Ordinary High Water Determination
Mahoning River, PA Miles 0 to 11.85
August 1999

The Ordinary High Water (OHW) mark is a distinct line along the shore, which has been established by fluctuations in the water level, with enough frequency and duration to change the character of both the vegetation and soil from upland to riverbed. Sections 9 & 10 of the River and Harbor Act (1899 and 1966) established Federal jurisdiction over navigable waters, and the OHW defines the lateral extent of Federal jurisdiction. This law states that "...the bed of navigable streams includes lands below the ordinary high water line and the exercise of the power to regulate commerce within the bed of a navigable stream is not an invasion of any private property right for which the US must make compensation". Periodic high water events therefore have an observable and permanent effect on the shoreline. Since the vegetation and soils of lands located below the OHW line are aquatic (hydric), or transitional between wetland and upland, this area is also jurisdictional wetland.

Between August 24 and August 31, 1999, an OHW study was conducted along the Mahoning River in order to define the lateral boundaries for the Mahoning River, PA Environmental Dredging Reconnaissance Study and to facilitate right-of-entry for the proposed restoration project. The OHW study area included the entire Mahoning River, PA Environmental Dredging Recon Study area: an 11.85 mile reach of the of the Mahoning River located in Lawrence County, PA, between river miles 0 (the confluence of the Mahoning River with the Beaver River) and 11.85 (Hillsville, PA). A total of 11 sites were selected along the study reach, approximately one site per mile. In addition, sites were also selected upstream and downstream of the dam located at mile 6.85 in Edinburg, PA (Table 1).

The OHW line was determined using the "physical fact" method, as defined in the 1965 USACE report entitled "Ordinary High Water". This method requires a detailed visual investigation of the banks for reliable determination of the OHW line. At each of the sites, observations were made of riverbank terracing; soil type; vegetation community composition and density; and comparative growth rates between similar plant communities located at different elevations. All unique vascular plants were keyed to species (Ref 1 through 3). Banks were then characterized into three distinct zones, where Zone A is the area between the river and Zone B, Zone B extends from Zone A to the ordinary high water line, and Zone C is the area located above the OHW line.

Zone A is generally characterized by soil free, water scoured, sandy or rocky shorelines, dominated almost exclusively by water tolerant trees such as black willow, silver maple, and sycamore. Herbaceous wetland and pioneer plants are present in Zone A where the slopes are gentle enough to support emergent wetlands in pockets of sediment along the shorelines, on sandbars, and islands. Pioneer species

are annual, non-aquatic, herbaceous plants, which can quickly colonize continually disturbed areas, such as riverbanks.

Zone B is generally covered in layers of deposited silt of varying thickness, with little or no organic matter, no signs of soil horizons, and mottled hydric soil at the bottom of soil profiles. Typically, the high side of this Zone ends at a relatively steep vertical slope. The vegetation of Zone B is similar to that found in Zone A but there is more diversity, greater numbers of aquatic herbaceous plants, and great numbers of pioneer species. Species typical of Zone B include silver maple, willows, dogwood, ninebark, wingstem, and garlic mustard.

Zone C, above the ordinary high water line, has defined soil layers, which include topsoil and leaf litter. There are no scour marks or silt deposition layers. Silt is only observable in this zone only for a short time after high water events, as succeeding rains wash the silt into the humus. Vegetation of this zone is typical of mesic forests with a complete understory, typically dominated by upland species such as oaks and hickories.

Elevations of the OHW water line, the river pool, and the last high water event were then determined. This was accomplished using a hand level to tie unknown elevations to known reference points such as dam elevations, USGS standard discs, and historical high water reference points. Because there were few available elevation reference points along the 1999 study reach and the few calculated pool elevations were very close to the 1960 USACE High Water Profile, Mahoning River, 300 cfs pool elevations, the 1960 pool elevations were used to calculate the OHW mark elevations (TABLE 1). Photographs were taken of the OHW mark at each site and a few are presented in FIGURES 1 through 7. In these figures, the OHW mark is highlighted with a horizontal white line. The ordinary high water profile for the study reach, the 100-year flood profile, and the 1960 low flow channel profile were then plotted. In addition, the last high water event, which occurred July 29, 1999 (Lowellville gage 6.25 ft or 5,600 cfs), was plotted as a slope validity check. Site locations and elevation data are also presented in TABLE 1 and the OHW profile is presented on FIGURE 8.

TABLE 1

Mahoning River, PA Ordinary High Water Line Determination

August 1999

Location	River mile	BM * elevation (ft NGVD)	Calculated low flow pool elevation (ft NGVD)	Low flow pool elevation from profile (ft NGVD)	ZONE A elevation (ft NGVD)	OHW feet above low flow pool elevation (ft)	OHW elevation (ft NGVD)	July 29,1999 pool rise elevation (ft NGVD)
Old Route 18 Bridge, Laurence Junction, PA	0.45	790.50	761.41	762.00	766.91	8.3	770.3	773
Route 108 Bridge, Lauerence Junction, PA	1.6	788.91	764.89	765.50	768.44	6	771.5	776.5
Route 60 Bridge, New Castle, PA	3.05	783.00	768.47	767.50	772.02	6.3	773.8	778.5
Brewsrer Road Bridge, Coverts PA	4.64	787.79	775.33	769.50	773.45	8.5	778	780.5
Right bank 0.4 mile downstream of Edinburg, PA	5.6	none		772.00	776.4	8.85	780.85	783
Downstream of Edinburg Dam	6.8	none		776.20	780.95	8.95	785.15	787.2
Edinburg Dam, height 3.86' above base flow, elevation 779.0	6.85							
Upstream of Edinburg Dam	6.9	none		776.75	781.8	8.65	785.4	787.75
Route 224 Bridge, Edinburg, PA	7.03	none		777.00	782.15	8.5	785.5	788
2 miles Downstream of Hillsville Hwy Bridge	8.15	800.00	777.90	778.00	782	7.5	785.5	789
0.8 mile Downstream of Hillsville Hwy Bridge	9.14	none		780.00	783.95	9.1	789.1	791
Hillsville Hwy Bridge, Hillsville, PA	9.92	806.70	780.62	782.90	787.25	9.35	792.25	793.9
Washington St Bridge, Lowellville, OH **	12.84			899.50		7.48	807.98	811.5
Downstream of Lowellville Dam **	13.04			801.10		8.8	809.9	812.1
Lowellville Dam, height 3.3' above base flow, elevation 804.3	13.05							
Upstream of Lowelleville Dam **	13.07			805.20		6.3	811.5	816.2

* BM = Bench Mark

** Measured in 1998

Figure 1: Left Bank of Mahoning River @ Mile 7.03

Figure 2: Right Bank of Mahoning River @ Mile 6.9, Upstream of Dam

Figure 3: Mahoning River Island at Mile 6.8, Downstream of Dam

Figure 4: Left Bank of Mahoning River @ 6.8, Downstream of Dam

Figure 5: Left Bank of Mahoning River @ 4.64

Figure 6: Right Bank Mahoning River @ Mi 1.6

Figure 7: Right Bank Mahoning River @ Mi 0.45

FIGURE 8
Mahoning River, PA Ordinary High Water Profile
August 1999

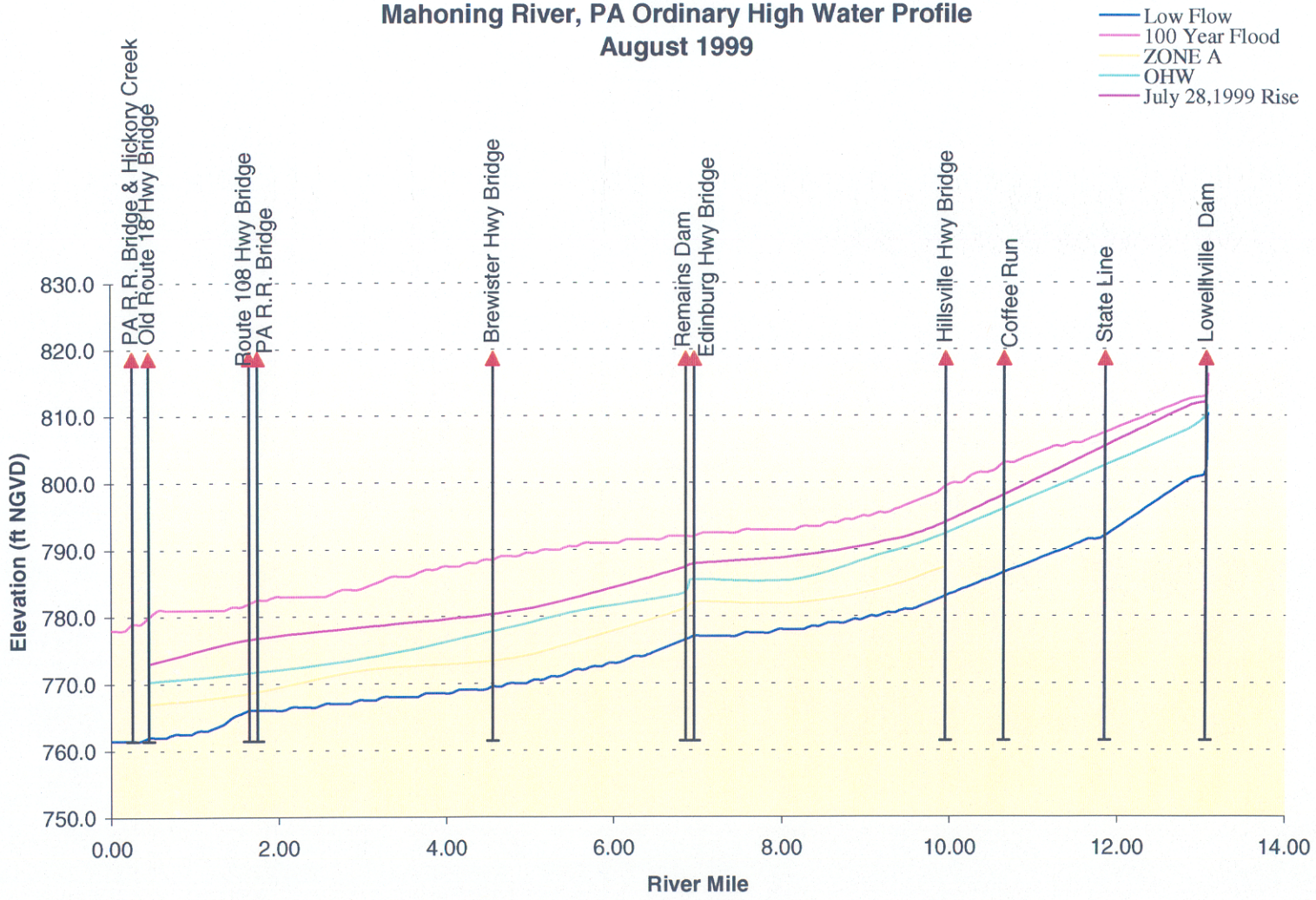

Figure 9: Edinburg Dam @ Mahoning River Mile 6.85

Figure 10: Zone A Sandbar @ Mahoning River Mile 1.65

The elevation of the OHW line averaged approximately 8 feet above the river pool. At the Edinburg dam, the OHW lane was 6 above the pool upstream of the dam and 10 ft downstream of the dam (TABLE 1 and FIGURE 9). This line corresponds approximately to a 3-year flood. Table 2 lists observed vegetation with associated relative abundance, for Zones A, B, and C along the Mahoning River PA study reach. The canopy of Zone A was dominated by silver maple, black willow, and sycamore and the understory primarily by pioneer species such as barnyard grass, wire stem muhly, and lady's thumb and wetland species such as clearweed, false nettle, spikerush, and whitegrass. A typical example of the vegetation of a sandbar in Zone A is presented in FIGURE 10. The canopy of Zone B was dominated by silver maple, black willow, sycamore, box elder, and slippery elm, with an understory of silky cornel, tall coneflower, wing-stem, reed canary grass, poison ivy, joe-pye-weed, touch-me-not, riverbank grape, white snakeroot, climbing false buckwheat, and garlic mustard. The canopy of Zone C was dominated by silver maple, black cherry, white ash, tree-of-heaven, hawthorn, and staghorn sumac, with an understory of false nettle, multi-flora rose, burdock, white snakeroot, Virginia creeper, and garlic mustard.

Also included in TABLE 2 are the U.S. Fish and Wildlife Service's wetland indicator status or tolerance to aquatic regimes for each species (Ref. 4). According to the U.S. Fish and Wildlife Service, "Plant species that occur in wetlands, as used in the National List, are defined as species that have demonstrated an ability to achieve maturity and reproduce in an environment where all or portions of the soil within the root zone become, periodically or continuously, saturated or inundated during the growing season". They developed a wetland fidelity system where obligate (OBL) species are those restricted to wetlands (>99%); facultative wet species (FACW) are those that usually occur in wetlands (67to79%); facultative species are those that equally occur in wetlands and non-wetlands (34-66%); and facultative upland plants (FACU) are species that usually occur in non-wetlands (67-99%) but are occasionally found in wetlands (1 to 33 %). As can be determined from TABLE 2 and presented in TABLE 3, Zones A, B, and C, respectively, contained 29.4%, 6.4%, and 0% obligate wetland species; 38.2%, 26.6%, and 19.6% facultative wetland species; 8.8%, 17%, and 17.9% facultative species; 2.9%, 27.7%, and 39.3% facultative upland species; 19.1%, 13.8%, and 7.1% pioneer species; and 1.5%, 8.5%, and 16.1% upland species.

TABLE 2
Mahoning River, PA Ordinary High Water Determination
Vegetation Inventory by Zone
August 1999

SCIENTIFIC NAME	AUTHOR	COMMON NAME	WETLAND INDICATOR	ZONE A		ZONE B		ZONE C	
				Present	Relative Abundance	Present	Relative Abundance	Present	Relative Abundance
Acalypha rhomboidea	L.	three-seeded mercury	U P	X		X			
Acer negundo	L.	boxelder	FAC			X	dom	X	
Acer rubrum	L.	red maple	FAC	X		X			
Acer saccharinum	L.	silver maple	FACW	X	dom	X	dom	X	dom
Achillea millefolium	L.	yarrow	FACU D					X	mod
Agrimonia gryposepala	Wallr.	tall agrimony	FACU			X			
Agrimonia parviflora	Ait.	small flowered agrimony	FAC			X	mod	X	
Agrostis alba	L.	red top	FACW			X			
Ailanthus altissima	(Mill.) Swingle	tree-of-heaven	FACU D					X	dom
Alliaria officinalis	Andrz.	garlic mustard	FACU P	X	ab	X	dom	X	dom
Allium vineale	L.	wild garlic	FACU D			X	ab	X	
Ambrosia artemisiifolia	L.	common ragweed	FACU P	X		X	mod	X	
Ambrosia trifida	L.	great ragweed	FAC			X	few	X	
Arctinum minus	(Hill) Bernh.	common burdock	U D			X	few	X	ab
Artemisia vulgaris	L.	common mugwort	U D			X		X	
Asclepias incarnata	L.	swamp milkweed	OBL	X	few	X			
Asclepias syriaca	L.	common milkweed	U D					X	
Aster lateriflorus	(L.) Britton ex Kearney	calico aster	FACW						
Aster macrophyllus	L.	bigleaf aster	U					X	
Bidens frondosa	L.	devil's beggar-ticks	FACW	X		X			
Blephilia hirsuta	(Pursh) Benth.	hairy wood mint	FACU					X	
Boehmeria cylindrica	(L.) Sw.	false nettle	FACW	X	dom	X	dom		
Carex grayii	Carey	sedge	FACW	X					
Carex sp.		sedge	FACW	X					
Catalpa speciosa	Warder	western catalpa	FAC			X	few		
Cephalanthus occidentalis	L.	buttonbush	OBL	X	few				
Circaea quadrisulcata	Franchet & Savatier	enchanter's nightshade	U			X	ab		

WETLAND INDICATOR CATAGORIES

OBL	Obligate Wetland
FACW	Facultative Wetland
FAC	Facultative
FACU	Facultative Up
U	Upland
Wet	In wet areas
P	Pioneer
D	In disturbed areas

RELATIVE ABUNDANCE

F	Few
Mod	Moderate
Ab	Abundant
Dom	Dominant
L	Locally
X	Present

TABLE 2
Mahoning River, PA Ordinary High Water Determination
Vegetation Inventory by Zone
August 1999 (Cont.)

SCIENTIFIC NAME	AUTHOR	COMMON NAME	WETLAND INDICATOR	ZONE A		ZONE B		ZONE C	
				Present	Relative Abundance	Present	Relative Abundance	Present	Relative Abundance
Commelina communis	L.	Asiatic day-flower	FAC			X	few		
Convolvulus sepium	L.	hedge bindweed	U P	X	mod	X	mod		
Cornus amomum	Mill.	silky cornel	FACW	X	few	X	few		
Crataegus sp.		hawthorn	U					X	dom
Cyperus strigosus	L.	umbrella sedge	FACW	X	L ab				
Dacus carota	L.	Queen Anne's lace	U D					X	mod
Dipsacus sylvestris	Huds.	common teasel	FAC					X	
Echinochloa crusgalii	(L.) Beauv.	barn yard grass	FACU P	X	dom	X			
Echinocystis lobata	(Michx.) T.& G.	wild balsam-apple	FAC					X	mod
Eleocharis obtusa	(Willd) Schultes	spikerush	OBL	X	dom				
Elymus virginicus	L.	Virginia wild rye	FACW	X	ab	X	ab	X	
Epilobium coloratum	Biehler	purple-leaved willow-herb	OBL	X	ab	X			
Equistum arvense	L.	horsetail	FAC			X	few		
Eupatorium altissima	L.	tall thoroughwort	U D			X		X	
Eupatorium fistulosum	Barratt	common joe-pye weed	U (Wet)	X	mod	X	dom	X	dom
Eupatorium rugosum	Houtt.	white snakeroot	U D	X	mod	X	dom	X	dom
Eupatorium serotinium	Michx.	late flowering thoroughwort	FAC	X		X			
Fraxinus americana	L.	American ash	FACU			X	mod	X	dom
Fraxinus pennsylvanica	Marshall	green ash	FACW			X			
Geum vernum	(Raf.) T. & G.	spring avens	FACU			X	ab		
Glechoma hederacea	L.	ground ivy, gill-over-the-ground	FACU D	X		X	ab	X	ab
Graminea g. sp.		grass				X	dom		
Helanthus decapetalus	L.	thin-leaved sunflower	FACU					X	
Hemerocallis fulva	L.	common day lily	U D					X	
Hesperis matronalis	L.	dame's rocket	U D			X	few	X	
Humulus japonicus	Sieb. & Zucc.	Japanese hops	FACU			X	L. dom		
Hydrophyllum canadense	L.	broad-leaved waterleaf	FACU			X	L. ab		
Hypericum mutilum	L.	small-flowered St. John's wort	FACW	X		X			

WETLAND INDICATOR CATAGORIES

OBL	Obligate Wetland
FACW	Facultative Wetland
FAC	Facultative
FACU	Facultative Up
U	Upland
Wet	In wet areas
P	Pioneer
D	In disturbed areas

RELATIVE ABUNDANCE

F	Few
Mod	Moderate
Ab	Abundant
Dom	Dominant
L	Locally
X	Present

TABLE 2
Mahoning River, PA Ordinary High Water Determination
Vegetation Inventory by Zone
August 1999 (Cont.)

SCIENTIFIC NAME	AUTHOR	COMMON NAME	WETLAND INDICATOR	ZONE A		ZONE B		ZONE C	
				Present	Relative Abundance	Present	Relative Abundance	Present	Relative Abundance
Impatiens capensis	Meerb.	spotted touch-me-not	FACW	X		X	dom	X	dom
Impatiens palada		pale touch-me-not	FACW	X		X	dom	X	dom
Iris psudacorus	L.	yellow iris	OBL	X	few				
Laporta canadensis	(L.) Weed.	wood nettle	FACW			X	mod		
Leersia oryzoides	(L.) Poll.	rice cut-grass	OBL	X	L ab	X			
Leersia viriginica	Willd.	white grass	FACW	X	L dom	X	ab		
Ligustrum vulgare	L.	privet	FACU D			X	ab	X	mpd
Linaria vulgaris	Hill.	butter-and-eggs	U P	X	few	X	few		
Lonicera tatarica	L.	tartarian honeysuckle	FACU D			X	few	X	
Ludwigia alternifolia	L.	seedbox	FACW	X	few				
Ludwigia palustris	(L.) Elliott	marsh purslane	OBL	X	few				
Lycopus americanus	Muhl.	water horehound	OBL	X	mod				
Lycopus uniflorus	Michx.	northern bugleweed	OBL	X					
Lycopus virginicus	L.	bugleweed	OBL	X					
Lysimachia nummularia	L.	moneywort	OBL	X	mod	X	mod		
Lysimachia terrestris	(L.) B.S.P.	swamp candle	OBL	X	few				
Lysimachia vulgarus	L.	golden loosestrife	FAC D			X	few		
Lythrum salicaria L.	L.	purple loosestrife	FACW D	X	few				
Mentha piperta	L.	peppermint	FACW	X					
Mimulus ringens	L.	common monkey flower	OBL	X					
Morus alba	L.	white mulberry	U			X	few	X	few
Morus rubra	L.	red mulberry	FACU			X	few		
Muhlenbergia frondosa	(Proir.) Fernald	wirestem muhly	FAC D	X	dom				
Nepeta cataria	L.	catnip	FACU D					X	
Oenothera biennis	L.	common evening-primrose	FACU D			X		X	
Onoclea sensibilis	L.	sensitive fern	FACW	X					
Oxalis europaea	Jord.	yellow wood sorrel	U P	X	few	X	dom	X	
Panicum sp.		panic grass		X					

WETLAND INDICATOR CATAGORIES

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TABLE 2
Mahoning River, PA Ordinary High Water Determination
Vegetation Inventory by Zone
August 1999 (Cont.)

SCIENTIFIC NAME	AUTHOR	COMMON NAME	WETLAND INDICATOR	ZONE A		ZONE B		ZONE C	
				Present	Relative Abundance	Present	Relative Abundance	Present	Relative Abundance
Parthenocissus quinquefolia	(L.) Planch.	Virginia creeper	FACU			X	mod	X	dom
Penthorum sedoides	L.	ditch stonecrop	OBL	X	few				
Phalaris arundinacea	L.	reed canary grass	FACW			X	dom		
Phlox paniculata	L.	fall phlox	FACU			X	few		
Physocarpus opulifolius	(L.) Maxim.	ninebark	FACW			X	mod		
Phytolacca americana	L.	polkweed	FACU			X			
Pilea pumilia	(L.) Gray	clearweed	FACW	X	dom	X	dom	X	ab
Plantago lanceolata	L.	English plantain	U P	X		X	L. dom		
Plantago rugelii	Dcne.	common plantain	FACU P	X					
Polygonum cuspidatum	Sieb. & Zucc.	Japanese knotweed	FACU D	X	L. dom	X	L. dom		
Polygonum hydropiperoides	Michx.	water dock	OBL	X					
Polygonum lapthifolium	L.	dock-leaved smartweed	FACW	X					
Polygonum pensylvanicum	L.	Pennsylvania knotweed	FACW	X	mod				
Polygonum persicara	L.	lady's thumb	U P	X	dom	X	dom		
Polygonum punctatum	Ell.	water smartweed	OBL	X					
Polygonum scandens	L.	climbing false buckwheat	FAC			X	dom	X	dom
Potomogrton nodosus	Poir.	pondweed	OBL	X					
Prunus serotina	Ehrh.	wild black cherry	FACU			X	ab	X	dom
Querqus rubra	L.	red oak	FACU					X	ab
Rannuculus septentrionalis	Poir.	northern swamp buttercup	OBL	X	mod	X			
Rhus glabra	L.	smooth sumac	U					X	
Rhus radicans	L.	poison ivy	U P			X	dom	X	dom
Rhus typhina	L.	staghorn sumac	U			X	mod	X	dom
Robina pseudo-acacia	L.	black locust	FACU			X		X	dom
Rorippa islandica	(Oeder) Borbas	marsh yellow cress	FAC D	X	few	X	mod		
Rorippa sylvestris	(L.) Bess.	creeping yellow cress	FACW	X					
Rosa multiflora	Thunb.	multiflora rose	FACU D			X	ab	X	dom
Rubus sp.		raspberry	U					X	ab

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TABLE 2
Mahoning River, PA Ordinary High Water Determination
Vegetation Inventory by Zone
August 1999 (Cont.)

SCIENTIFIC NAME	AUTHOR	COMMON NAME	WETLAND INDICATOR	ZONE A		ZONE B		ZONE C	
				Present	Relative Abundance	Present	Relative Abundance	Present	Relative Abundance
Rudbeckia hirta	L.	black-eyed Susan	FACU			X			
Rudbeckia lacinata	L.	tall coneflower	FACW	X		X	dom	X	dom
Rumex crispus	L.	curly dock	FACU P	X		X			
Rumex obtusifolius	L.	broadleaf dock	FACU D			X	few		
Salix interior	Rowlee	sandbar willow	OBL	X	few				
Salix nigra	Marsh.	black willow	FACW	X	dom	X	dom		
Sambucus canadensis	L.	common elder; black elderberry	FACW			X	ab		
Sanicula gregaria	Bicknell	clustered snakeroot	FACU			X		X	ab
Scrophularia marilandica	L.	Maryland figwort	FACU					X	
Sicyos angulatus	L.	one-seeded bur-cucumber	FACU			X	mod	X	dom
Solanum carolinense	L.	horse-nettle	U P	X	mod				
Solanum dulcamara	L.	dadly nightshade	FAC			X	ab		
Solanum nigrum	L.	black nightshade	FACU P	X	few	X			
Solidago altissima	L.	tall goldenrod	FACU			X		X	
Solidago canadensis	L.	Canada goldenrod	OBL	X		X			
Solidago gigantea	Ait.	late goldenrod	FACW			X		X	
Sycamore occidentalis	L.	sycamore	FACW	X	dom	X	dom	X	
Teucrium canadense	L.	American germander	FACW	X		X	ab		
Tilia americana	L.	American basswood	FACU			X			
Tovara virginiana	(L.) Raf.	Virginia knotweed	U (Wet)			X	ab	X	ab
Ulmus americana	L.	American elm	FACU					X	
Ulmus rubra	Muhl.	slippery elm	FAC			X	dom	X	
Urtica dioca	L.	stinging nettle	FACU			X	L. dom	X	
Urtica gracilis	Ait.	wild nettle	U (Wet)			X			
Verbena urticifolia	L.	white vervain	FACU D			X	mod		
Verbesina alternifolia	(L.) Britton ex Kearney	wing-stem	FAC			X	dom	X	dom
Vernonia altissima	Nutt.	tall ironweed	FAC	X		X			
Viola papilionacea	Pursh	common blue violet	FAC D	X	ab	X	dom	X	
Vitis riparia	Michx.	riverbank grape	FACW	X		X	dom	X	
Vitis vulpina	L.	wimter grape	FAC					X	
Xanthium pensylvanicum	Wallr.	smooth-body cocklebur	U P (Wet)	X	mod				

WETLAND INDICATOR CATAGORIES

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RELATIVE ABUNDANCE

F	Few
Mod	Moderate
Ab	Abundant
Dom	Dominant
L	Locally
X	Present

TABLE 3
Mahoning River PA
Numbers of Vascular Plant Species by Wetland Indicator for Ordinary High Water
August 1999

	ZONE A		ZONE B		ZONE C	
	# species	% of Total	# species	% of Total	# species	% of Total
Pioneer	13	19.1	13	13.8	4	7.1
Obligate	20	29.4	6	6.4	0	0.0
Facultative Wet	26	38.2	25	26.6	11	19.6
Facultative	6	8.8	16	17.0	10	17.9
Facultative Upland	2	2.9	26	27.7	22	39.3
Upland	1	1.5	8	8.5	9	16.1
Total # Species	68		94		56	

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