54	PEM	63.5	2 or 3 gray zone	0.161	0.161
34	55	PEM	63.5	2 or 3 gray zone	0.156	0.156
35	N/A	PEM/FO	36.5	Modified 2	1.740	0.000
36	56	R2UB1	63.5	2 or 3 gray zone	0.115	0.115
37	57	PEM	57.0	2	0.028	0.006
38	58	PSS/EM	71.0	3	22.630	0.374
39	59	PFO	61.0	2 or 3 gray zone	1.852	0.173
40	60	PEM	57.0	2	0.002	0.002
41	61	PEM	58.5	2	0.156	0.156
42	N/A	PEM	57.0	2	0.002	0.002
43	62	PFO	56.0	2	0.114	0.057
44	63	R2UB1	57.0	2	0.041	0.041
45	N/A	PFO	56.0	2	0.076	0.031

Wetland	Photo	Cowardin Classification	ORAM Score	ORAM Category	Total area, ac	Area within study limits, ac
46	64	PEM	57.0	2	0.050	0.050
47	65	PUS2	57.0	2	0.045	0.045
48	66	PEM	57.0	2	0.025	0.012
49	67	PEM	59.0	2	0.002	0.002
50	68	PEM	59.0	2	0.006	0.000
51	69	PEM	57.0	2	0.047	0.026
52	N/A	PFO	58.0	2	1.232	0.042
53	70	PFO	61.0	2	0.568	0.083
54	71	PEM	58.5	2	0.191	0.191
55	72	PEM	57.0	2	0.021	0.015
56	73	PEM	57.0	2	0.006	0.006
57	74	PFO/EM	61.0	2 or 3 gray zone	1.018	0.334
58	75	PFO	61.0	2 or 3 gray zone	0.914	0
59	76	PFO	71.0	3	14.332	0.243
60	77	PEM/US	58.5	2	0.280	0.280
61	78	PEM	58.5	2	0.058	0.058
62	79	PEM	58.5	2	0.039	0.039
63	80	PEM	58.5	2	0.470	0.407
64	N/A	PEM/SS	58.5	2	0.879	0
65	81	PEM/SS	58.5	2	1.126	0.001
66	82	PEM	57.0	2	0.016	0.016
67	83	PEM	57.0	2	0.010	0.010
68	84	PEM/FO	37.0	Modified 2	0.137	0.043
69	85	R2UB1	57.0	2	0.008	0.008
70	85	R2UB1	57.0	2	0.026	0.026
71	85	PUS2	57.0	2	0.306	0.306
TOTAL COWARDIN WETLAND AREA					129.390	12.305

* photos are located in Appendix C

4.2.1 Palustrine Emergent Wetlands

Many palustrine emergent wetlands were identified throughout the Cuyahoga River floodplain. Sample Plots 5 and 8 represent wetlands dominated by reed canary grass and wingstem. Other vegetation includes box-elder, Virginia knotweed, garlic mustard (*Alliaria petiolata*, FACU-), and spotted touch-me-not (*Impatiens capensis*, FACW) Sample Plot 15 represents a mixed emergent wetland and typical vegetation was comprised of American elderberry (*Sambucus canadensis*, FACW), multiflora rose (*Rosa multiflora*, FACU), rice cut-grass, soft rush (*Juncus effusus*, FACW+), narrow-leaved cattail, and spotted touch-me-not. These wetlands receive water from the surrounding area that drains towards the Cuyahoga River and from the Cuyahoga River itself following very large rain or thawing events when the river breaches the banks. Generally these wetlands are depressional and extend offsite away from the river into larger wetland complexes.

Sample Plots 6, 9, 12, 18, and 22 represent the palustrine emergent wetlands found on or adjacent to sandbars along the Cuyahoga River and are within the OHWM. Vegetation commonly identified within the sandbar wetlands include sycamore in the canopy and marshpepper smartweed (*Polygonum hydropiper*, OBL), swamp smartweed (*Polygonum hydropiperoides*, OBL), willow-weed (*Polygonum lapathifolium*, FACW+), true forget-me-not (*Myosotis scorpioides*, OBL), marsh seedbox, (*Ludwigia palustris*, OBL), barnyard grass (*Echinochloa crus-galli*, FACU), narrow-leaved cattail (*Typha angustifolia*, OBL), nodding beggars-tick (*Bidens cernua*, OBL), and rice cut-grass (*Leersia oryzoides*, OBL) in the groundcover. These areas are frequently flooded and regularly receive water from the river.

4.2.2 Mixed Palustrine Emergent/ Palustrine Forested Wetlands

Some wetlands include both emergent and forested components and are represented by Sample Plot 10. Dominant vegetation in these wetlands include silver maple, box-elder, reed canary grass, riverbank rye, poison ivy, and spotted touch-me-not. These wetlands receive water from the surrounding area and as overflow from the Cuyahoga River during flood events when the river breaches the banks. These wetlands are typically depressional and show signs of vernal pooling. These wetlands extend offsite away from the river into larger wetland complexes.

4.2.3 Riverine Unconsolidated Bottom Wetlands

According to Cowardin et al. (1979), “The Class Unconsolidated Bottom includes all wetland and deepwater habitats with at least 25% cover of particles smaller than stones, and a vegetative cover less than 30%.Water regimes are restricted to subtidal, permanently flooded, intermittently exposed, and semipermanently flooded. Unconsolidated Bottoms are characterized by the lack of large stable surfaces for plant and animal attachment. They are usually found in areas with lower energy than Rock Bottoms, and may be very unstable. Exposure to wave and current action, temperature, salinity, and light penetration determines the composition and distribution of organisms.”

These Cowardin wetland areas were unvegetated gravel bars within the Cuyahoga River. They would not be considered wetlands under the USACE definition as they did not have vegetation, but would likely be considered as part of the Cuyahoga River, as they were below the OHWM of the river.

4.2.4 Palustrine Unconsolidated Shore Wetlands

This Cowardin Class Unconsolidated Shore “includes all wetland habitats having three characteristics: (1) unconsolidated substrates with less than 75% areal cover of stones, boulders, or bedrock; (2) less than 30% areal cover of vegetation other than pioneering plants; and (3) any of the following water regimes: irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently

flooded, saturated, or artificially flooded. Unconsolidated Shores are characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce a number of landforms such as beaches, bars, and flats, all of which are included in this Class. (Cowardin et al. 1979)"

These wetlands were vegetated or unvegetated. If they were unvegetated, they would not be considered wetlands under the USACE definition, but would be considered as part of the Cuyahoga River, as they were below the OHWM of the river.

4.3 PONDS AND LAKES

No Palustrine Open Water (POW) bodies were found within the study area.

4.4 STREAMS AND RIVERS

A total of 12 streams were identified within the study area. Five perennial streams were present within the study area: the Cuyahoga River, Chippewa Creek, and Streams 2, 4 and 9. Stream results are depicted in Table 8.

Table 10. Stream and River Results.

Stream Name	Photo(s)*	Cowardin Class	Average OHWM Width (ft)	Flow Regime	Length within study area (l.f.)	Area within study area (ac)
Cuyahoga River	86-90	R2OWZ	133	Perennial	20,215	61.9
Chippewa Creek	92, 93	R2OWZ	40	Perennial	1,008	1.6
S1	94, 95		3	Intermittent	5.3	0.0004
S2	96, 97		10	Perennial	792.6	0.18
S3	98, 99		8	Intermittent	19.1	0.004
S4	100, 101		11	Perennial	29.0	0.007
S5	102, 103		2	Ephemeral	14.3	0.0007
S6	104, 105		6	Ephemeral	31.8	0.004
S7	106, 107		2	Ephemeral	15.9	0.0007
S8	108, 109		3	Intermittent	23.5	0.0017
S9	110, 111		12	Perennial	25.9	0.007
S10	112, 113		1	Ephemeral	16.4	0.0004
Total Ephemeral Stream					78.4	0.00578
Total Intermittent Stream					47.9	0.0061
Total Perennial Stream					22,071	63.69

* photos are located in Appendix C

5.0 REGULATORY JURISDICTION OVERVIEW

These wetlands, deepwater aquatic habitats and other waters are under the jurisdiction of the Ohio EPA or Corps. No filling may occur within these areas without their written permission. Please contact the Ohio EPA Division of Surface Water at (614) 644-2001 or the Buffalo District, U.S. Army Corps of Engineers, at (716) 879-4329 before working in these areas.

The following information is excerpted and summarized from the 2007 U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook.

"In 2001, the … U.S. Supreme Court's decision in the Solid Waste Agency of Northern Cook County (SWANCC) v. Corps…held that isolated, intrastate, non-navigable waters could not be regulated under the CWA based solely on the presence of migratory birds. Following the SWANCC decision … it generally was believed that a water body (including a wetland) was subject to CWA jurisdiction if the water body was part of the U.S. territorial seas, or a traditional navigable water, or any tributary to a traditional navigable water, or a wetland adjacent to any one of the above. In addition, isolated wetlands and other waters might be considered jurisdictional where they had the necessary link to either navigable waters or interstate commerce."

In the state of Ohio, the Ohio EPA isolated wetland permitting program was legislatively created in response to the 2001 SWANC decision. On July 17, 2001, House Bill 231 was signed into law, establishing a permanent permitting process for isolated wetlands. The provisions of House Bill 231 were incorporated in Sections 6111.021 through 6111.029 of the Ohio Revised Code.

"In 2006, the Supreme Court once again addressed the jurisdictional scope of Section 404 of the CWA, specifically the term "the waters of the U.S.," in Rapanos v. U.S. and in Carabell v. U.S. (hereafter referred to as Rapanos).

The decision provides two new analytical standards for determining whether water bodies that are not traditional navigable waters (TNWs), including wetlands adjacent to those non-TNWs, are subject to CWA jurisdiction: (1) if the water body is relatively permanent, or if the water body is a wetland that directly abuts (e.g., the wetland is not separated from the tributary by uplands, a berm, dike, or similar feature) a relatively permanent water body (RPW), or (2) if a water body, in combination with all wetlands adjacent to that water body, has a significant nexus with TNWs. CWA jurisdiction over TNWs and their adjacent wetlands was not in question in this case, and, therefore, was not affected by the Rapanos decision. In addition, at least five of the Justices in Rapanos agreed that CWA jurisdiction exists over all TNWs and over all wetlands adjacent to TNWs.

The Memo states that the [Corps and USEPA] will assert jurisdiction over the following categories of water bodies: TNWs; all wetlands adjacent to TNWs; non-navigable tributaries of TNWs that are relatively permanent (i.e., tributaries that typically flow year-

round or have continuous flow at least seasonally); and wetlands that directly abut such tributaries. In addition, the agencies will assert jurisdiction over every water body that is not an RPW if that water body is determined (on the basis of a fact-specific analysis) to have a significant nexus with a TNW. The classes of water body that are subject to CWA jurisdiction only if such a significant nexus is demonstrated are: non-navigable tributaries that do not typically flow year-round or have continuous flow at least seasonally; wetlands adjacent to such tributaries; and wetlands adjacent to but that do not directly abut a relatively permanent, non-navigable tributary. A significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or an insubstantial effect on the chemical, physical, and/or biological, integrity of a TNW. Principal considerations when evaluating significant nexus include the volume, duration, and frequency of the flow of water in the tributary and the proximity of the tributary to a TNW, plus the hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands."

6.0 ASSUMPTIONS AND DISCLAIMERS

The constant influence of man on the study area can result in a rapid change of ecological boundaries. Over time, natural succession and changes in hydrology can also affect their boundaries. Precision of GPS collected data is subject to variation caused by canopy cover, atmospheric interference and satellite configuration. Because slight inaccuracies are possible, all acreages and derived boundaries presented in this report are approximate.

The results and conclusions contained in this report apply to the year and date in which the data were collected. This report is not considered officially valid until it is approved by the Corps. The report is then valid for a period of five years. Refer to the Corps' Regulatory Guidance Letter # 94-1 (23 May 1994).

REFERENCES

Anderson, D.M. 1982. Plant Communities of Ohio: A Preliminary Classification and Description. Ohio Department of Natural Resources, Division of Natural Areas and Preserves, Columbus, Ohio.

Color Communications, Inc. 1997. EarthColors Soil Color Book. Poughkeepsie, New York.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classifications of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Department of Interior, Fish and Wildlife Service, Office of Biological Services, Washington, D.C.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Gordon, R.B. 1966. Natural Vegetation of Ohio at the Time of the Earliest Land Surveys. Ohio Biological Survey, Columbus, Ohio.

Gordon, R.B. 1969. The Natural Vegetation of Ohio in Pioneer Days. Ohio Biological Survey 3(2). The Ohio State University, Columbus, Ohio.

Mack, J.J. 2000. ORAM v. 5.0 Quantitative Score Calibration. Ohio Environmental Protection Agency, Division of Surface Water, Wetland Ecology Unit, Columbus, Ohio.

Mack, J.J. 2001. Ohio Rapid Assessment Method for Wetlands v. 5.0, User's Manual and Scoring Forms. Ohio EPA Technical Report WET/2001-1. Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Ecology Unit, Columbus, Ohio.

Reed, P.B., Jr. 1988. National List of Plant Species that Occur in Wetlands: Northeast (Region 1). Biological Report 88 (26.1). U.S. Department of the Interior, Fish and Wildlife Service, Research and Development, Washington, D.C.

Schaffner, J.H. 1932. Revised Catalog of Ohio Vascular Plants. Ohio Biological Survey Bulletin 25. The Ohio State University, Columbus, Ohio.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/ accessed (09/10/2009).

Tiner, R., R. Lichvar, R. Franzen, C. Rhodes and W. Sipple. 1995. 1995 Supplement to the List of Plant Species that Occur in Wetlands (Region 1). U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

U.S. Department of Agriculture. 1982. National List of Scientific Plant Names. Soil Conservation Service, Washington, D.C.

Woods, A.J., J.M. Omernick, C.S. Brockman, T.D. Gerber, W.D. Hosteter and S.H. Azevedo. 1998. Ecoregions of Indiana and Ohio. U.S. Geological Survey, Denver, Colorado.

Appendix A:
Figures

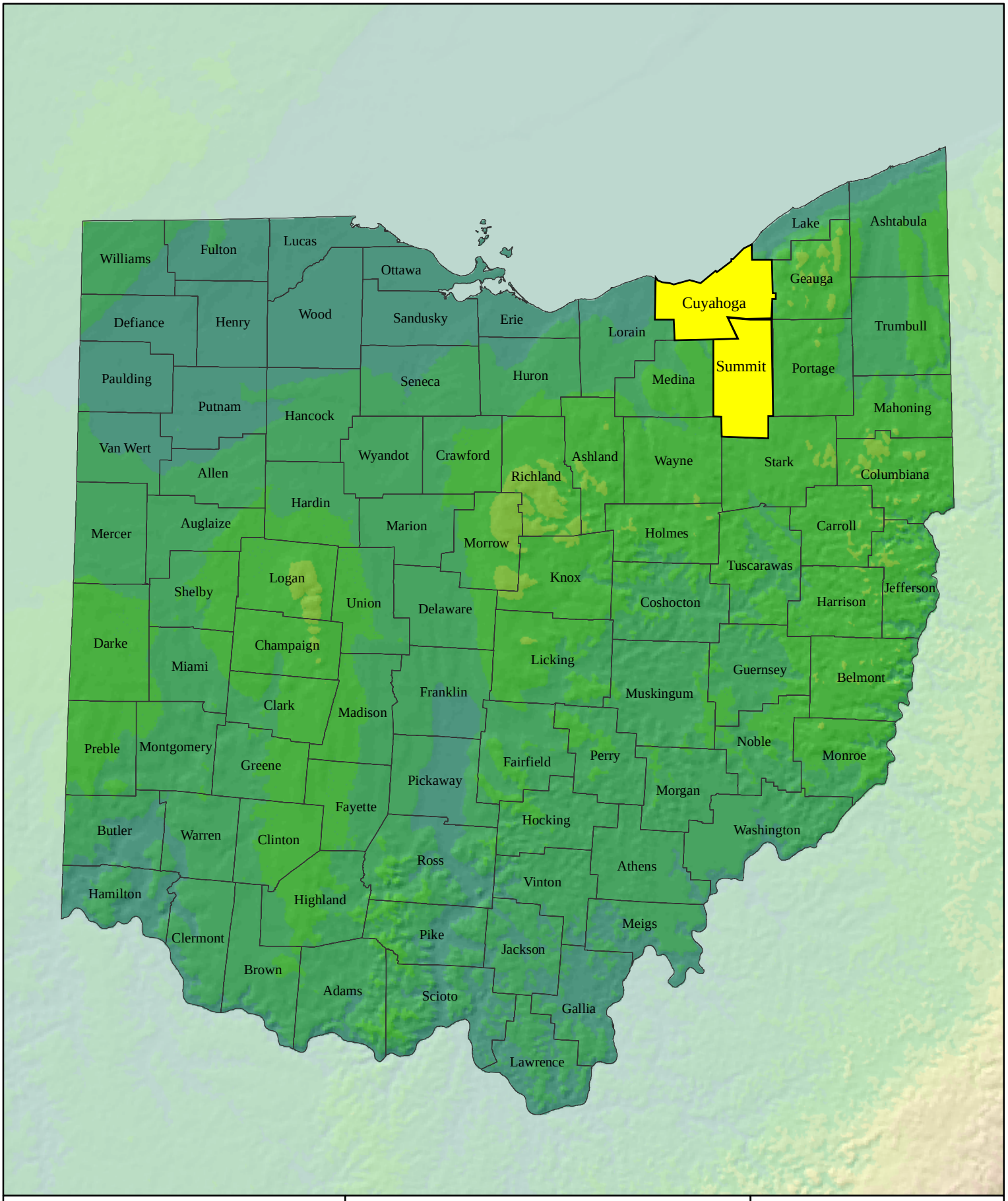

Figure 1. Location of Cuyahoga and Summit Counties, Ohio.

40 20 0 40 Miles

60 30 0 60 Kilometers

N

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Figure 2. Location of Site on Highway Map of Summit and Cuyahoga Counties, Ohio.

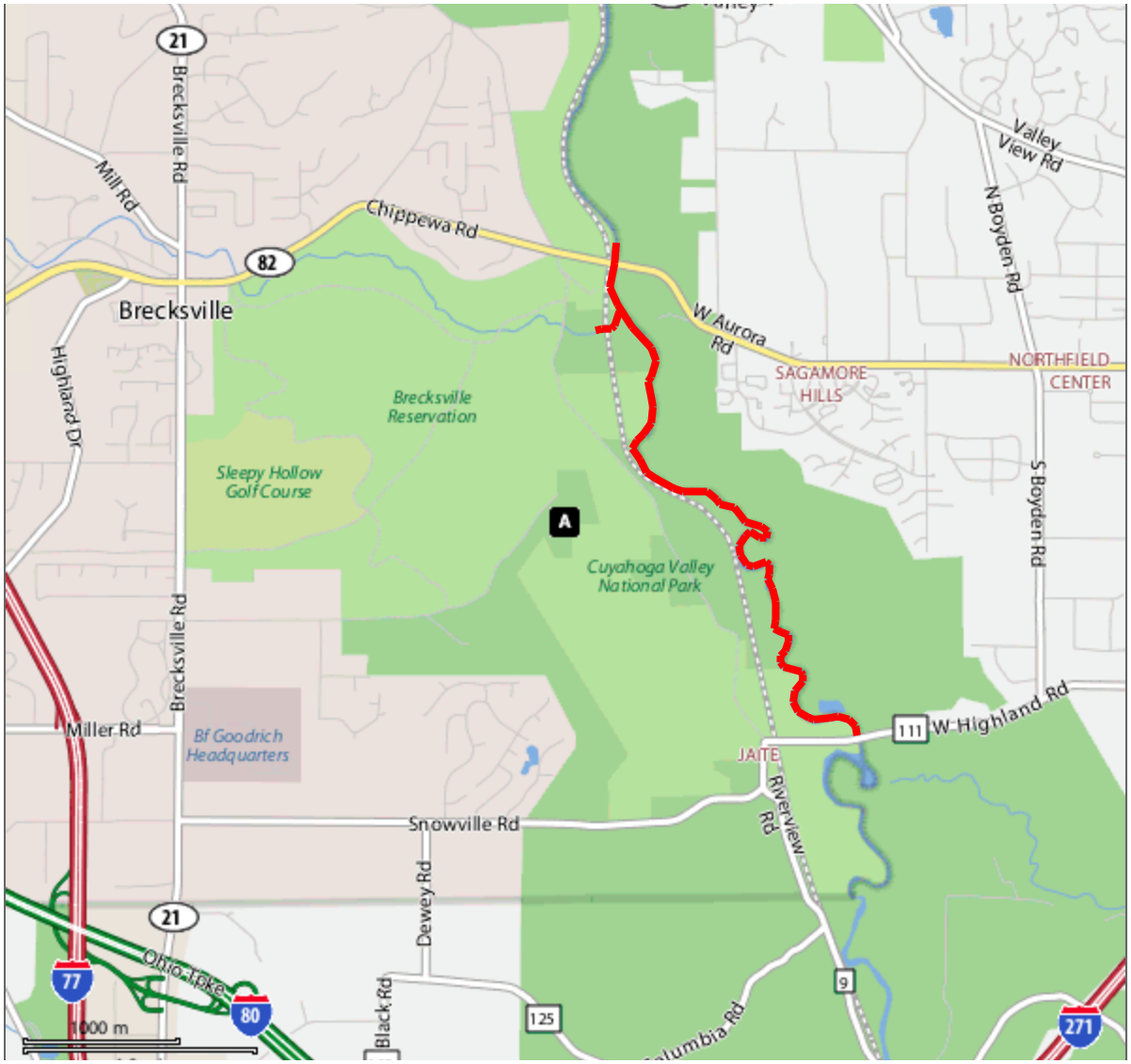


Figure 3. USGS 7.5-minute Topographic Map of Site (Northfield Quadrangle).

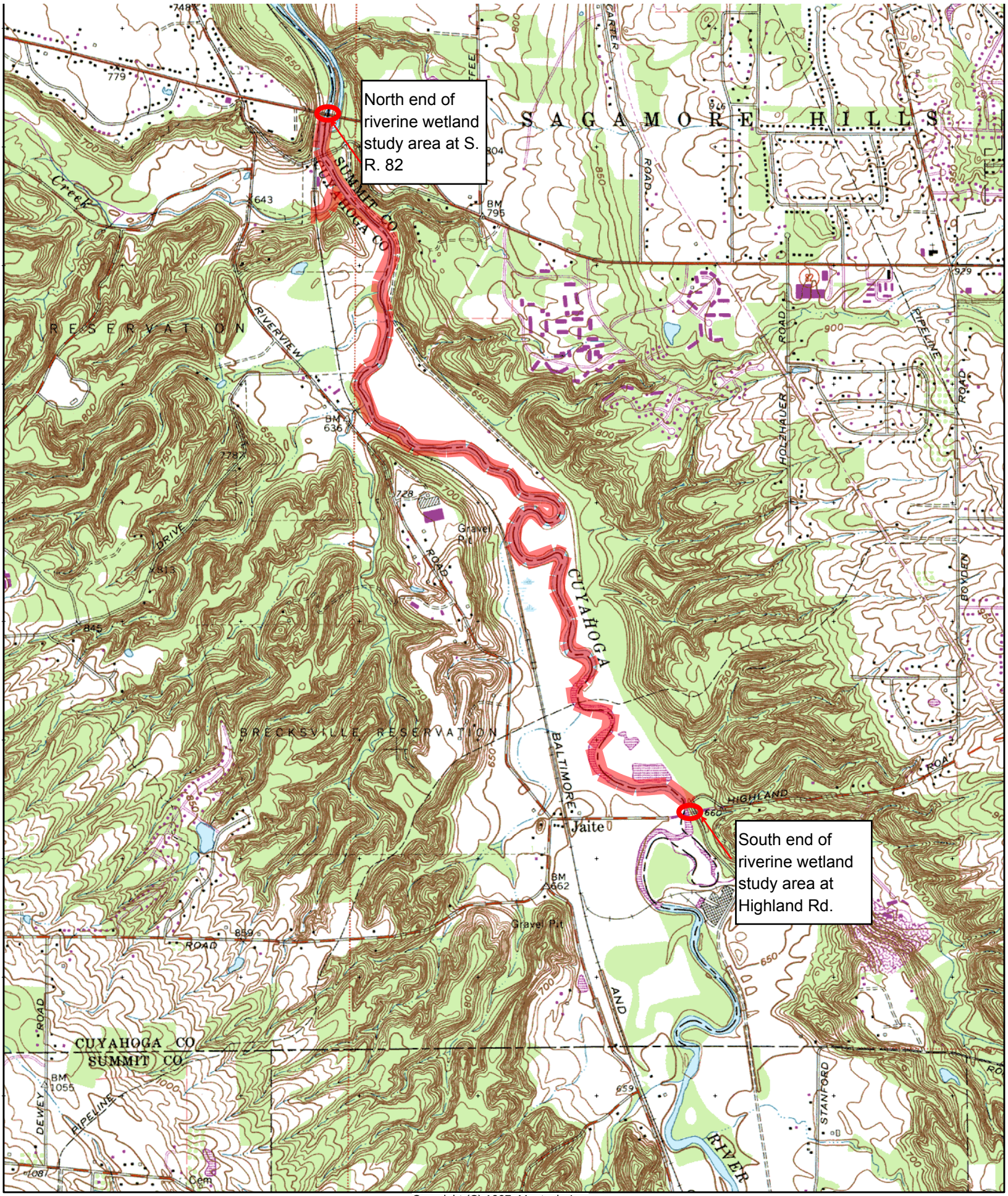
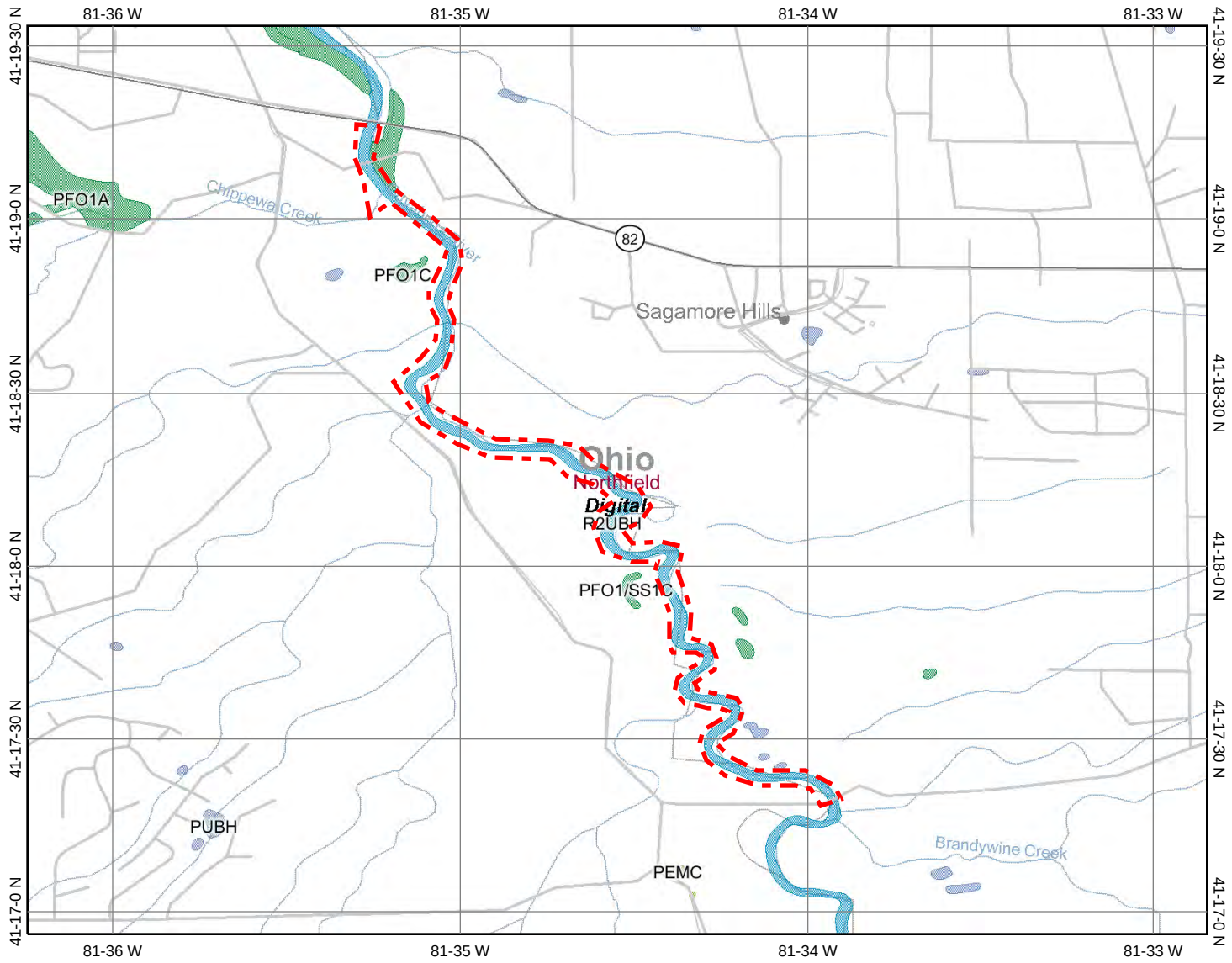


Figure 4. **NWI Map of Site (Northfield Quadrangle).**



Interstate
Major Roads
Other Road
Interstate
State highway
US highway
Roads
Cities
USGS Quad Index 24K
Lower 48 Wetland Polygons
Estuarine and Marine Deepwater
Estuarine and Marine Wetland
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
Lower 48 Available Wetland Data
Non-Digital
Digital
No Data
Scan
NHD Streams
Counties 100K
States 100K
South America
North America

Figure 5. Soil Survey Map of Study Area.

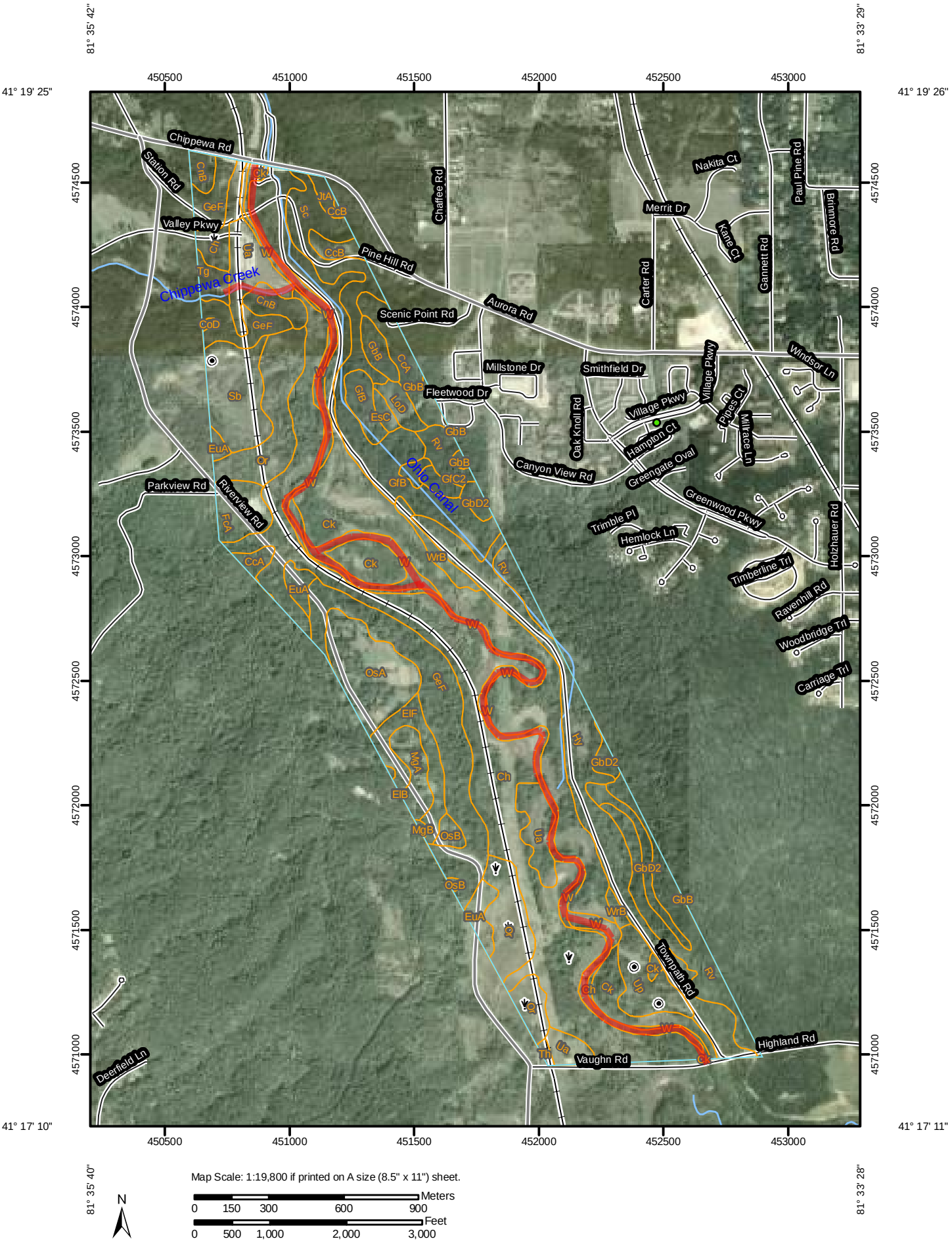


Figure 6. Aerial Photograph of Study Area.

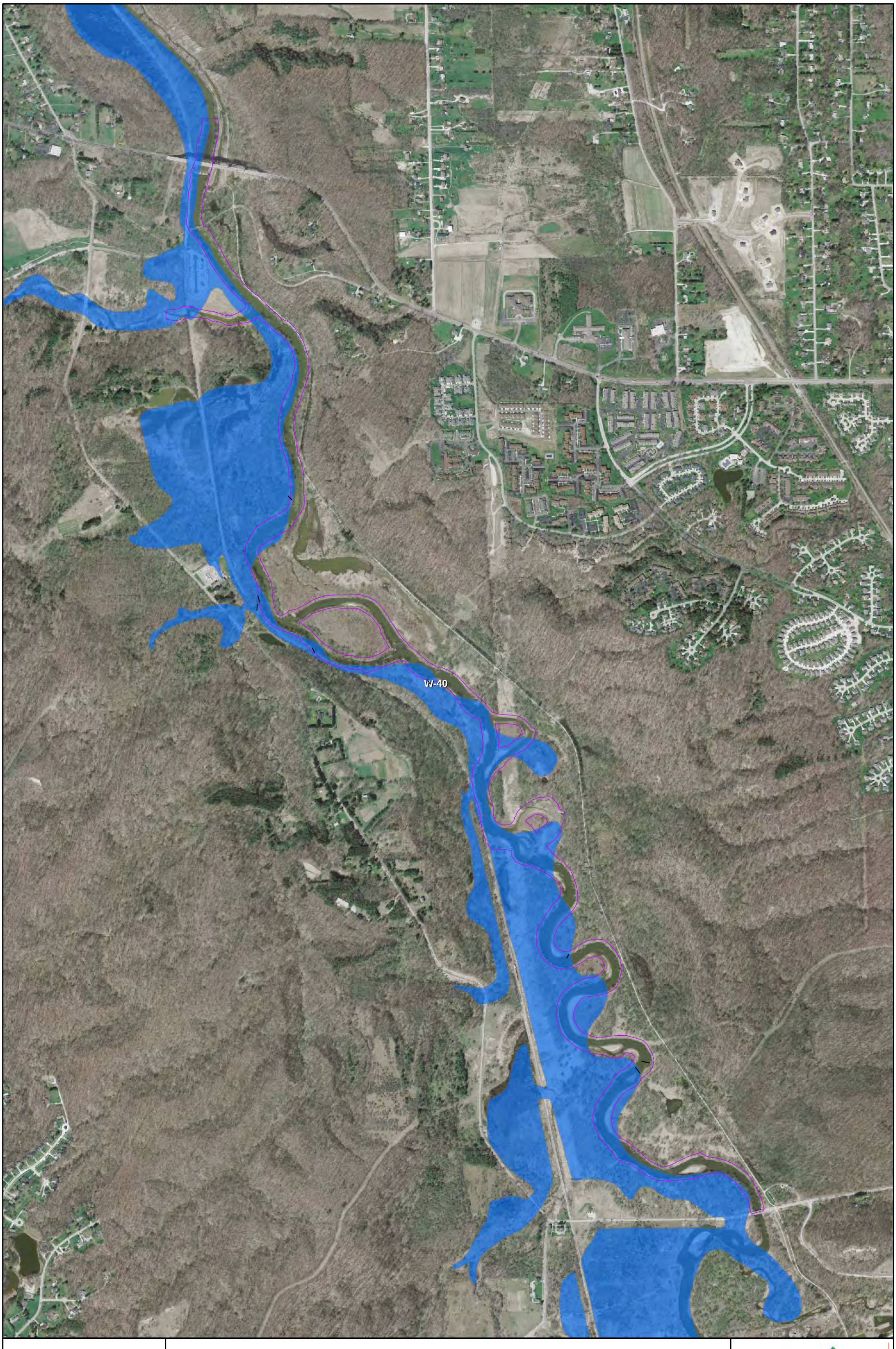


Figure 7. FEMA Floodplain Map of Study Area. Cuyahoga County portion Sheet 1 of 3

Study Area

100yr Floodplain (Cuyahoga County_

Floodplain data source: ODNR

1,000 500 0 1,000 Feet

300 150 0 300 Meters

N

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Figure 7. FEMA Floodplain Map of Study Area. Summit County portion

Sheet 2 of 3

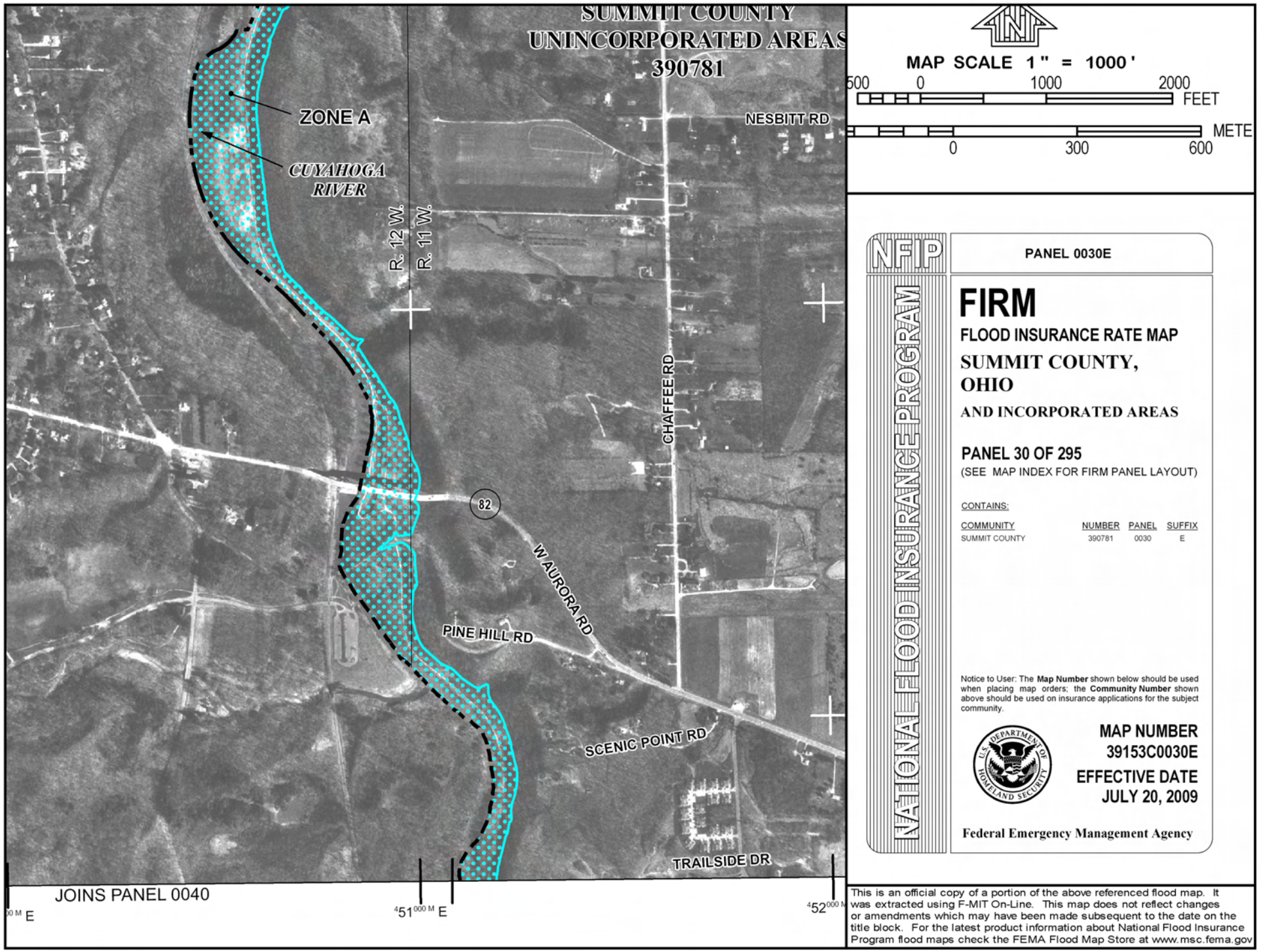

Figure 7. FEMA Floodplain Map of Study Area. Summit County portion.

Sheet 3 of 3.

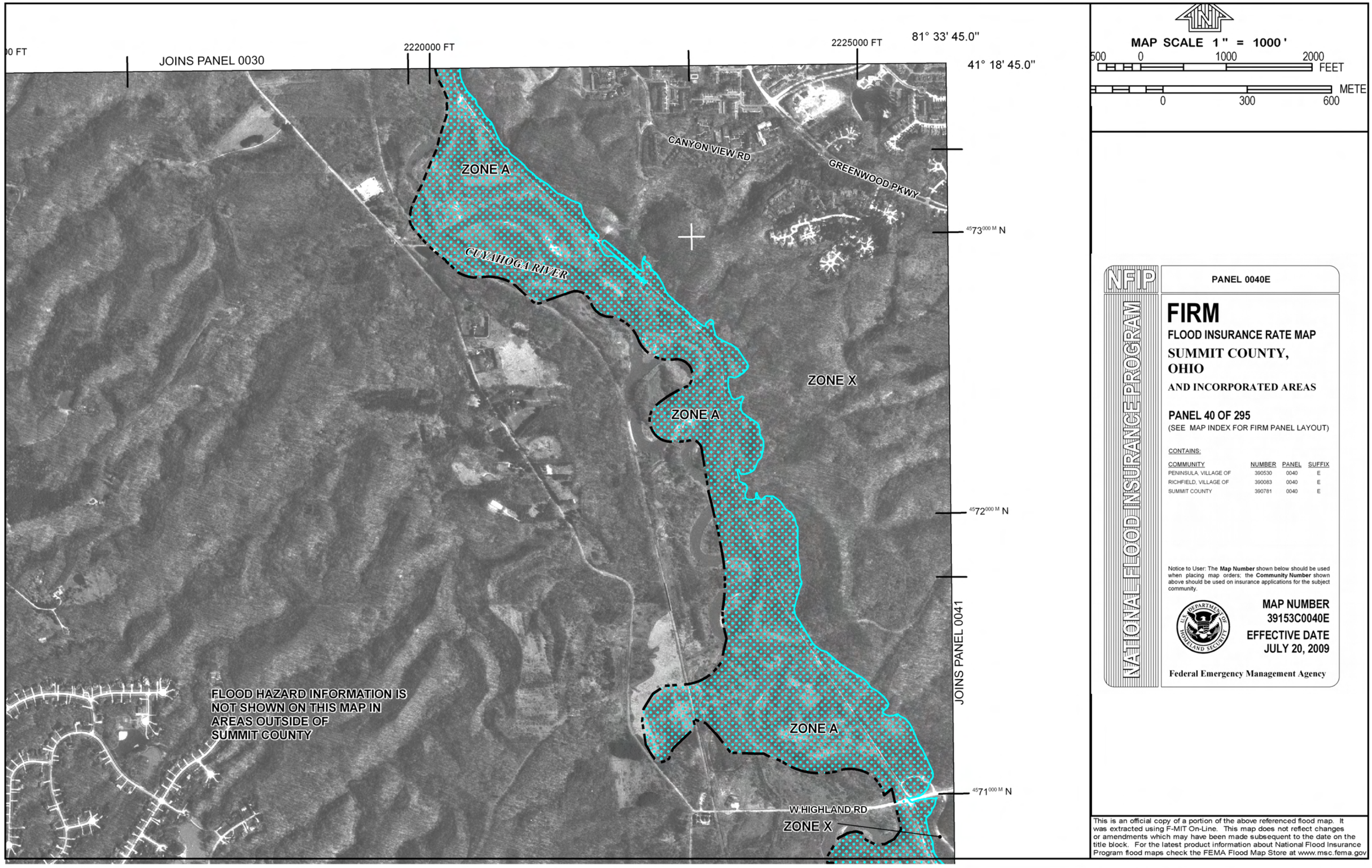

Figure 8. Site Map of Wetlands and other Waters (USACE Definition). Sheet 1 of 4.

Sample Plot
Stream
Wetland (USACE)
within study area boundaries
Wetland (Total)
Study Area

300 150 0 300 Feet
100 50 0 100 Meters

N

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Figure 8. Site Map of Wetlands and other Waters (USACE Definition). Sheet 2 of 4.

Figure 8. Site Map of Wetlands and other Waters (USACE Definition). Sheet 3 of 4.

Figure 8. Site Map of Wetlands and other Waters (USACE Definition). Sheet 4 of 4.

Sample Plot
Stream
Wetland (USACE)
within study area boundaries
Wetland (Total)
Study Area

300 150 0 300 Feet
100 50 0 100 Meters

N

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Figure 9. Site Map of Wetlands and other Waters (Cowardin et al. 1979 Definition). Sheet 1 of 4.

Sample Plot
Stream
Wetland (Cowardin) within study area boundaries
Wetland (Total)
Study Area

300 150 0 300 Feet
100 50 0 100 Meters

N

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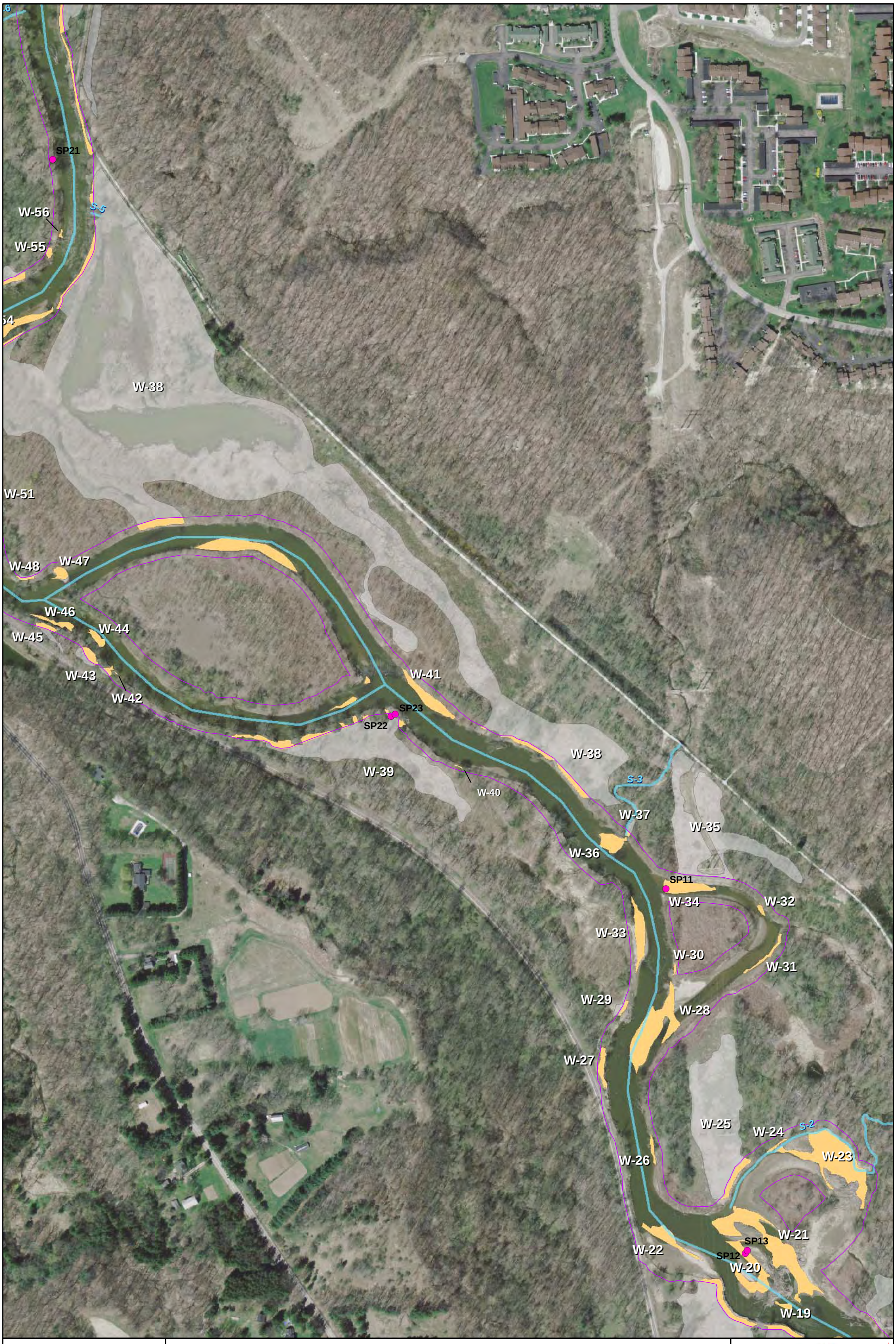

Figure 9. Site Map of Wetlands and other Waters (Cowardin et al. 1979 Definition). Sheet 2 of 4.

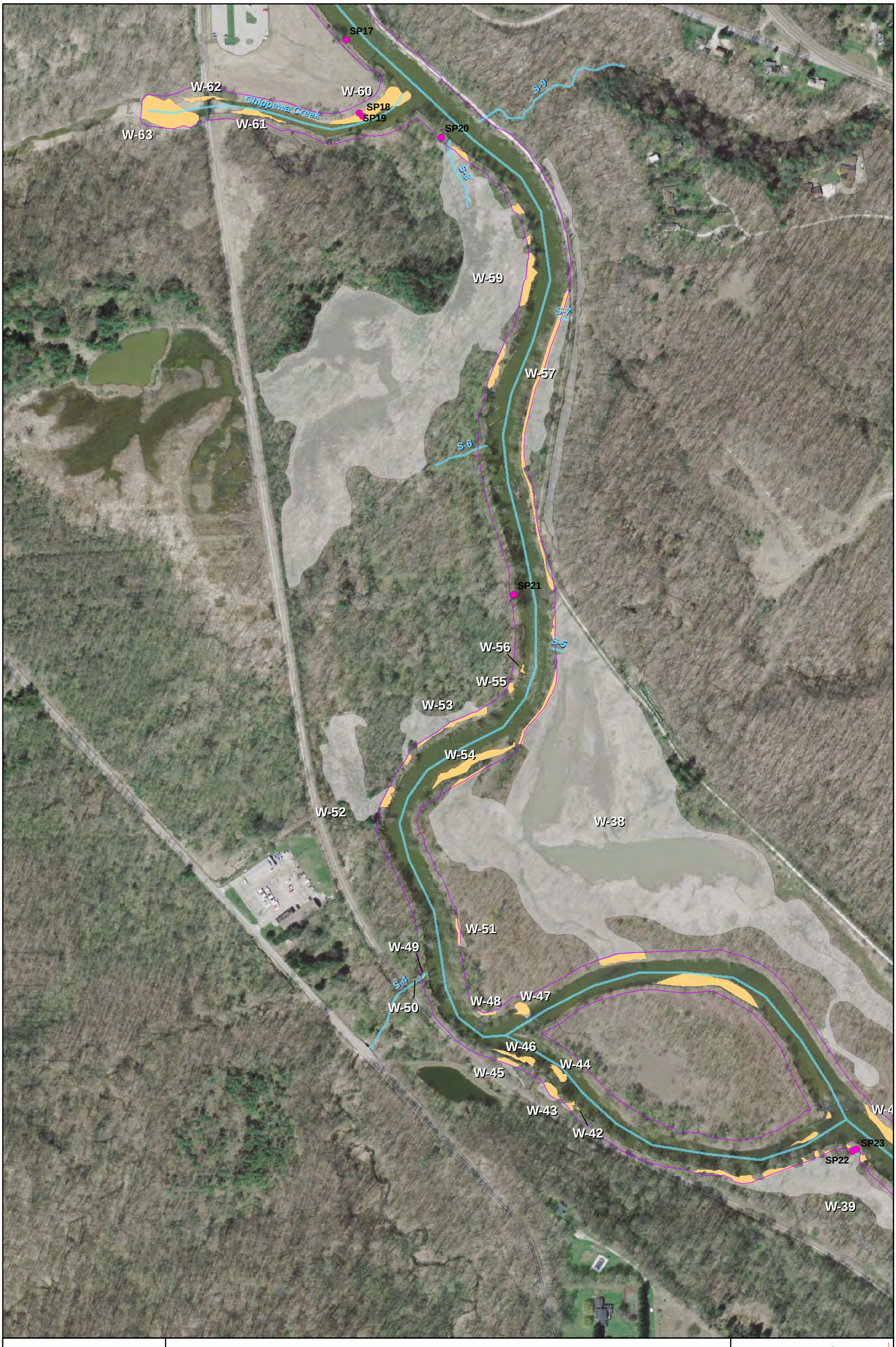

Figure 9. Site Map of Wetlands and other Waters (Cowardin et al. 1979 Definition). Sheet 3 of 4.

Figure 9. Site Map of Wetlands and other Waters (Cowardin et al. 1979 Definition). Sheet 4 of 4.

Sample Plot
Stream
Wetland (Cowardin)
within study area boundaries
Wetland (Total)
Study Area

300 150 0 300 Feet
100 50 0 100 Meters

N

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