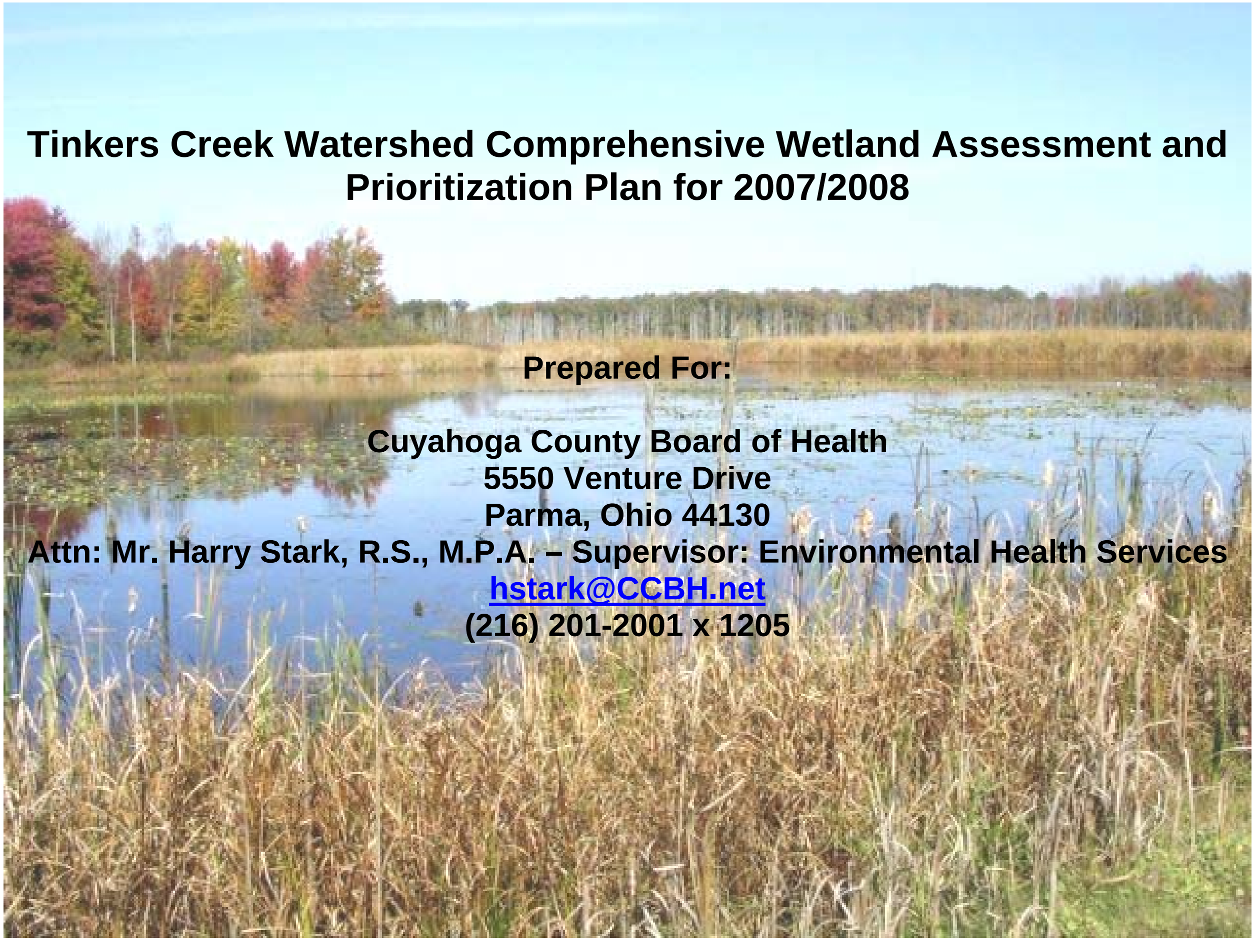

Tinkers Creek Watershed Comprehensive Wetland Assessment and Prioritization Plan for 2007/2008

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Table of Contents

Appendices

Acknowledgments

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Executive Summary

The Cuyahoga County Board of Health (CCBH) has commissioned a Comprehensive Wetland Assessment and Prioritization Plan for the Tinkers Creek Watershed in order to inventory and assess the ecological, hydrologic and economic value of wetlands within the entire Tinkers Creek Watershed, from headwaters to the confluence of Tinkers Creek and the Cuyahoga River at Cuyahoga River Mile 16.36.

This Assessment and Prioritization Plan will assist the CCBH in identifying priority areas with high ecological, hydrological and societal economic values so these areas can be managed, preserved or enhanced. It will also help CCBH and local communities explain the values of particular wetlands to the public in measurable terms.
This study will assist local governments and community residents in recognizing the need for prioritizing conservation practices that offer sustainable growth for the community while promoting environmental integrity by developing a wetland assessment and monitoring program.

Wetlands were evaluated using analysis of recent aerial and satellite imagery, available geographic information systems (GIS) data and secondary resources, and limited field verifications of wetlands. A total of 951 wetlands were identified in the Tinkers Creek Watershed with a total acreage of 3,917 ac. Wetlands were ranked according to their ecological, hydrological, and economic values. Ecological values were determined primarily by ORAM Category, ORAM score, and occurrence of threatened or endangered species within the wetland. Hydrological values were obtained using the ArcView Generalized Watershed Loading Function (AVGWLF), a watershed model developed by the Penn State University Institutes of Energy and the Environment. A model of the watershed was run under current conditions, and was run again after all wetlands in the model were replaced by high density urban land use. A second measure of hydrological importance was obtained by calculating the volume of each wetland using regression equations developed by Ohio EPA. Economic importance of wetlands was evaluated by calculating the recreational, property, flood reduction, permitting, mitigation and stormwater retention values for wetlands in the watershed.

Not surprisingly, the larger wetlands had the highest ecological and hydrologic values. The AVGWLF model calculated that, as a whole, wetlands within the Tinkers Creek Watershed reduced stream inputs by over 8,000 acre-feet annually and returned another 8,000 acre-feet to the atmosphere by evapotranspiration. The model showed wetlands as a net sink for water, processing more water through evapotranspiration and retention of surface and ground water than is input to the wetland through direct precipitation. The ratio of water processed to water falling directly on each wetland area was found to be 1.13:1. Based on the size of wetlands, AVGWLF calculated that an acre of wetland in the Tinkers Creek Watershed, on average, retains and processes 3.70 acre-ft water per year. Economic values showed that wetlands in parks had a high societal value for recreation. In fact, recreational value was the largest societal value derived from these calculations. Average calculated values for wetlands in the Tinkers Creek Watershed were $130,572 per wetland acre outside of parks, and $361,995 per wetland acre in parks.

Abbreviations

A	area, ac
ac	acre
AmphIBI	Amphibian Index of Biotic Integrity
AVGWLF	ArcView Generalized Watershed Loading Function
B	annual benefit
CBG	census block group
CCAP	Coastal Change Analysis Program
CCBH	Cuyahoga County Board of Health
cfs	cubic feet per second
DNAP	Division of Natural Areas and Preserves
EPA	Environmental Protection Agency
ET	evapotranspiration
ft	feet
G	groundwater loss
GIS	geographic information system
GWLF	Generalized Watershed Loading Function
i	real interest rate
MGD	millions of gallons per day
N	nitrogen
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
ODNR	Ohio Department of Natural Resources
ORAM	Ohio Rapid Assessment Method for Wetlands
OSIP	Ohio's Statewide Imagery Program's (NOAA) P
PReDICT	Pollution Reduction Impact Comparison Tool
R	Runoff
SSURGO	Soil Survey Geographic database
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USFS	US Forestry Service
USFWS	US Fish and Wildlife Service
V	volume, ac-ft
VIBI	Vegetative Index of Biotic Integrity

1.0 Introduction

The Cuyahoga County Board of Health (CCBH) has commissioned a Comprehensive Wetland Assessment and Prioritization Plan for the Tinkers Creek Watershed (Figure 1.1) in order to inventory and assess the ecological, hydrologic and economic value of wetlands within the entire Tinkers Creek Watershed, from headwaters to the confluence of Tinkers Creek and the Cuyahoga River at Cuyahoga River Mile 16.36.

This Assessment and Prioritization Plan will assist CCBH in identifying priority areas with high ecological, hydrological and societal economic values so these areas can be managed, preserved or enhanced. It will also help CCBH and local communities explain the values of particular wetlands to the public in measurable terms. This study will assist local governments and community residents in recognizing the need for prioritizing conservation practices that offer sustainable growth for the community while promoting environmental integrity by developing a wetland assessment and monitoring program.

1.1 Watershed Description

The following description of the Tinkers Creek Watershed is taken from the Ohio EPA report *Total Maximum Daily Loads for the Lower Cuyahoga River* (2003).

> Tinkers Creek is the largest tributary of the Cuyahoga River and drains portions of Portage, Geauga, Summit and Cuyahoga counties. Tinkers Creek has a drainage area of 96.4 square miles and a total length of about 30 miles and enters the Cuyahoga River at RM 16.36. The watershed lies on a glaciated plateau. Soils are mostly silt loam and clayey silt loam. Wetland swamps, bogs and fens are common in the upper watershed. Flows in the lower section of the creek are highly influenced by the discharge of treated wastewater from upstream WWTPs; in 1991 the combined effluent had a median discharge of 11.623 mgd or 17.9 cubic feet per second (cfs). Portions of the stream are on bedrock and form waterfalls which are a natural barrier to fish passage. The lower portions

of the stream have formed the Tinkers Creek Gorge which is a National Natural Landmark. Recent acquisitions in the basin by MetroParks Serving Summit County and the Cleveland Metro Parks have increased the amount of protected watershed in the basin. Many local communities are also involved in protecting and acquiring parkland in the basin.

2.0 Project Purpose and Approach

The purpose of the project was to develop a comprehensive wetland inventory for the Tinkers Creek Watershed that would provide a current "snapshot" of wetland acreage, classification, functionality and economic value within the Tinkers Creek basin. This study was conducted to assist local governments and community residents in recognizing the need for prioritizing conservation practices that offer sustainable growth for the community while promoting environmental integrity.

The project consisted of geographic information systems (GIS) analysis of existing data, evaluation of wetland ecological quality through accepted Ohio EPA methods such as ORAM, preparation of a hydrologic model of the watershed to evaluate hydrologic significance of existing wetlands, and an analytical evaluation to evaluate the economic significance of the functions each wetland provides. The project included limited ground-truthing of wetlands that had not been visited for previous studies within the watershed. Wetlands within the watershed were assessed based on the following criteria:

1) Ecological significance, as determined by accepted Ohio EPA methods such as ORAM and VIBI scores;

2) Hydrological significance, as determined by methods using accepted hydrological modeling and wetland storage capacities, and;

3) Economic significance to the watershed and individual communities, as determined utilizing sound economic valuation analysis.

The general project approach is similar to other large-scale evaluations of wetland functions in Ohio. Initial desktop analysis of secondary literature and available data were used to identify wetland areas for field verification and evaluation. Wetland field visits were prioritized for wetlands expected to be highly valuable to their communities in terms of ecosystem function.

3.0 Methods

3.1 Literature Review

The analysis of the project area began by utilizing the data compiled in the 2005 Tinkers Creek Watershed Land Conservation Priority Plan by Kerr+Boron Associates. Available secondary literature was also reviewed and compiled for the project. This information included:

- GIS data from the Tinkers Creek Watershed Land Conservation Priority Plan (Kerr+Boron Associates, 2005)
- Soil data (Soil Survey Geographic (SSURGO) database),
- Aerial imagery (Ohio's Statewide Imagery Program (OSIP), National Oceanic and Atmospheric Administration's (NOAA) Coastal Change Analysis Program (CCAP),
- State and federal wetland inventory data,
- Ohio EPA functional wetland assessment data (ORAM, VIBI, AmphIBI) collected from urban wetlands within the Cuyahoga River watershed (Fennessy et al. 2007),
- ORAM data collected by the Cuyahoga River Remedial Action Plan,
- Threatened and endangered species location information from the Ohio Department of Natural Resources (ODNR), Division of Natural Areas and Preserves,
- Water quality information from Ohio EPA, and
- Census Block Group data from the U.S. Census Bureau

This information was used to determine areas that would require limited field investigations and provided necessary and valuable information to be used in GIS analysis and assessment efforts.

Watershed and subwatershed boundaries obtained from CCBH were examined and compared with existing ODNR data. Boundaries were updated and modified using Environmental Systems Research Institutes' (ESRI) ArcGIS 9.1 software as necessary for the completion of further analyses.

Existing wetland boundary data from Portage, Summit and Cuyahoga counties were compared with high-resolution orthorectified color aerial imagery collected in 2006 (OSIP 2006). Using ArcGIS 9.1, these boundaries were manually updated to reflect their proper locations and shapes, based on the most up-to-date aerial imagery, as necessary.

3.2 Field Investigations

Limited field investigations were performed to update, verify or fill in gaps in existing data. These field investigations were completed following the literature review to avoid duplication of field efforts from previous evaluators. Field investigations included completion of the ORAM if not completed previously, and limited verification of wetland boundaries using aerial imagery analysis.

3.3 Analysis and Assessment

Existing primary and secondary data, as well as data collected during field investigations, were used to assess the values provided by wetlands within the Tinkers Creek Watershed. Data analysis was conducted using a combination of ArcGIS 9.1 and ArcView 3.2 software, both ESRI products. The wetland assessment relied on three key general criteria: ecological significance, hydrological significance, and economic significance. These criteria and the valuation methods associated with each are discussed in detail below.

3.3.1 Ecological Significance

Wetlands' ecological significance were determined primarily by wetland regulatory Category (as determined by ORAM scores), presence of threatened or endangered species, and wetland size. These methods have a great degree of regulatory and public acceptance as methods for evaluating ecosystem function. Limited field verifications were used for some wetlands that did not have assigned ORAM scores. DNAP Natural Heritage Data were used to identify regionally significant wetlands or wetlands with known threatened and endangered species.

3.3.2 Hydrological Significance

Hydrological significance of wetlands within the Tinkers Creek Watershed was evaluated using two methods. The primary method was the ArcView Generalized Watershed Loading Function version 7.1.5 (AVGWLF) as developed by the Penn State Institutes of Energy and the Environment (http://www.avgwlf.psu.edu/). The AVGWLF uses the Generalized Watershed Loading Function model developed by Haith and Shoemaker (1987). This model simulates runoff, sediment, and nutrient loading, based on land cover, soil type, and precipitation. The model is a continuous model that uses a daily time step for weather data and water balance calculations. A detailed description of the AVGWLF is contained in Appendix C.

Daily precipitation and temperature data were obtained from the NOAA National Climatic Data Center (http://www.ncdc.noaa.gov/oa/ncdc.html). As no current data were available from weather stations within the Tinkers Creek Watershed, the Ravenna 2S and Hiram weather stations were chosen for precipitation and temperature data, respectively. Daily data from 1997 to 2006 were examined, and the precipitation data from 1998 and 1999 were used, as they were the closest to the 30-year average. Temperature data from the last 20 years of Hiram data were averaged to provide daily average temperatures for input into the model. Soil data were obtained from the Natural Resource Conservation Service, both from digital and printed Soil Surveys. Land cover data were derived by adding a raster version of the new wetland layer (updated based on 2006 OSIP aerial imagery) to existing CCAP raster data from 2001.

Surface flow is modeled in AVGWLF using the Soil Conservation Service TR-55 method (USDA 1975), using daily temperature and precipitation inputs. Erosion and sediment yield are estimated using monthly erosion calculations based on the Universal Soil Loss Equation algorithm (with monthly rainfall-runoff coefficients) and a monthly composite of KLSCP values for each source area (K=changes in soil loss erosion, LS=length slope factor, C=vegetation cover factor, P=conservation practices factor). A sediment delivery ratio based on watershed size, and a transport capacity based on average daily runoff, are then applied to the calculated erosion to determine sediment yield for each source area. Surface nutrient losses are determined by applying dissolved nitrogen (N) and phosphorus (P) coefficients to surface runoff and a sediment coefficient to the yield portion for each agricultural source area. Point source discharges can also contribute to dissolved losses and are specified in terms of kilograms per month. Manured areas, as well as septic systems, can also be considered. Urban nutrient inputs are all assumed to be solid-phase, and the model uses an exponential accumulation and washoff function for these loadings. Sub-surface losses are calculated using dissolved N and P coefficients for shallow groundwater contributions to stream nutrient loads, and the sub-surface sub-model only considers a single, lumped-parameter contributing area. Evapotranspiration is determined using daily weather data and a cover factor dependent upon land use/cover type. Finally, a water balance is performed daily using supplied or computed precipitation, snowmelt, initial unsaturated zone storage, maximum available zone storage, and evapotranspiration values.

Table 3.1 Summary of AVGWLF Input Data

Parameter	Method	Time Step	Input	Data Source
Surface Flow	SCS TR-55	daily	Daily temperature and precipitation	NOAA
Erosion	USLE	monthly	Soil type	USDA NRCS
Sediment Yield	KLSCP	monthly	Soil type	USDA NRCS
Nutrient data				Default from model
Land Cover				NOAA CCAP, modified by new wetland areas

The AVGWLF model was run under two different scenarios. Initially, the model was run under current conditions to give baseline values. Next, all wetland landcover was converted to impervious surface, and the model was run again. This process was repeated for each subwatershed to provide an estimate of the water and sediment retained by the wetlands in each subwatershed. The volume retained was divided by the total wetland area to give a per-acre measure of water retained by these wetlands for each subwatershed.

The second method of evaluating wetland hydrologic functions used regression equations developed by Ohio EPA for urban wetlands within the greater Columbus area (Gamble et al. 2007).

For Depressional Wetlands: $V = 0.3557 * A^{0.8045}$

For Riverine Wetlands: $V = 0.6468 * A^{1.0992}$

Where V=Volume contained within wetland boundary (ac-ft) and
A=Wetland area in ac

These equations were used to estimate the volume of water contained by each wetland. These volumes were also compared with the volume of precipitation that fell directly into the wetlands. The volume of precipitation falling into the wetlands is used as a measure of water retention. In general, this measure is more applicable to depressional wetlands than to riverine wetlands, because riverine wetlands would be expected to export more water through overland flow than would depressional wetlands. However, this method was used for both types of wetlands in the Tinkers Creek Watershed.

3.3.3 Economic Significance

Wetlands provide both market and nonmarket values to the private landowner and to the general public. Since most wetland values are diffuse and to the benefit of the public, the private landowner has little method to recover those market values and thus, little incentive to keep an area as wetland if it could be converted to other, more profitable land uses.

Wetland values can be thought of in four major categories: Direct Use Values, Indirect Use Values, Option Values, and Non-Use Values (Lambert 2003). Direct Use Values are the benefits derived from the using the wetlands directly, for fish production, agricultural use, fuel wood, recreation, hunting and trapping, peat mining, etc. These values can be measured directly using market price analysis and travel cost analysis. The second major category of values is Indirect Use Values, which are the indirect societal benefits derived from wetland functions like nutrient retention, flood control, groundwater recharge, external ecosystem support, increased property values, and shoreline stabilization, among others. These values are generally estimated using replacement costs, damage costs avoided, or hedonic pricing (statistical analysis of housing prices at varying distances from an amenity such as a park or wetland). The third value type is Option Value in which an individual derives benefits from ensuring that a resource will be available for future use. The fourth type, Non-Use Value is derived from the knowledge that a resource is maintained for future generations, even if a person has no uses of the resource. These values are generated from surveys.

Most people understand Direct Use Values and Indirect Use Values and the methods to generate these values, but the public does not generally understand the methods by which Option Values and Non-Use Values are obtained. In addition, initial secondary literature review shows that past wetland valuation studies using various methods have provided a range of economic values, from low ($4/ac, Hovde 1993; $14-21/ac, Barbier *et al.* 1997) to mid-range ($883/ac, Emerton and Kekunlandala 2003; $5,986/ac, Costanza *et al*. 1997), to high values ($8,000-$51,000/ac, Leschine et al. 1997). Amacher *et al*. (1989) found economic values of Great Lakes wetlands ranging from $22/ac to $1,475/ac.

These wide ranges of values and methods could lead to public confusion over wetland values in general. While it is possible to evaluate the value of wetlands using surveys and questionnaires, the goal of this project was to develop defensible valuation methods for wetland functions that the public can understand. Therefore, this study focused on those functions of wetlands that the public most readily accepts: flood water storage, property values, and recreational uses such as hunting and park use. The analysis focused on housing values, recreational values, avoided damage costs (flood losses avoided) and replacement costs (the costs for stormwater basins and water treatment facilities to replace the lost hydrologic functions) within the local subwatersheds, as these are the most intuitive societal values that a wetland provides. In addition, the analysis considered current wetland permitting and mitigation costs in money and time. Using these factors, the analysis yielded a per-acre estimate of economic significance of these wetland functions.

The economic valuation method used was similar to that of Leschine *et al.* (1997), who found that the value of wetlands for flood control in Washington State varied between $8,000-$12,000 per acre at one site and $36,000 to $51,000 at another using the "alternative/substitute cost" method. The Tinkers Creek analysis was not based strictly on flood control but included other methods of valuation as well. For example, Census Bureau property data was used to estimate hedonic values associated with proximity to the wetlands. To provide context for the economic study, a review of the literature on wetlands values was conducted. These literature values provide further support for the calculations of economic value in the watershed. Wetland values were calculated as the value of those functions as provided in perpetuity.

Table 3.2. Summary of Societal Values and Costs

Function	Societal Value or Cost	Method of Calculation
Flood Storage	Flooding reduced	Replacement cost (stormwater basin construction)
Flood Storage	Property damage reduction	Damage costs avoided
Sediment and Nutrient Removal	Water Quality Improvement	Replacement Cost (treatment plant)
Permit Preparation Costs and Fees	Avoided private costs	Permitting Costs, Fees and Time Costs
Mitigation Costs	Avoided costs	Mitigation and Monitoring Costs
Property value	Increased adjacent property values	Hedonic valuation (statistical property values analysis)
Recreation	Recreational Value	Travel Cost- based on secondary literature research and available local data

4.0 Results

4.1 Watershed Overview

The Team identified 951 wetlands within the Tinkers Creek Watershed using GIS data and analysis, and available secondary literature sources (Figure 4.1). These 951 wetlands had a total calculated acreage of 3,917 acres, or an average size of 4.11 ac. This is 6.2 percent of the total size of the Tinkers Creek Watershed. If filled to their capacity, these wetlands would hold an estimated 591 acre-feet based on the OEPA regression equation. The basinwide AVGWLF analysis calculated the wetlands as storing and processing a total of 16,006 acre-feet over one year through retention and evapotranspiration, or an average of 4.09 ac-ft per wetland acre per year. This is 27.08 times the calculated volume of the wetlands. EnviroScience visited 57 wetlands totaling 720 acres in size, whose ORAM scores ranged from 24.5 to 96.

Table 4.1. Summary Table of Wetland Characteristics in the Tinkers Creek Subwatershed, 2007.

Cumulative subwatershed total number of wetlands exceeds entire watershed figure due to wetlands that crossed subwatershed boundaries.

Watershed	Communities	Total Area, ac	% Imperv. (KBA 2005)	# of Mapped Wetlands	Ac of Wetlands	Cat. 1 based on Field Visit	Cat. 2* based on Field Visit	Cat. 3** Based on Field Visit	Not Visited
Entire Watershed		62,942	18.84%	951	3,917	8	63	115	832
1-Tinkers Creek Confluence	Valley View, Walton Hills	1,572	7.16%	23	34.8	0	1	2	20
2-Wood Creek	Bedford, Maple Heights, Walton Hills	2,336	43.70%	10	5.2	0	1	2	7
3- Deer Lick Run	Oakwood, Bedford, Walton Hills	2,134	31.00%	26	24.1	0	0	8	18
4-Tinkers Creek Gorge	Oakwood, Glenwillow, Solon, Bedford Heights, Bedford, Walton Hills	5,113	24.80%	79	106.2	0	0	34	45
5-Hawthorn Creek	Beachwood, Highland Hills, Warrensville Heights, North Randall, Bedford Heights, Bedford, Maple Heights	3,383	39.25%	17	31.2	0	2	1	14
6-Mud Creek	Solon, Glenwillow, Orange Township	4,470	27.77%	63	107.6	0	8	1	54
7-Beaver Meadow Run	Solon, Oakwood, Bedford Heights, Warrensville Heights, Orange Township, Highland Hills, Beachwood	4,569	27.01%	75	129.0	0	4		71
8-Middle Tinkers Creek	Twinsburg, Twinsburg Township, Macedonia, Oakwood, Glenwillow	12,253	16.59%	166	361.5	0	6	8	152
9-Pond Brook	Aurora, Reminderville, Twinsburg, Twinsburg Township, Solon, Bainbridge Township	10,173	10.37%	219	1035.0	2	12	16	189
10-Tinkers Creek State Park	Aurora, Streetsboro, Hudson Village, Twinsburg Township	4,668	7.97%	90	1012.1	0	4	17	69
11-Hudson Springs	Hudson Village	3,084	12.99%	56	63.0	0	4	0	52
12-Bell Run	Streetsboro, Aurora	5,031	17.37%	98	565.4	6	7	13	72
13-Tinkers Creek Headwaters	Franklin Township, Streetsboro, Hudson Village	4,156	6.16%	96	441.4	0	14	13	69

4.2 Ecological Significance

The wetlands within the Tinkers Creek Watershed make up approximately 6.2% of the entire watershed. Overall, the watershed contains numerous significant wetland resources, including large wetland complexes at several parks. Of the 162 wetlands evaluated in this and previous studies, 93 are Category 3 or 2-3 Gray Zone wetlands, occupying 1432 ac. Sixty-one are Category 2, Modifed 2, or 1-2 Gray Zone wetlands, occupying 702 ac. Eight are Category 1 wetlands, occupying 13 ac. This was not an average sample, as the current study was biased to select high-quality wetlands over low-quality.

4.3 Hydrologic Significance

The AVGWLF model calculated that as a whole, wetlands within the Tinkers Creek Watershed reduced stream inputs by over 8,000 acre-feet annually and returned another 8,000 acre-feet to the atmosphere by evapotranspiration. When compared with high density development, wetlands retained or processed significantly more of the precipitation falling on them. In fact, the model shows wetlands as a net sink for water, processing more water through evapotranspiration and retention of surface water and ground water than is input to the wetland through direct precipitation. The ratio of water processed to water falling directly on each wetland area is 1.13. Based on the size of wetlands, AVGWLF calculated that an acre of wetland on average retains or processes 3.70 acre-ft water per year.

Nutrient and sediment data should be used only with caution, as they are based on average Pennsylvania values from AVGWLF. Nevertheless, the model indicates that wetlands are a net sink for sediment, nitrogen and phosphorus.

When analyzing flows generated by the 24-hour precipitation with a 10-year return interval, wetlands within the Tinkers Creek Watershed retained 3,149 ac-ft (95,561,000 cu. ft.). Based on cost equations for retention and detention basins as discussed in USEPA (1999), and assuming a per retention basin capacity of 170,000 cu. ft., the cost to retain this amount of water in the Tinkers Creek Watershed would be approximately $81.7 million. This translates to a per-acre value of $18,933.

Table 4.2. Hydrologic Effects of Wetlands within the Tinkers Creek Watershed.

Parameter	With Wetlands	No Wetlands	Difference	Total Volume, ac-ft	Volume per wetland acre, ac-ft	Sediment and Nutrient retention lb/ac
Wetland Area, ac	4,314.5	0	4,314.5			
Precipitation, in	39.32	39.32	0	14,137.2	3.277	
Evapotranspiration, in	14.58	13.07	1.51	7,924.5	1.837	
Groundwater Loss, in	15.69	16.88	-1.19	-6,245.1	-1.447	
Runoff Generated, in	5.92	6.26	-0.34	-1,784.3	-0.414	
Input to Stream, in	21.61	23.15	-1.54	-8,081.9	-1.873	
ET+G+R, in			3.04	15,953.9	3.698	
Erosion, ton	27,606	27,987	-381			-176.6
Sediment, ton	28,333	34,505	-6,172			-2,861.2
Stream Sed, ton	25,932	32,071	-6,139			-2,845.8
Stream N, ton	2,593	3,207	-614			-284.6
Stream P, ton	1,141	1,411	-270			-125.2
Dissolved N, ton	258,506	273,415	-14,909			-6,911.1
Total N, ton	407,027	451,117	-44,090			-20,438.3
Dissolved P, ton	3,540	3,661	-121			-55.9
Total P, ton	22,681	26,237	-3,557			-1,648.6

4.4 Economic Significance

Economic significance is discussed in the following sections, but is summarized in the table below in terms of net present value in perpetuity and annual value.

Table 4.3. Economic Values of Wetlands within the Tinkers Creek Watershed.

Category	Value in Perpetuity per Acre of Wetland (2007 U.S. Dollars)	Per Year Value (Perpetual Value*0.03)
Added Housing Value	$976	$29.28
Public Recreation Value (State Parks and Preserve)	$231,423 ($5,273 to $520,523)	$6,943 ($158 to $15,616)
Avoided Flood Costs	$663	$19.89
Avoided Permitting and Mitigation Costs	$110,000 ($85,000 to $135,000)	$3,300 ($2,550 to $4,050)
Stormwater Basin Replacement Costs (Not including water quality treatment)	$18,933	$567.99
Sum of Above per-Acre Values and Avoided Costs	$393,470 ($110,845 to $676,095)	$12,058.95 ($3,325.35 to $20,282.85)

4.4.1 Housing Value

The presence of natural areas such as wetlands can add to the value of nearby housing. Ideally, to predict the impacts of wetlands on nearby housing values, one would use individual house transaction data to estimate a hedonic house price model. Unfortunately, the collection of such a dataset is prohibitively time consuming, and was outside the scope of this project. Thus, to obtain a rough idea of the potential for wetlands to increase house values, GIS analysis was to combine Census housing data at the Census block group (CBG) level with physical data from the Tinkers Creek Watershed. Because only parts of some of the block groups fell within the watershed, block groups were weighted according to their contribution to the area of the watershed. The result was 103 observations, with the adjusted census block groups covering about 0.95 square miles on average.

The house value model presented in this report was estimated as a simple linear regression, with median value assumed to be a function of house, demographic and physical variables. Each characteristic was viewed as contributing directly to median house values, and the total house value was comprised of the sum of expenditures on individual characteristics. The model was specified as:

$$
\begin{aligned}
&\text{Median\_Value} = a_0 + a_1 * \text{\%\_Wetlands} + a_2 * \text{Number\_of\_Rooms} + \\
&a_3 * \text{Year\_House\_Built} + a_4 * \text{Household\_Income} + a_5 * \text{\%\_Urban\_Population} + \\
&a_6 * \text{Population/Sq\_Mi} + a_7 * \text{Low\_Slope\_Land} + a_8 * \text{High\_Slope\_Land} + \\
&a_9 * \text{Longitudinal\_CBG\_Centroid} + a_{10} * \text{Latitudinal\_CBG\_Centroid} + \varepsilon
\end{aligned}
$$

Because of linearity, the parameter estimates can be interpreted as the marginal contribution to median value of each the explanatory variables, holding all others constant. More generally, the parameter estimates can be interpreted as 'prices' of the various house, demographic, and physical characteristics. The characteristic of interest to this study is the effect of percentage of wetlands in a CBG towards its associated median house value. Table 4.4 below contains the estimated value function, along with the mean values of the underlying variables.

Table 4.4: Median House Value Model*

Variable Name	Parameter Estimate	Mean
Median House Value		$138,862.14
Intercept	-651,210***	1
Wetland Percentage	5,939***	0.25
Median Number of Rooms	26,965***	6.3039
Median Year House Built	1,532***	1966.73
Median Household Income	859***	56.85
Urban Population Percentage	-262***	93.11
Population Density (persons/mi^2)	-7***	2723.59
Average Slope 25-70%	3,919***	0.03
Average Slope<6%	-11,205***	0.05
Distance to Cleveland	-11,171***	15.12
X Coordinate	17,936***	224.99
Y Coordinate	-6,290***	61.82
n =103	R^2=0.845;	F=28,404***

*Regression adjusted for CBG areas within Tinker's Creek Watershed

In the house value model, the per unit value of wetlands in a CBG amounts to $5,939—that is, for every percentage increase in wetlands in a CBG, median house value increases by nearly $6,000.[1] Although the model has relatively few explanatory variables, it appears to be sensible; for example, urban economic theory suggests house values decrease with distance from employment centers, which we see in the negative price of distance from Cleveland. On the other hand, each room contributes about $27,000 to the value of the median house.

It is difficult to calculate the overall impact of the wetlands on all the houses in the Tinkers Creek Watershed—this is because data concerning the variance in house

[1] It should be noted that if a CBG consisted of 100% wetland, it would be the case that no house would be built there. In our data, the percentages are sufficiently small compared to the overall area of the CBG that this is not a concern.

values in a CBG were not available, and any assumptions about the distribution could be misleading. Nonetheless, it appears that in the average CBG of 0.95 square miles, increasing wetland area by one percentage point (6.1 ac) would result in about a 4.3% ($5,939/$138,862) increase in median house value. To translate this to a per-acre value, a 1-acre increase in wetlands in the average CBG would increase median house value by approximately $976.

4.4.2 Recreation Value

The Tinkers Creek Watershed is home to natural areas in which a large number of individuals participate in non-consumptive recreation activities, in particular hiking, biking and bird watching; in one case, fishing, a consumptive activity, is available. Chief among these are Bedford Reservation (2,235 ac, of which 1,858 ac, or 83%, is within the Tinkers Creek Watershed boundary), Liberty Park (1,662 ac), Tinkers Creek State Nature Preserve (786 ac), and Tinkers Creek State Park (355 ac). In 2007, Bedford Reservation was visited by an adjusted 514,813 visitors (0.83*620,257) [personal communication, Cleveland Metroparks], Liberty Park in Summit County was visited by 26,650 recreationists (personal communication, Summit County Metroparks); the Tinkers Creek State Nature Preserve was visited by 2,100 individuals (personal communication, ODNR-Division of Natural Areas and Preserves); and the Tinkers Creek State Park was visited by 26,756 individuals (personal communication, ODNR). Thus in total, about 570,319 individuals participated in outdoor recreation in the Tinkers Creek Watershed's public natural areas.

To put a value on recreation in these natural areas, it would be ideal to conduct surveys and estimate a travel cost model. However, such surveys are expensive, and outside the scope of the project. However, it is possible to get a range of estimated lower bound values from secondary sources.

One method that can provide a lower bound on benefits from recreation activities at the natural areas is to calculate the expected expenditures made by recreationists in the watershed's natural areas. The best available expenditure estimate can be obtained from the US Fish and Wildlife Service (USFWS), which periodically conducts a survey of wildlife-related recreation. The USFWS reports on expenditures for both non-consumptive (e.g. wildlife/bird watching) and consumptive (e.g. fishing) wildlife-related recreation activities. USFWS do not have specific expenditures for activities such as hiking, but it can be assumed that they will be similar to bird watching.

In 2001, the latest year for which individual state figures are available, per trip expenditures on wildlife related recreation activities was estimated at $15, or $17.56[2] in 2007 dollars. Applying the average per person expenditures to the visitation levels suggests that total expenditures associated with Bedford Reservation within the watershed were about $9,040,122 in 2007 (0.83*620,257 visitors * $17.56); those associated with Liberty Park were approximately $467,974 in 2007; and total expenditures associated with the Tinkers Creek Nature Preserve were about $36,876 in 2007. Tinkers Creek State Park also provides opportunities for recreational fishing, which adds to the potential value of the site; Ohio anglers' per-trip expenditures in 2007 dollars were $23.60 per annum. According to the survey, about 33% of those who participated in outdoor recreation were anglers, while 67% were nonconsumptive. Applying these percentages to the 26,756 visitors to Tinkers Creek State Park, it was estimated that about 8,919 engaged in fishing activities while 17,837 engaged in nonconsumptive activities. Thus the expected 2007 annual expenditures at the park would be $523,706 ($210,481 for anglers and $313,218 for others). Summing the above estimates, the total for all recreation expenditures within the Tinkers Creek watershed is thus estimated at $10,068,676 for 2007.

The problem with per trip expenditures is that they cannot capture economic surplus, which is the amount one is willing to pay over and beyond the actual expenditures made on recreation activities. One source of estimates of recreation values that take such benefits into account can be obtained from a technical report by the US Forest Service

[2] Obtained from the US Bureau of Labor Statistics' Inflation Calculator http://data.bls.gov/cgi-bin/cpicalc.pl

(USFS).[3] The USFS document contains a meta-analysis of different types of per-visit, recreation-based benefits, including those for picnicking, hiking, sightseeing, etc. However, the estimates were made for calendar year 2000, so it is necessary to adjust the benefits for inflation to 2007 dollars. Table 4.5 contains selected benefit values from the USFS report, in 2000 and 2007 dollars.[4]

Table 4.5: Forecasted United States Average Benefit Values from Meta Analysis

Activity	Value in 2000 U.S. dollars	Value in 2007 U.S. dollars
Picnicking, Sightseeing, Hiking, Wildlife Viewing	$29.57	$34.62
Fishing	$36.63	$42.89
Biking	$15.27	$17.88

Aside from Bedford Reservation, there is no basis for splitting out bicycling from other nonconsumptive activities, although it is a reasonable assumption that there will be no cycling at the Tinkers Creek State Nature Preserve. It was assumed a maximum of 10% visitors to the other two parks will engage in cycling, thus resulting in cyclist numbers of about 5,341 ((55,506-2,100)*0.10), and 2007 annual benefits of about $95,490. In addition, for Bedford Reservation data was available on cycling participation, estimated at 17% of 620,257 total visitors; adjusting for the portion of the reservation in the watershed, it was estimated that surplus from cycling at the reservation are $1,564,827 (0.17*0.83*620,257*$17.88). This brought total cycling surplus estimates to $1,660,317 for 2007. Fishing is an available activity at Tinkers Creek State Park; it was assumed, as before, a third of visitors to the site engage in this activity. Thus, the fishing benefit of $42.89 from Table 2 accrued to 8,919 visitors (26,756/3) for an annual total benefit of $382,536. All remaining activities were valued at $34.62 per visit, which was applied to all other visitors—427,295 from Bedford Reservation (620,027*[1-0.17]*0.83), 2,100 from Tinkers Creek State Nature Preserve,

[3] Randall S. Rosenberger and John B. Loomis. "Benefit Transfer of Outdoor Recreation Use Values: A Technical Document Supporting the Forest Service Strategic Plan (2000 Revision)", US Department of Agriculture Forest Service. Available online at: http://marineeconomics.noaa.gov/bibsbt/Benefits_Transfer_Guide.pdf.

[4] Inflation adjustments were made with the Bureau of Labor Statistics' CPI Inflation calculator, available online at: http://data.bls.gov/cgi-bin/cpicalc.pl.

23,985 (26,650*0.9) from Liberty Park, and 15,161 (26,756-2,676 cyclists-8,919 anglers) from Tinkers Creek State Park for a total value of $16,220,905. Combining all these values resulted in a grand total of about $18.3 million annual recreation benefits from Tinkers Creek Watershed's natural areas, or an additional $8.2 million above the expenditures estimated from the USFWS survey.

As demonstrated above, expenditures alone under-represent the benefits enjoyed by recreationists. However, there are additional, regional economic benefits associated with outdoor activities, known as multiplier effects. These are generally estimated using a widely accepted program called IMPLAN, which captures the impact of dollars spent on various activities as they filter through the economy. According to Chang (2001),[5] IMPLAN multipliers for recreation nationally range from 1.4 to 2.4; a recent study by Ojumu and Hite (2007)[6] found a 1.7 multiplier for recreational fishing in Alabama. The basic interpretation of these multipliers is that for every dollar spent on recreation, 0.4-1.4 dollars additional are spent in the regional economy. The multiplier effects result from individuals purchasing equipment, gasoline, food, and so on, which then gets paid in salaries and spent by others in the regional economy. Assuming the multiplier effect in the Tinkers Creek Watershed is 1.4, then a conservative net multiplier effect for the estimated expenditures of $10,068,676 would be $4,027,471.

Based on all the above calculations, a conservative annual recreation benefit estimate for the public natural areas associated with Tinkers Creek Watershed wetland areas was found to be $10,068,676 in direct expenditures, $18,263,757 in consumer surplus and $4,027,471 in regional multiplier effects. The total annual benefit is thus $32,359,903 in 2007 dollars, or on average $8,142 per ac of preserved parkland (including wetland). It is important to note that average values per park ranged from $158/ac to $15,616/ac, and were strongly dependent on number of visitors.

[5] Chang, Wen-Huei. 2001. "Variations in Multipliers and Related Economic Ratios for Recreation and Tourism Impact Analysis." Unpublished PhD Dissertation, Michigan State University, Lansing, MI.
[6] Gbenga Ojumu and Diane Hite. 2007. "Economic Impacts of Recreational Fisheries in Alabama's Black Belt." Unpublished report, Auburn University, Auburn, AL.

Table 4.6: 2007 Recreational Benefits of Public Lands in the Tinkers Creek Watershed

Park	Park Size (ac)	Visits/ Year	Expenditures	Economic Surplus	Multiplier Effect	Total Benefits	Benefits/ Visits/Yr	Benefits/ ac/yr	Benefits/ac in Perpetuity
Bedford Reservation	1,858	514,813	$9,040,122	$16,357,781	$3,616,049	$29,013,952	$56.36	$15,616	$520,523
Liberty Park	1,662	26,650	$467,974	$878,011	$187,190	$1,533,175	$57.53	$922	$30,750
Tinkers Creek Nature Preserve	786	2,100	$36,876	$72,702	$14,750	$124,328	$59.20	$158	$5,273
Tinkers Creek State Park	355	26,756	$523,704	$955,263	$209,482	$1,688,449	$63.11	$4,756	$158,540
All Parks	4,661	570,319	$10,068,676	$18,263,757	$4,027,471	$32,359,904	$56.74	$6,943	$231,423

The benefit in perpetuity is given by *B/i* where *i* is the real interest rate, and *B* is the annual benefit. The typical assumption for real interest rate is 3% per annum, suggesting that the net present value of benefits of recreation in the Tinkers Creek public natural areas is $1.08 billion ($32,359,904/0.03), or $231,423/ac. This level of value is remarkable in light of a 2003 study by the Ohio Environmental Agency[7] that found the watershed to be "uniquely impaired" by phosphorus and bacteria. The implication is that any improvement in water quality could increase the total value estimated here. For example, Hite et al. (2002)[8] found that Mississippi residents would be willing to pay an annual tax of about $47 to get a 10% improvement in water quality.

4.4.3 Flood Reduction Benefits

The wetlands in the Tinkers Creek Watershed have significant potential to mitigate flooding of surrounding areas; for example, a recent study in the US estimated that 0.4 hectares (1 acre) of wetland can store more than 6,000 cubic meters (4.86 acre-feet) of floodwater.[9] In our study, we found that for every acre of wetland in the Tinkers Creek Watershed, approximately 3.70 acre-feet of water is sequestered or processed.

Table 4.7: Rainfall Sequestration in Tinkers Creek Wetlands[10]

Average Yearly Rainfall (ft) falling directly on wetland footprint (per Acre of Wetland)	3.28
Wetlands Area (Acres)	3,917
Estimated Total Rainfall on Wetland Footprint (Acre-Feet per year)	12847.8
Estimated Total Retention and Processing by Wetlands from AVGWLF model (Acre-Feet per year)	15,953.9

7 "Total Maximum Daily Loads for the Lower Cuyahoga River Final Report," Ohio Environmental Protection Agency, Division of Surface Water, Sept 2003.

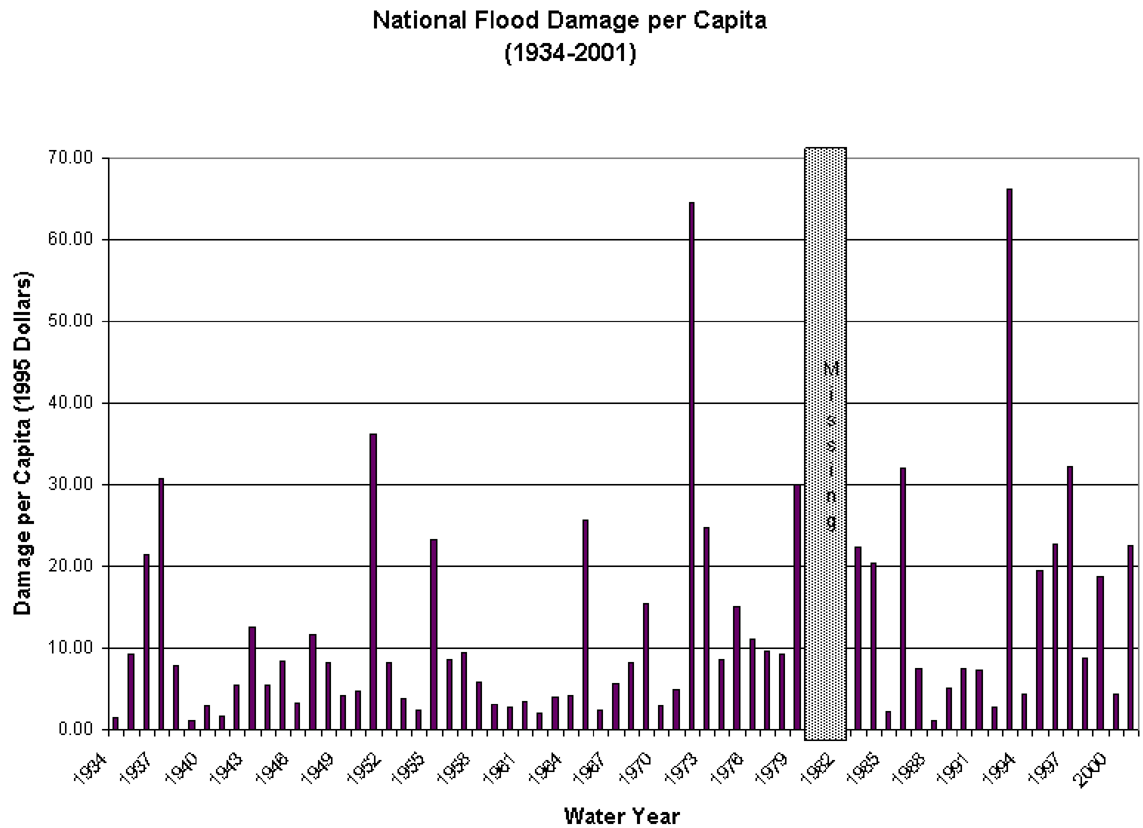
8 Hite, D., D Hudson and W. Intarapaong. 2002 "Willingness to Pay for Water Quality Improvements: the Case of Precision Application Technology." Journal of Agricultural and Resource Economics 27(20)433-449.

9 Background papers on Wetland Values and Functions, the Ramsar Convention on Wetlands. Available online at http://www.ramsar.org/info/values_floodcontrol_e.htm

10 Calculated using SAS software and data compiled by Enviroscience, Inc.

Flooding obviously has significant economic consequences. On a per capita basis, in 1995 dollars, the national *per capita* cost of floods has ranged from about $2 to $67, as seen in the chart below. In terms of 2007 dollars, the costs are $2.72-$91.15, and the damage amounts are trending upward over time.

Figure 4.2. National Flood Damage Per Capita, 1934-2001.



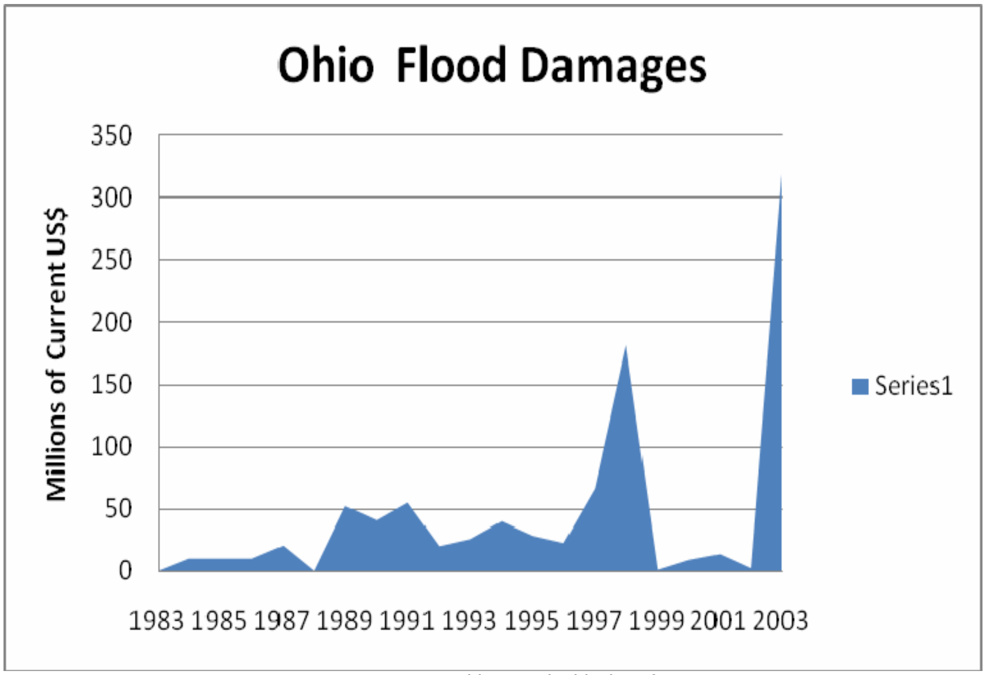
Source: http://www.flooddamagedata.org/cgi/national.cgi

In Ohio, *total* annual flood damages from 1983-2003 have ranged from zero to over $300 million dollars per year, which are also trending upward.

There are a number of reasons that flooding damages are increasing. First, more houses are being built in flood plains. Second, houses have increased in size over time. According to Eggers and Thackeray (2007),[11] median single-family detached house sizes increased by 10% between 1985 and 2005, and thus the houses embody more value that can be subject to potential damages.

[11] F. J. Eggers and A. Thackeray. 2007. "32 Years of Housing Data." Econometrica, Inc. Bethesda, Maryland, available online http://www.huduser.org/datasets/ahs/AHS_taskC.pdf

Figure 4.3. Ohio Flood Damages, 1983-2003.



Source: Generated in Excel with data from http://www.flooddamagedata.org/data/statescurrent65111054-386.txt

Third, urbanization and increases in impervious surface areas have resulted in less percolation of water through the ground, and have also resulted in rerouting of storm water and surface runoff in unpredictable ways. Finally, and importantly to the current study, wetlands have been filled in during the urbanization process, decreasing sequestration of increased urban runoff. Although exact figures are unavailable to estimate urbanization growth in the Tinkers Creek Watershed, the Cuyahoga River Community Planning Organization reports on its website that urban growth rates of a contiguous watershed (Brandywine Creek) are about 10% annually.[12] Any additional urbanization pressure would make the remaining wetlands in Tinkers Creek a critical feature in flood prevention.

In order to obtain economic benefits of flood mitigation, it was first recognized that house values within flood zones are negatively impacted; because benefits of flood mitigation[13] are based on house values, it was necessary to adjust average house

12 http://www.crcpo.org/brandywinecreek.html

13 The benefit of flood mitigation is the potential for decreased damage costs.

values within the flood plains down, and to adjust other house values upward to compensate. To examine the impact of 100 year flood zones in the Tinkers Creek Watershed on houses in the watershed, owner occupied housing was concentrated upon.[14] In the 103 CBGs included that are at least partially in the watershed, it was found that approximately 4,478.95 acres within the 100 year floodplain.[15] Further, in those CBGs, the total value of all owner occupied houses in the Tinkers Creek Watershed was about $2.4 billion in 2000—a figure that does not include significant commercial, industrial and public property value.

In a 1998 study, the US Army Corps of Engineers (USACE)[16] calculated that a 0.42% chance of flooding would reduce house values by 0.157%; since a 100 year flood zone implies a 1% chance of flooding, it was expected that the sample house values that are in flood plains would be reduced by 0.374%. Further, in the economic analysis, it is important to note that the value reductions were found to be equal to the net present value of expected flood damages.

If house values are decreased in the flood zones, then other values are increased outside the flood zone. Thus, an adjustment was made on CBG total owner occupied house values such that the value inside a flood plain was TV* %_in *(1-0.00374) and that outside was TV- TV* %_in *(1-0.00374), where TV was the total owner occupied house value reported by Census for 2000, %_in was the percentage of the CBG within the watershed that falls in a flood plain, and 1-0.00374 was the estimated amount that houses are discounted according to the USACE study.

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[14] We are restricted to housing because of data on the value of other types of property are not readily available.

[15] Within the 100 year flood plains, there are areas of more frequent flooding, which would have larger impacts for property damage; however, we do not have the complete distribution of house values, densities, and flooding frequencies with which to make inferences in this report.

[16] P.T. Chao, J.L. Floyd, W. Holliday. 1998 "Empirical Studies of the Effect of Flood Risk on Housing Prices." US Army Corps of Engineers, Institute for Water Resources REPORT 98-PS-2 Alexandria, VA 22315-3868. http://www.iwr.usace.army.mil/inside/products/pub/iwrreports/98ps2.pdf

Table 4.8. House Value Adjustments at CBG Level[17]

Percentage Area in Flood Plain	7.14%
Percentage House Value Adjustment	0.374%
Total CBG House Value within Watershed	$2,410,809,963
Total Adjusted Value in Flood Plain	$60,333,788
Total Adjusted Value out of Flood Plain	$2,350,476,176

A study by the University of Manitoba Natural Resources Institute found that a 2% increase in wetlands areas would decrease total flood volume in Manitoba's Red River Valley by about 3.7%, or about 1.85% decrease in flood volume for a 1% increase in wetland area.[18] Although precise economic estimates would require sophisticated hydrologic models to understand the relationship between topography and flooding in the Tinkers Creek Watershed, a rough estimate was made on the assumption that there is a one-to-one relationship between flood volume and the frequency of flooding. Thus, a 1% increase in wetland area resulted in a 1.85% decrease in the probability of flooding in houses in the existing flood plain.

To examine the economic impact of decreased flooding frequency, the USACE estimate above was considered and applied to house values in the Tinkers Creek Watershed. As before, 1% flooding probability decreased house values by 0.374%, representing the net present value of the expected damage costs. Thus it is assumed the overall added value of a 1% increase in the wetlands area was 0.692% (1.85%*0.374%) of total adjusted house value from Table 4.7. Therefore, it was expected that the total value of houses in flood zones in Tinkers Creek Watershed would increase by $417,510 (0.00692*$60,333,788). This represents the net present value in the watershed of avoided flood damage costs resulting from a 1% decrease in flooding to be gained by increasing wetland areas by 1%.

[17] Calculated using SAS software and data compiled by Enviroscience, Inc.
[18] K. Juliano and S.P. Simonovic. 1999. "The Impact of Wetlands on Flood Control in the Red River Valley of Manitoba." Final Report, Natural Resources Institute University of Manitoba Winnipeg, Manitoba.

Based on a total watershed size of 98.34 square miles, the per-acre value of avoided flood damage costs would be $663/ac of added wetland. However, it should be noted that this figure is highly conservative for a number of reasons. First, it does not capture avoided flooding costs to commercial and industrial structures; second, it does not capture avoided flooding costs to public infrastructure; finally, the projection is made based on a simplifying assumption that the areal extent of the flood zones stays the same, while it can be said with some certainty that increasing sequestration will decrease the extent of existing flood zones. In addition, it would be desirable to perform a non-marginal calculation, for example, to estimate amount of damage that would occur if the wetlands did not exist and compare that to the amount mitigated by the current wetlands. However, the relationship between flooding, sequestration and damages is highly nonlinear, which would result in a higher degree of error than the estimates reported here.

4.4.4 Stormwater and Nutrient Retention

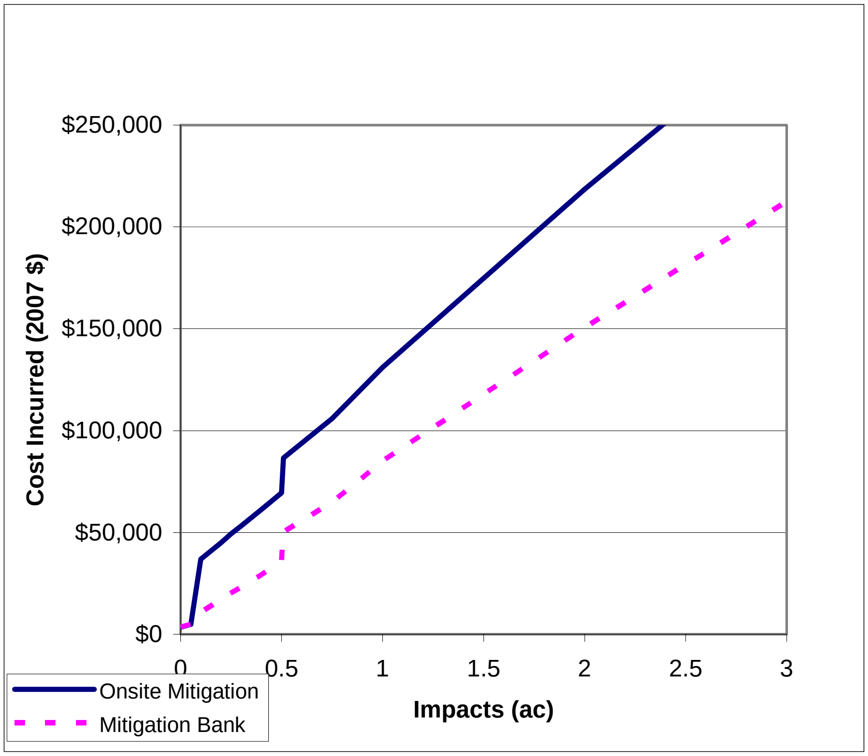
When analyzing flows generated by the 24-hour precipitation with a 10-year return interval, wetlands within the Tinkers Creek Watershed retained 3,149 ac-ft (95,561,000 cu. ft.). Based on cost equations for retention and detention basins as discussed in USEPA (1999), and assuming a per retention basin capacity of 170,000 cu. ft., the cost to retain this amount of water in the Tinkers Creek Watershed would be approximately $81.7 million. This translates to a per-acre value of $18,933.

Using simulations of the impacts of agricultural best management practices on nonpoint source pollution, Intarapapong et al. (2005) found that the marginal cost of sediment reduction ranges from $0.12 to $38.54 per ton in 2005 dollars, while the marginal cost of nitrate reduction ranges from $1.22 to $9.24 per pound. The increasing marginal costs associated with reducing these pollutants suggest that there is a significant value due to sediment and nitrate impoundment of wetlands. In particular, wetlands can recycle nonpoint source pollution in a way that is much less costly than agricultural producers are able to.

4.4.5 Permitting Costs for Wetland Impacts

Permitting costs in the state of Ohio are rising as permitting and mitigation requirements become more stringent. Typical 2007 costs incurred due to federal and state wetland delineation and permitting requirements have been summarized in the graph below. The graph assumes that all wetlands are under Corps jurisdiction.

Figure 4.4. Approximate 2007 Permitting Costs for Wetland Impacts.



4.5 Subwatershed Summaries

The following summaries provide additional data for each subwatershed. Political boundaries do not coincide with subwatershed boundaries; therefore, Table 4.9 is provided below.

Table 4.9. Political Boundaries and Associated Subwatersheds

County	City, Village, Township	Sub-Watershed
Cuyahoga	Beachwood	Hawthorn Creek (5), Beaver Meadow Run (7)
Cuyahoga	Bedford	Wood Creek (2), Deer Lick Run (3), Tinkers Creek Gorge (4), Hawthorn Creek (5)
Cuyahoga	Bedford Heights	Wood Creek (2), Tinkers Creek Gorge (4), Hawthorn Creek (5), Beaver Meadow Run (7)
Cuyahoga	Glenwillow	Tinkers Creek Gorge (4), Mud Creek (6), Middle Tinkers Creek (8)
Cuyahoga	Highland Hills	Hawthorn Creek (5), Beaver Meadow Run (7)
Cuyahoga	Maple Heights	Wood Creek (2)
Cuyahoga	North Randall	Hawthorn Creek (5)
Cuyahoga	Oakwood Village	Deer Lick Run (3), Tinkers Creek Gorge (4), Beaver Meadow Run (7), Middle Tinkers Creek (8)
Cuyahoga	Orange	Mud Creek (6), Beaver Meadow Run (7)
Cuyahoga	Solon	Tinkers Creek Gorge (4), Mud Creek (6), Beaver Meadow Run (7), Middle Tinkers Creek (8), Pond Brook (9)
Cuyahoga	Valley View	Tinkers Creek Confluence (1)
Cuyahoga	Walton Hills	Tinkers Creek Confluenc (1), Wood Creek (2), Deer Lick Run (3), Tinkers Creek Gorge (4)
Cuyahoga	Warrensville Heights	Hawthorn Creek (5), Beaver Meadow Run (7)
Geauga	Bainbridge Township	Pond Brook (9)
Portage	Aurora	Pond Brook (9), Tinkers Creek State Park (10)
Portage	Franklin Township	Tinkers Creek Headwaters (13)
Portage	Streetsboro	Tinkers Creek State Park (10), Bell Run (12), Tinkers Creek Headwaters (13)
Portage	Sugar Bush Knolls	Tinkers Creek Headwaters (13)
Summit	Hudson Village	Middle Tinkers Creek (8), Tinkers Creek State Park (10), Hudson Springs (11), Bell Run (12), Tinkers Creek Headwaters (13)
Summit	Macedonia	Deer Lick Run (3), Middle Tinkers Creek (8),
Summit	Northfield	Deer Lick Run (3)
Summit	Reminderville	Pond Brook (9)
Summit	Twinsburg	Middle Tinkers Creek (8), Pond Brook (9)
Summit	Twinsburg Township	Middle Tinkers Creek (8), Pond Brook (9), Tinkers Creek State Park (10)

Table 4.10. Summary of the 2007 Wetland Rankings Results, Showing the 20 Highest Ranking Wetlands in the Tinkers Creek Watershed.

WETLAND ID	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank	AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)	Economic Value	Economic Rank	Average Rank	Final Rank
103	3	Y	Y	244.868	**1**	908.5	273.3	**1**	$82,053,293	**1**	1.0	**1**
820	3	Y	Y	195.150	**2**	724.0	213.0	**2**	$65,402,013	**2**	2.0	**2**
810	3	Y	Y	98.143	**3**	364.1	100.1	**3**	$32,912,543	**3**	3.0	**3**
633	3	Y	Y	65.514	**4**	243.1	64.2	**5**	$21,984,556	**5**	4.7	**4**
144	3	Y	Y	45.096	**6**	167.3	42.6	**12.5**	$15,146,486	**8**	8.8	**5**
39	3	Y	Y	37.630	**7**	139.6	34.9	**15.5**	$12,645,917	**10**	10.8	**6**
755	3	Y	Y	36.443	**8**	135.2	33.7	**16.5**	$12,248,319	**11**	11.8	**7**
145	3	Y	Y	29.743	**10**	110.3	26.9	**21.5**	$10,004,173	**13**	14.8	**8**
113	3	Y	N	45.142	**5**	167.5	42.6	**11.5**	$4,714,825	**33**	16.5	**9**
782	3	Y	Y	27.190	**11**	100.9	24.4	**26.5**	$9,149,343	**16**	17.8	**10**
784	3	Y	Y	24.130	**12**	89.5	21.4	**30.5**	$8,124,604	**19**	20.5	**11**
37	3	Y	N	36.081	**9**	133.9	33.3	**17.5**	$3,777,037	**40**	22.2	**12**
42	3	Y	Y	17.727	**14**	65.8	15.3	**40.5**	$5,979,978	**24**	26.2	**13**
82	3	Y	Y	20.103	**13**	74.6	4.0	**66**	$6,775,749	**22**	33.7	**14**
38	3	Y	Y	13.121	**16**	48.7	11.0	**50.5**	$4,437,196	**36**	34.2	**15**
621	2 MOD	N	Y	52.004	**94**	192.9	49.8	**8**	$17,459,993	**7**	36.3	**16**
41	3	Y	Y	17.670	**15**	65.6	3.6	**72.5**	$5,961,033	**25**	37.5	**17**
279	3	N	N	50.281	**80**	186.5	48.0	**9**	$5,246,649	**28**	39.0	**18**
645	3	N	Y	29.294	**82**	108.7	26.5	**23**	$9,853,937	**14**	39.7	**19**
634	3	Y	Y	10.290	**19**	38.2	8.4	**62.5**	$3,489,204	**42**	41.2	**20**

1-Tinkers Creek Confluence

The Tinkers Creek Confluence subwatershed is 1,572 ac in size, and has a large amount of natural areas for its urban location. The subwatershed has 7.16% impervious surface (Kerr+Boron 2005). There are 23 wetlands within the subwatershed with a total area of 32.1 ac. Of the three wetlands with known ORAM scores, none were Category 1, two were Category Modified 2 or Category 2, and one was Category 3.

2-Wood Creek

The Wood Creek subwatershed is 2,336 ac in size. The subwatershed has 43.70% impervious surface (Kerr+Boron 2005). There are 10 wetlands within the subwatershed with a total area of 5.2 ac. Of the three wetlands with known ORAM scores, none were Category 1, two were Category Modified 2 or Category 2, and one was Category 3. Wetlands within the subwatershed retain and process a total of 33.1 ac-ft of water per year, for an average retention of 2.67 ac-ft per acre of wetland per year.

3-Deer Lick Run

The Deer Lick Run subwatershed is 2,134 ac in size. The subwatershed has 31.00% impervious surface (Kerr+Boron 2005). There are 26 wetlands within the subwatershed with a total area of 24.1 ac. Of the eight wetlands with known ORAM scores, all eight were classified as Category 3. Wetlands within the subwatershed retain and process a total of 90.7 ac-ft of water per year, for an average retention of 3.33 ac-ft per acre of wetland per year.

4-Tinkers Creek Gorge

The Tinkers Creek Gorge subwatershed is 5,113 ac in size. The subwatershed has 24.80% impervious surface (Kerr+Boron 2005). There are 79 wetlands within the subwatershed with a total area of 106.2 ac. Of the 34 wetlands with known ORAM scores, all were Category 3. Wetlands within the subwatershed retain and process a total of 447.4 ac-ft of water per year, for an average retention of 3.55 ac-ft per wetland acre per year.

5-Hawthorn Creek

The Hawthorn Creek subwatershed is 3,383 ac in size. The subwatershed has 39.25% impervious surface (Kerr+Boron 2005). There are 17 wetlands within the subwatershed with a total area of 31.2 ac. Of the three wetlands with known ORAM scores, 0 were Category 1, two were Category Modified 2 or Category 2, and one was Category 3. Wetlands within the subwatershed retain and process a total of 104.3 ac-ft of water per year, for an average retention of 3.25 ac-ft of water per acre wetland per year.

6-Mud Creek

The Mud Creek subwatershed is 4,470 ac in size. The subwatershed has 27.77% impervious surface (Kerr+Boron 2005). There are 63 wetlands within the subwatershed with a total area of 107.6 ac. Of the nine wetlands with known ORAM scores, none were Category 1, eight were Category Modified 2 or Category 2, and one was Category 3. Wetlands within the subwatershed retain and process a total of 458.2 ac-ft of water per year, for an average retention of 3.57 ac-ft water per wetland acre per year.

7-Beaver Meadow Run

The Beaver Meadow Run subwatershed is 4,569 ac in size. The subwatershed has 27.01% impervious surface (Kerr+Boron 2005). There are 75 wetlands within the subwatershed with a total area of 129 ac. Of the All four wetlands with known ORAM scores were Category Modified 2 or Category 2. Wetlands within the subwatershed retain and process a total of 468.3 ac-ft of water per year, for an average retention of 3.64 ac-ft per wetland acre per year.

8-Middle Tinkers Creek

The Middle Tinkers Creek subwatershed is 12,253 ac in size. The subwatershed has 16.59% impervious surface (Kerr+Boron 2005). There are 166 wetlands within the subwatershed with a total area of 361.5 ac. Of the 14 wetlands with known ORAM scores, none were Category 1, six were Category Modified 2 or Category 2, and eight were Category 3. Wetlands within the subwatershed retain and process a total of

1459.3 ac-ft of water per year, for an average retention of 3.58 ac-ft of water per wetland acre per year.

9-Pond Brook

The Pond Brook subwatershed is 10,173 ac in size. The subwatershed has 10.37% impervious surface (Kerr+Boron 2005). There are 219 wetlands within the subwatershed with a total area of 1,035 ac. Of the 30 wetlands with known ORAM scores, two were Category 1, 12 were Category Modified 2 or Category 2, and 16 were Category 3. Wetlands within the subwatershed retain and process a total of 3967.5 ac-ft of water per year, for an average retention of 3.73 ac-ft per wetland acre per year.

10-Tinkers Creek State Park

The Tinkers Creek State Park subwatershed is 4,668 ac in size. The subwatershed has 7.97% impervious surface (Kerr+Boron 2005). There are 90 wetlands within the subwatershed with a total area of 1,012 ac. Of the 21 wetlands with known ORAM scores, none were Category 1, four were Category Modified 2 or Category 2, and 17 were Category 3. Wetlands within the subwatershed retain and process a total of 3789.9 ac-ft of water per year, for an average retention of 3.58 ac-ft of water per wetland acre per year.

11-Hudson Springs

The Hudson Springs subwatershed is 3,084 ac in size. The subwatershed has 12.99% impervious surface (Kerr+Boron 2005). There are 56 wetlands within the subwatershed with a total area of 63.0 ac. All four wetlands with known ORAM scores were Category 2 wetlands. Wetlands within the subwatershed retain and process a total of 275.0 ac-ft of water per year, for an average retention of 3.59 ac-ft of water per wetland acre per year.

12-Bell Run

The Bell Run subwatershed is 5,031 ac in size. The subwatershed has 17.37% impervious surface (Kerr+Boron 2005). There are 98 wetlands within the subwatershed with a total area of 565.4 ac. Of the 26 wetlands with known ORAM scores, six were Category 1, seven were Category Modified 2 or Category 2, and 13 were Category 3. Wetlands within the subwatershed retain and process a total of 1916.0 ac-ft of water per year, for an average retention of 2.97 of water per wetland acre per year.

13-Tinkers Creek Headwaters

The Tinkers Creek Headwaters subwatershed is 4,156 ac in size. The subwatershed has 6.16% impervious surface (Kerr+Boron 2005). There are 96 wetlands within the subwatershed with a total area of 441.4 ac. Of the 27 wetlands with known ORAM scores, none were Category 1, 14 were Category Modified 2 or Category 2, and 13 were Category 3. Wetlands within the subwatershed retain and process a total of 2033.0 ac-ft of water per year, for an average retention of 3.69 ac-ft of water per acre wetland per year.

5.0 Discussion and Conclusions

The analysis shows that despite the rapid growth within the watershed, the Tinkers Creek Watershed contains significant wetland resources whose ecosystem functions provide a high societal value. As expected, the major predictor of hydrologic and ecological wetland values within the watershed was wetland size. Larger wetlands contained and removed larger flows of water than smaller wetlands. The role of evapotranspiration in the wetland hydrologic cycle is extremely important. Evapotranspiration was often equal to the retention of surface and groundwater, essentially doubling the water storage capacity of the wetlands.

Economic valuation methods for wetlands can rarely include the value of all functions provided by the wetlands. The major value of wetlands from an economic standpoint came from their recreational value, stormwater retention capabilities, and avoided permitting and mitigation costs.

High value wetlands were often found to be protected by parks, but several unprotected high-quality wetlands remain in the Tinkers Creek Watershed, particularly Wetlands 33, 37, 113, 279, and 996.

6.0 Recommendations for Further Analysis

Output from the AVGWLF model can be used with another Penn State University product called PRedICT (Pollution Reduction Impact Comparison Tool) [http://www.predict.psu.edu/overview.htm]. This companion software tool would allow CCBH to create various scenarios comparing current watershed conditions modeled in this study with conditions following implementation of best management practices throughout the watershed. The PRedICT tool allows the user to calculate not only the reduction in pollutants, but also the costs of implementation so that a user can identify the most cost-effective and efficient pollution reduction strategy. Input of data from identified point sources in the watershed would improve model accuracy and utility.

7.0 References

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Online Resources

http://data.bls.gov/cgi-bin/cpicalc.pl
http://marineeconomics.noaa.gov/bibsbt/Benefits_Transfer_Guide.pdf
http://ogrip.oit.ohio.gov/ServicesData/StatewideImagery/tabid/86/Default.aspx
http://www.avgwlf.psu.edu/
http://www.predict.psu.edu/overview.htm
http://www.crcpo.org/brandywinecreek.html
http://www.csc.noaa.gov/crs/lca/ccap.html
http://www.flooddamagedata.org/cgi/national.cgi
http://www.flooddamagedata.org/data/statescurrent65111054-386.txt
http://www.huduser.org/datasets/ahs/AHS_taskC.pdf
http://www.iwr.usace.army.mil/inside/products/pub/iwrreports/98ps2.pdf
http://www.ncdc.noaa.gov/oa/ncdc.html
http://www.ramsar.org/info/values_floodcontrol_e.htm
http://www.soils.usda.gov/survey/geography/ssurgo/

Appendix A: Maps

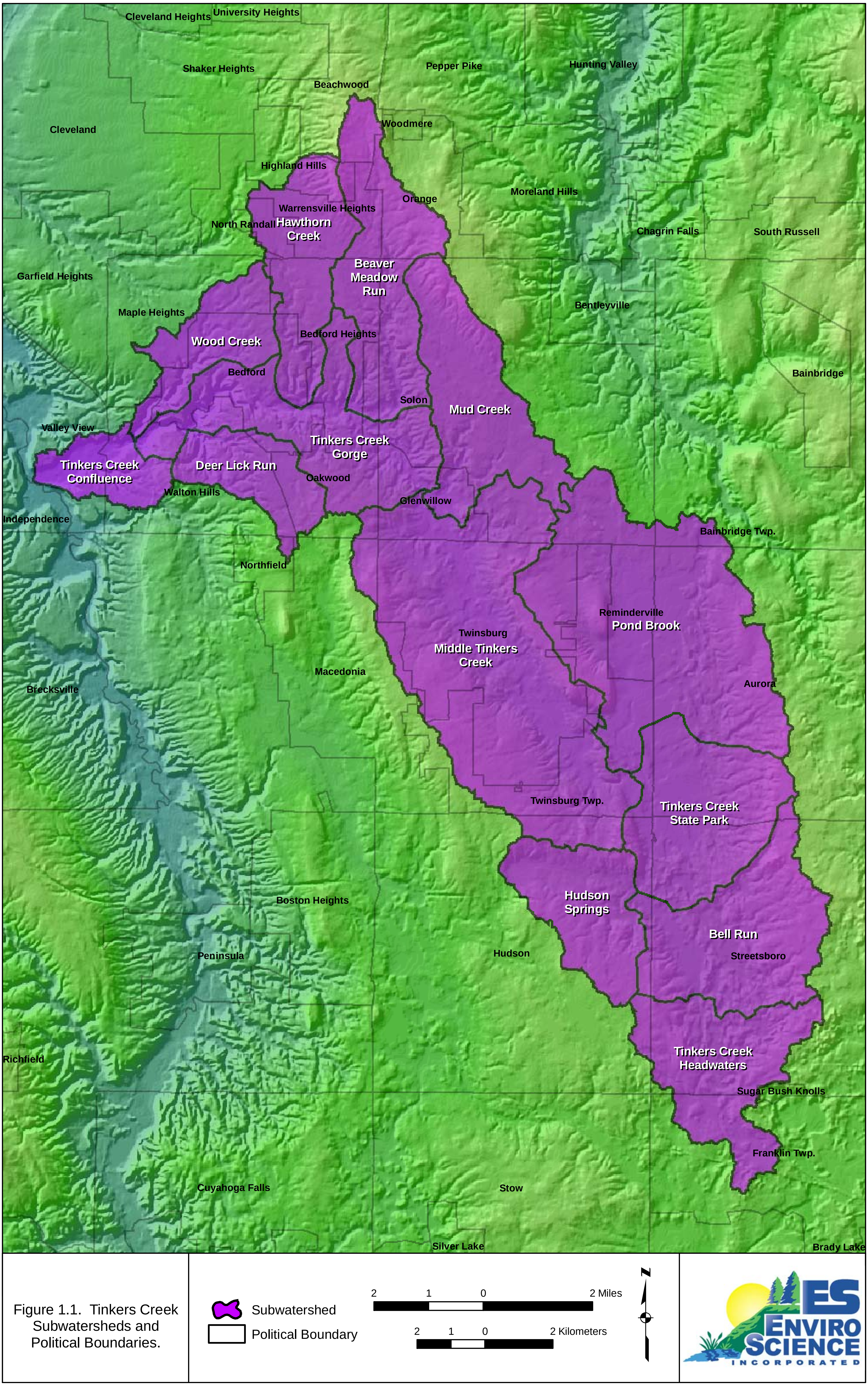


Figure 1.1. Tinkers Creek Subwatersheds and Political Boundaries.

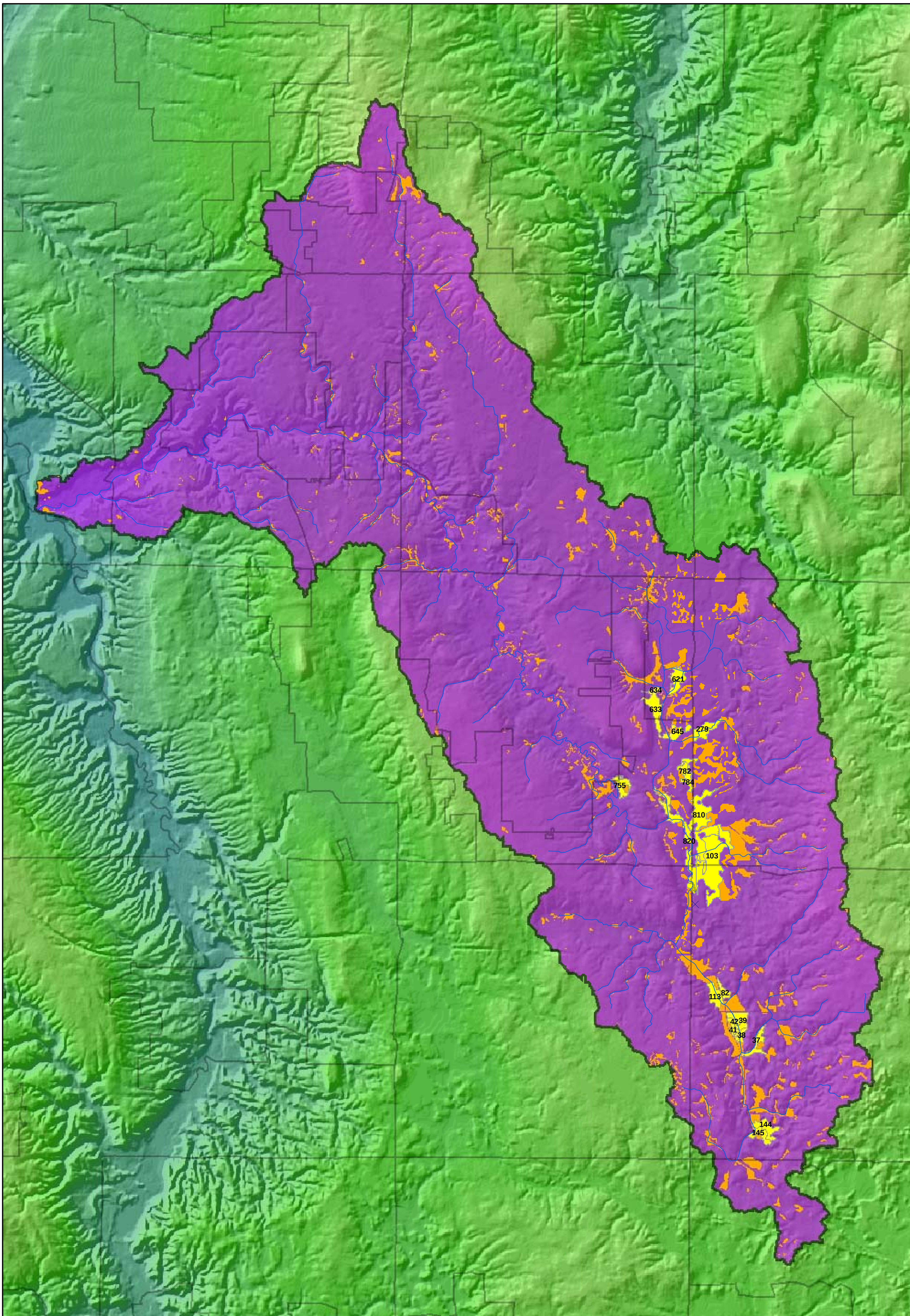


Figure 4.1. Tinkers Creek Political Boundaries, Streams and Wetlands.

Appendix B: Wetland Ranking Results

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank	AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)	Economic Value	Economic Rank	Average Rank	Final Rank
103	-81.3850784	41.2771873	3	Y	Y	244.868	1	908.5	273.3	1	$82,053,293	1	1.0	1
820	-81.3926428	41.2824018	3	Y	Y	195.150	2	724.0	213.0	2	$65,402,013	2	2.0	2
810	-81.3893133	41.2899776	3	Y	Y	98.143	3	364.1	100.1	3	$32,912,543	3	3.0	3
633	-81.4041990	41.3148977	3	Y	Y	65.514	4	243.1	64.2	5	$21,984,556	5	4.7	4
144	-81.3670091	41.2106778	3	Y	Y	45.096	6	167.3	42.6	12.5	$15,146,486	8	8.8	5
39	-81.3755798	41.2375318	3	Y	Y	37.630	7	139.6	34.9	15.5	$12,645,917	10	10.8	6
755	-81.4152505	41.2963913	3	Y	Y	36.443	8	135.2	33.7	16.5	$12,248,319	11	11.8	7
145	-81.3688188	41.2090188	3	Y	Y	29.743	10	110.3	26.9	21.5	$10,004,173	13	14.8	8
113	-81.3841345	41.2439400	3	Y	N	45.142	5	167.5	42.6	11.5	$4,714,825	33	16.5	9
782	-81.3944820	41.2999331	3	Y	Y	27.190	11	100.9	24.4	26.5	$9,149,343	16	17.8	10
784	-81.3932820	41.2998229	3	Y	Y	24.130	12	89.5	21.4	30.5	$8,124,604	19	20.5	11
37	-81.3702592	41.2319273	3	Y	N	36.081	9	133.9	33.3	17.5	$3,777,037	40	22.2	12
42	-81.3779322	41.2375569	3	Y	Y	17.727	14	65.8	15.3	40.5	$5,979,978	24	26.2	13
82	-81.3812860	41.2451188	3	Y	Y	20.103	13	74.6	4.0	66	$6,775,749	22	33.7	14
38	-81.3753074	41.2340240	3	Y	Y	13.121	16	48.7	11.0	50.5	$4,437,196	36	34.2	15
621	-81.3973273	41.3229874	2 MOD	N	Y	52.004	94	192.9	49.8	8	$17,459,993	7	36.3	16
41	-81.3783088	41.2358818	3	Y	Y	17.670	15	65.6	3.6	72.5	$5,961,033	25	37.5	17
279	-81.3878711	41.3104554	3	N	N	50.281	80	186.5	48.0	9	$5,246,649	28	39.0	18
645	-81.3968134	41.3099199	3	N	Y	29.294	82	108.7	26.5	23	$9,853,937	14	39.7	19
634	-81.4049953	41.3202131	3	Y	Y	10.290	19	38.2	8.4	62.5	$3,489,204	42	41.2	20
996	-81.4065089	41.3458872	2-3 GRAY	N	N	57.131	91	212.0	55.2	7	$5,955,581	26	41.3	21
184	-81.3768015	41.2816632	2	N	Y	80.391	120	298.2	80.3	4	$26,967,106	4	42.7	22
278	-81.3962488	41.3153961	3	N	Y	42.341	81	157.1	7.2	39	$14,223,487	9	43.0	23
969	-81.3957478	41.3282309	3	N	Y	25.186	83	93.4	22.4	29.5	$8,478,250	18	43.5	24
185	-81.3734248	41.2857272	2	N	Y	64.833	121	240.5	63.4	6	$21,756,656	6	44.3	25
36	-81.3755211	41.2310867	3	Y	Y	9.606	20	35.6	7.8	68.5	$3,260,019	46	44.8	26
619	-81.4140408	41.3241654	3	N	Y	23.054	84	85.5	20.4	31.5	$7,764,110	20	45.2	27
92	-81.3785231	41.2703330	3	N	Y	20.798	85	77.2	18.2	33.5	$7,008,507	21	46.5	28
33	-81.3596520	41.2346564	2 MOD	N	N	34.147	95	126.7	31.3	18.5	$3,576,907	41	51.5	29
646	-81.3937181	41.3076592	3	N	Y	15.751	86	58.4	13.4	44	$5,318,165	27	52.3	30
785	-81.3926348	41.2934545	3	Y	Y	8.417	24	31.2	6.7	80	$2,861,863	54	52.7	31
148	-81.3695564	41.2187466	2 MOD	N	N	33.183	96	123.1	30.4	20.5	$3,477,111	44	53.5	32
380	-81.4928225	41.3776820	3	Y	Y	8.121	25	30.1	6.5	82	$2,762,729	55	54.0	33
547	-81.4869941	41.4458437	2	N	N	44.641	122	165.6	42.1	13.5	$4,663,020	34	56.5	34
616	-81.4047981	41.3244888	2	N	Y	27.058	125	100.4	24.3	27.5	$9,105,106	17	56.5	35
81	-81.3784014	41.2421411	2-3 GRAY	N	N	25.951	92	96.3	23.2	28.5	$2,728,693	56	58.8	36
579	-81.4915242	41.3792930	3	Y	Y	9.000	21	33.4	2.1	117	$3,057,018	49	62.3	37
783	-81.3957509	41.2989503	3	Y	Y	8.792	22	32.6	2.0	118.5	$2,987,570	50	63.5	38
744	-81.4227119	41.2957443		N	Y	34.138	166	126.7	31.3	19.5	$11,476,392	12	65.8	39
568	-81.4844293	41.3525023	2	N	N	28.447	124	105.5	25.6	24	$2,987,016	51	66.3	40
187	-81.3801602	41.2908749	2 MOD	N	N	18.724	98	69.5	16.2	36.5	$1,980,715	67	67.2	41
861	-81.3899912	41.2511898		N	N	47.611	163	176.6	45.2	10	$4,970,361	30	67.7	42
3	-81.3713463	41.2020119	2 MOD	N	N	27.266	97	101.2	5.1	54	$2,864,721	53	68.0	43
210	-81.3803186	41.3124150	2 MOD	N	N	18.026	99	66.9	15.5	37.5	$1,908,465	69	68.5	44
93	-81.3815811	41.2701439		N	Y	27.247	167	101.1	24.5	25.5	$9,168,323	15	69.2	45
43	-81.3770667	41.2298490	3	Y	N	11.200	17	41.6	2.5	96.5	$1,202,050	96	69.8	46
143	-81.3706637	41.2132491	2	N	Y	13.348	129	49.5	11.2	49.5	$4,513,472	35	71.2	47
22	-81.3333605	41.2266873	3	Y	N	8.715	23	32.3	7.0	76.5	$944,802	118	72.5	48
114	-81.3842402	41.2472731	3	Y	N	10.873	18	40.3	2.4	99.5	$1,168,231	101	72.8	49
234	-81.3761493	41.3426826	2	N	N	29.700	123	110.2	5.4	50	$3,116,615	48	73.7	50
6	-81.3731639	41.1999655	2	N	N	18.855	126	70.0	16.3	35.5	$1,994,238	66	75.8	51
282	-81.3864898	41.3036717		N	N	45.381	164	168.4	7.7	36	$4,739,580	32	77.3	52
754	-81.4139800	41.2956847	3	Y	Y	6.666	27	24.7	1.6	144.5	$2,275,493	61	77.5	53
289	-81.3857062	41.2875817		N	Y	17.804	171	66.1	15.3	39.5	$6,005,915	23	77.8	54
20	-81.3372634	41.2269068	3	Y	N	8.116	26	30.1	6.5	84	$882,871	125	78.3	55
532	-81.4285267	41.3634433	2 MOD	N	N	12.747	101	47.3	10.6	55.5	$1,362,104	87	81.2	56
193	-81.3856179	41.2990861		N	N	40.153	165	149.0	6.9	40.5	$4,198,505	39	81.5	57
50	-81.3750482	41.2256343	2	N	N	15.724	127	58.3	13.4	45	$1,670,229	77	83.0	58
91	-81.3746950	41.2746826		N	Y	15.079	175	55.9	12.8	46	$5,093,050	29	83.3	59
237	-81.3829540	41.3485766	2 MOD	N	N	15.753	100	58.4	3.3	79.5	$1,673,274	75	84.8	60
583	-81.4189259	41.3582853		N	N	22.543	168	83.6	19.9	32.5	$2,375,993	58	86.2	61
137	-81.3862712	41.2159973	2	N	N	13.349	128	49.5	11.2	48.5	$1,424,487	83	86.5	62
201	-81.3776971	41.3023146	2-3 GRAY	N	N	9.770	93	36.2	7.9	67.5	$1,054,065	106	88.8	63
102	-81.3782254	41.2787372		N	Y	12.874	180	47.8	10.7	53.5	$4,354,768	37	90.2	64
528	-81.4298977	41.3695219	2 MOD	N	N	10.038	102	37.2	8.2	65.5	$1,081,723	104	90.5	65
550	-81.4760353	41.4211004	2 MOD	N	N	9.807	103	36.4	8.0	66.5	$1,057,869	105	91.5	66
80	-81.3768777	41.2407895		N	N	17.915	170	66.5	15.4	38.5	$1,896,983	70	92.8	67
608	-81.4118710	41.3399460	1-2 GRAY	N	N	12.990	146	48.2	10.8	51.5	$1,387,236	84	93.8	68
803	-81.3975388	41.2917066		N	Y	14.416	177	53.5	3.0	84	$4,870,963	31	97.3	69
617	-81.4092651	41.3226843		N	Y	10.268	189	38.1	8.4	63.5	$3,481,954	43	98.5	70
44	-81.3792275	41.2339821		N	N	20.640	169	76.6	4.1	64	$2,178,967	63	98.7	71
152	-81.3646464	41.2152175		N	Y	10.047	190	37.3	8.2	64.5	$3,407,774	45	99.8	72
971	-81.4568289	41.3468215	3	N	N	8.002	88	29.7	6.4	85.5	$871,046	128	100.5	73
622	-81.3994968	41.3264207		N	Y	9.558	192	35.5	7.7	70.5	$3,244,075	47	103.2	74
959	-81.6082353	41.3698762		N	Y	12.599	182	46.7	2.7	91	$4,262,671	38	103.7	75
156	-81.3744927	41.2189230		N	N	12.894	179	47.8	10.7	52.5	$1,377,310	85	105.5	76
604	-81.3955471	41.3387117		N	N	17.587	172	65.2	3.6	73.5	$1,863,004	71	105.5	77
163	-81.3573440	41.2186395	2	N	N	9.174	132	34.0	7.4	73	$992,371	114	106.3	78
11	-81.3804311	41.1970831		N	N	16.462	173	61.1	3.4	75	$1,746,577	73	107.0	79
150	-81.3642643	41.2127952	3	Y	Y	3.934	29	14.6	1.1	204.5	$1,360,403	88	107.2	80
821	-81.3928986	41.2681902		N	N	12.834	181	47.6	10.7	54.5	$1,371,164	86	107.2	81
582	-81.4318995	41.3549602		N	N	16.398	174	60.8	3.4	76	$1,740,002	74	108.0	82
837	-81.3940052	41.2598226	3	N	N	8.665	87	32.1	2.0	121	$939,650	119	109.0	83
153	-81.3589526	41.2145028		N	N	12.486	183	46.3	10.4	57	$1,335,114	90	110.0	84
747	-81.4275050	41.3005943		N	N	12.243	184	45.4	10.2	58	$1,309,934	92	111.3	85
35	-81.3656170	41.2293586		N	N	14.633	176	54.3	3.1	82.5	$1,557,325	79	112.5	86
40	-81.3793594	41.2365811	3	Y	Y	3.606	31	13.4	1.0	217.5	$1,250,563	95	114.5	87
280	-81.3896401	41.3061584		N	N	13.525	178	50.2	2.9	85.5	$1,442,660	82	115.2	88
121	-81.3906933	41.2494386	2	N	N	9.514	130	35.3	2.2	110	$1,027,497	109	116.3	89
149	-81.3703798	41.2152646		N	N	10.708	187	39.7	8.8	61	$1,151,152	102	116.7	90
13	-81.3559566	41.1906602	3	Y	N	5.694	28	21.1	1.4	160.5	$632,227	163	117.2	91
576	-81.4581397	41.3639385	2	N	N	9.347	131	34.7	2.1	112.5	$1,010,284	111	118.2	92
560	-81.5176469	41.3802756	3	Y	Y	3.395	32	12.6	1.0	228.5	$1,180,048	98	119.5	93
562	-81.5040456	41.3838762	3	Y	Y	3.395	33	12.6	1.0	229.5	$1,179,953	99	120.5	94
76	-81.3742679	41.2485939		N	N	9.584	191	35.6	7.8	69.5	$1,034,816	108	122.8	95
291	-81.3864857	41.2891485		N	Y	6.686	213	24.8	5.2	97	$2,282,230	60	123.3	96
628	-81.3944168	41.3207753		N	Y	8.440	196	31.3	2.0	123	$2,869,599	52	123.7	97
812	-81.3992778	41.2803483		N	N	11.770	185	43.7	2.6	94.5	$1,261,016	94	124.5	98
545	-81.4917561	41.4443760		N	N	11.015	186	40.9	2.5	98.5	$1,182,847	97	127.2	99
663	-81.4429453	41.3275509	2 MOD	N	N	6.702	104	24.9	1.6	143	$736,484	143	130.0	100
112	-81.3896970	41.2569055		N	N	10.375	188	38.5	2.3	102.5	$1,116,614	103	131.2	101
776	-81.4142020	41.3021508		N	N	8.584	195	31.8	6.9	78.5	$931,273	121	131.5	102
612	-81.4043742	41.3303277		N	Y	7.242	204	26.9	1.7	134.5	$2,468,400	57	131.8	103
561	-81.5057135	41.3827929	3	Y	Y	2.374	36	8.8	1.7	230	$838,062	134	133.3	104
849	-81.3951497	41.2548614		N	N	8.332	197	30.9	6.7	81	$905,187	122	133.3	105
630	-81.3982518	41.3190948	2	N	Y	4.555	137	16.9	1.2	186	$1,568,493	78	133.7	106
575	-81.4526782	41.3511191	2	N	N	5.928	134	22.0	4.6	109.5	$656,398	160	134.5	107
834	-81.3935456	41.2640011		N	N	8.120	198	30.1	6.5	83	$883,215	124	135.0	108
637	-81.3945282	41.3173531		N	Y	6.717	212	24.9	1.6	141.5	$2,292,628	59	137.5	109
312	-81.5082393	41.3841128	3	Y	Y	2.866	34	10.6	0.8	270	$1,002,872	113	139.0	110
32	-81.3597601	41.2325987		N	N	7.766	202	28.8	6.2	87.5	$846,672	132	140.5	111
816	-81.3987610	41.2836593		N	N	9.065	193	33.6	2.1	116	$981,031	115	141.3	112
641	-81.3978032	41.3117803		N	Y	6.458	216	24.0	1.6	147.5	$2,205,889	62	141.8	113
692	-81.4553950	41.3359551	3	N	N	5.357	89	19.9	1.4	168.5	$597,305	170	142.5	114
474	-81.5214517	41.4055265		N	N	7.184	205	26.7	5.7	89.5	$786,370	135	143.2	115

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank	AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)	Economic Value	Economic Rank	Average Rank	Final Rank
584	-81.4111140	41.3592721		N	N	8.726	194	32.4	2.0	119.5	$946,028	117	143.5	116
99	-81.3782102	41.2772445		N	Y	6.309	218	23.4	1.6	149.5	$2,155,831	64	143.8	117
139	-81.3860633	41.2091441		N	N	7.132	206	26.5	5.6	90.5	$780,980	136	144.2	118
246	-81.3791101	41.3336417	2	N	N	6.285	133	23.3	1.6	152.5	$693,391	151	145.5	119
737	-81.4121084	41.2810810		N	N	6.879	209	25.5	5.4	93	$754,804	139	147.0	120
83	-81.3816376	41.2408249		N	N	6.876	210	25.5	5.4	94	$754,565	140	148.0	121
651	-81.4097033	41.3110392		N	Y	6.008	225	22.3	1.5	156	$2,054,969	65	148.7	122
64	-81.3648393	41.2407394		N	N	6.851	211	25.4	5.4	95	$751,946	141	149.0	123
34	-81.3691239	41.2314537		N	N	8.042	199	29.8	1.9	127	$875,145	127	151.0	124
23	-81.3349037	41.2239048	3	Y	N	3.907	30	14.5	1.1	206.5	$447,247	217	151.2	125
277	-81.3872851	41.3149958		N	N	7.935	200	29.4	1.9	128.5	$864,154	129	152.5	126
910	-81.4022981	41.2286978	2	N	N	5.663	135	21.0	1.4	161.5	$628,998	164	153.5	127
515	-81.4656672	41.3621731	1-2 GRAY	N	N	4.865	147	18.0	3.7	125	$546,389	189	153.7	128
161	-81.3580615	41.2217136	2 MOD	N	N	5.146	105	19.1	1.3	174.5	$575,476	182	153.8	129
952	-81.6061584	41.3644802		N	Y	5.627	230	20.9	1.4	163.5	$1,927,568	68	153.8	130
261	-81.3755560	41.3406121		N	N	7.804	201	29.0	1.9	130	$850,609	131	154.0	131
63	-81.3683272	41.2407928		N	N	7.708	203	28.6	1.8	131.5	$840,603	133	155.8	132
141	-81.3856396	41.2071404		N	N	6.307	219	23.4	4.9	101.5	$695,640	148	156.2	133
259	-81.3743495	41.3208246		N	N	6.288	220	23.3	4.9	102.5	$693,669	149	157.2	134
529	-81.4286374	41.3690608		N	N	6.287	221	23.3	4.9	103.5	$693,586	150	158.2	135
565	-81.5006857	41.3633873		N	N	6.284	222	23.3	4.9	105	$693,212	152	159.7	136
425	-81.4048532	41.3582540		N	N	7.097	207	26.3	1.7	137	$777,399	137	160.3	137
178	-81.3681278	41.2795625		N	Y	4.182	260	15.5	3.1	141.5	$1,443,475	81	160.8	138
600	-81.3960574	41.3436910		N	N	6.916	208	25.7	1.7	138	$758,697	138	161.3	139
840	-81.3937601	41.2524352		N	N	6.078	223	22.5	4.7	106	$671,889	155	161.3	140
204	-81.3774298	41.3090002		N	N	6.014	224	22.3	4.6	107	$665,296	156	162.3	141
614	-81.4032320	41.3273891		N	Y	5.129	242	19.0	1.3	175.5	$1,760,688	72	163.2	142
146	-81.3694005	41.2087489		N	Y	4.864	244	18.0	1.3	179	$1,671,925	76	166.3	143
491	-81.5127978	41.3966979		N	N	5.850	228	21.7	4.5	110.5	$648,359	161	166.5	144
218	-81.3586209	41.3007716	2 MOD	N	N	4.335	106	16.1	1.2	192.5	$491,516	204	167.5	145
806	-81.4057549	41.2935989		N	N	6.581	214	24.4	1.6	145.5	$724,016	144	167.8	146
197	-81.3814754	41.3048551		N	N	6.514	215	24.2	1.6	146.5	$717,057	145	168.8	147
12	-81.3630038	41.1918465	2	N	N	4.743	136	17.6	1.2	183.5	$533,799	193	170.8	148
236	-81.3815975	41.3410476		N	N	6.410	217	23.8	1.6	148.5	$706,331	147	170.8	149
115	-81.3872195	41.2478112		N	N	5.377	233	19.9	4.1	114.5	$599,371	168	171.8	150
318	-81.5017400	41.3835908	3	Y	Y	1.627	39	6.0	1.1	303	$587,905	176	172.7	151
31	-81.3503214	41.2349573		N	N	5.320	236	19.7	4.1	117.5	$593,508	173	175.5	152
845	-81.3965870	41.2580983		N	N	5.310	237	19.7	4.1	118.5	$592,483	174	176.5	153
460	-81.5767959	41.3793323	3	Y	Y	2.011	38	7.5	0.6	349.5	$716,373	146	177.8	154
100	-81.3810742	41.2771237		N	Y	4.262	259	15.8	1.1	195.5	$1,470,300	80	178.2	155
370	-81.5337466	41.3755134		N	N	5.213	239	19.3	4.0	120.5	$582,419	179	179.5	156
45	-81.3809652	41.2385536		N	N	5.974	226	22.2	1.5	157	$661,207	158	180.3	157
966	-81.4459878	41.3066417		N	N	5.205	240	19.3	4.0	121.5	$581,598	180	180.5	158
203	-81.3852691	41.3062398		N	N	5.971	227	22.2	1.5	158	$660,809	159	181.3	159
254	-81.3727169	41.3244085		N	N	5.185	241	19.2	3.9	122.5	$579,535	181	181.5	160
94	-81.3774228	41.2692963		N	Y	3.370	285	12.5	2.5	165.5	$1,171,659	100	183.5	161
319	-81.4981992	41.3813971	3	Y	Y	1.528	41	5.7	1.0	323.5	$554,562	187	183.8	162
912	-81.3959998	41.2236648		N	N	5.634	229	20.9	1.4	162.5	$625,983	165	185.5	163
745	-81.4252197	41.2978671		N	N	4.835	245	17.9	3.7	126.5	$543,330	190	187.2	164
509	-81.4864286	41.3744834		N	N	5.611	231	20.8	1.4	165	$623,565	166	187.3	165
937	-81.5767969	41.3726482		N	Y	3.900	267	14.5	1.1	207.5	$1,348,942	89	187.8	166
264	-81.3844275	41.3409649		N	N	5.478	232	20.3	1.4	166	$609,815	167	188.3	167
286	-81.3900293	41.2997025		N	N	5.373	234	19.9	1.4	167.5	$598,926	169	190.2	168
788	-81.3944007	41.2899343		N	Y	3.787	269	14.1	1.0	211	$1,311,325	91	190.3	169
485	-81.4848225	41.4107263		N	N	4.550	249	16.9	3.4	131	$513,775	195	191.7	170
798	-81.4022477	41.2978864		N	N	5.333	235	19.8	1.4	169.5	$594,876	172	192.2	171
790	-81.3987529	41.2986019		N	Y	3.664	271	13.6	1.0	213.5	$1,269,926	93	192.5	172
819	-81.3943807	41.2735836		N	N	4.456	251	16.5	3.3	133.5	$504,095	197	193.8	173
556	-81.4976730	41.3981970		N	N	4.449	252	16.5	3.3	134.5	$503,345	198	194.8	174
552	-81.4800153	41.4066841		N	N	5.234	238	19.4	1.3	171.5	$584,593	178	195.8	175
885	-81.3927066	41.2515969		N	N	4.418	253	16.4	3.3	135.5	$500,161	200	196.2	176
734	-81.4185391	41.2791133		N	N	4.398	255	16.3	3.3	137	$498,083	202	198.0	177
1015	-81.3598407	41.2445786		N	N	4.378	256	16.2	3.3	138	$495,986	203	199.0	178
844	-81.4411438	41.2624411	2	N	N	3.435	138	12.7	1.0	226	$398,377	237	200.3	179
294	-81.3702595	41.2773060		N	Y	3.007	310	11.2	2.2	186	$1,049,861	107	201.0	180
154	-81.3625715	41.2210499		N	N	5.020	243	18.6	1.3	176.5	$562,444	184	201.2	181
381	-81.4902027	41.3764515	3	Y	Y	1.301	43	4.8	0.9	360	$478,526	207	203.3	182
566	-81.4972502	41.3625152		N	N	4.095	261	15.2	3.0	143	$466,713	208	204.0	183
77	-81.3688371	41.2503524	1	N	N	3.452	155	12.8	1.0	224	$400,159	235	204.7	184
940	-81.5723197	41.3679041	2 MOD	N	Y	1.552	112	5.8	1.0	319.5	$562,643	183	204.8	185
173	-81.3371435	41.2239574	3	Y	N	2.727	35	10.1	0.8	281	$325,142	300	205.3	186
895	-81.3986002	41.2335346		N	N	4.765	246	17.7	1.2	181.5	$535,994	191	206.2	187
800	-81.4027154	41.2947771		N	N	4.036	263	15.0	3.0	145	$460,626	211	206.3	188
8	-81.3654391	41.1963100		N	N	4.745	247	17.6	1.2	182.5	$533,956	192	207.2	189
526	-81.4798371	41.3712764		N	N	4.573	248	17.0	1.2	185	$516,129	194	209.0	190
192	-81.3824348	41.2978422		N	N	4.489	250	16.7	1.2	188	$507,455	196	211.3	191
531	-81.4360130	41.3658513	2 MOD	N	N	3.010	107	11.2	0.9	256.5	$354,394	271	211.5	192
546	-81.4924950	41.4524981		N	N	3.851	268	14.3	2.8	149.5	$441,496	218	211.8	193
499	-81.4557579	41.3864321	1-2 GRAY	N	N	3.192	148	11.8	0.9	238.5	$373,199	250	212.2	194
842	-81.4065096	41.2485417	2 MOD	N	N	2.580	109	9.6	1.8	216	$309,873	313	212.7	195
269	-81.3888538	41.3212990		N	N	4.411	254	16.4	1.2	190.5	$499,456	201	215.2	196
175	-81.3410606	41.2185972		N	N	3.656	273	13.6	2.7	153	$421,286	222	216.0	197
227	-81.3568535	41.3195849		N	N	3.643	274	13.5	2.7	154	$419,964	223	217.0	198
379	-81.4952543	41.3781714	3	Y	Y	1.532	40	5.7	0.5	425.5	$555,946	186	217.2	199
235	-81.3796096	41.3400353		N	N	4.301	257	16.0	1.2	193.5	$488,003	205	218.5	200
281	-81.3842561	41.3075009		N	N	4.295	258	15.9	1.1	194.5	$487,436	206	219.5	201
62	-81.3669244	41.2418724		N	N	3.539	278	13.1	2.6	157	$409,200	228	221.0	202
165	-81.3606202	41.2042192		N	N	4.072	262	15.1	1.1	200.5	$464,328	210	224.2	203
571	-81.4866574	41.3698852		N	N	3.494	281	13.0	2.6	159.5	$404,480	233	224.5	204
603	-81.3921587	41.3381523		N	N	4.020	264	14.9	1.1	202	$458,979	212	226.0	205
47	-81.3800280	41.2300445	1	N	N	3.011	156	11.2	0.9	255	$354,503	269	226.7	206
964	-81.4767670	41.3099464		N	N	4.008	265	14.9	1.1	203.5	$457,742	213	227.2	207
467	-81.4960594	41.4506942	2 MOD	N	N	2.747	108	10.2	0.8	278	$327,235	297	227.7	208
567	-81.4944128	41.3509670		N	N	3.402	283	12.6	2.5	162	$395,018	239	228.0	209
483	-81.4786859	41.4042981		N	N	3.934	266	14.6	1.1	205.5	$450,000	216	229.2	210
1004	-81.5312843	41.3604909		N	N	3.401	284	12.6	2.5	163.5	$394,856	240	229.2	211
848	-81.3982942	41.2563237		N	N	3.314	287	12.3	2.4	168	$385,859	242	232.3	212
382	-81.4893882	41.3762771	3	Y	Y	1.068	45	4.0	0.7	419.5	$400,650	234	232.8	213
794	-81.3979621	41.2971980		N	Y	2.913	322	10.8	0.8	267.5	$1,018,562	110	233.2	214
110	-81.3891073	41.2596155		N	N	3.727	270	13.8	1.0	212.5	$428,577	220	234.2	215
70	-81.3619043	41.2443047		N	N	3.272	289	12.1	2.4	169.5	$381,551	245	234.5	216
653	-81.4112679	41.3131455		N	Y	2.868	324	10.6	0.8	269	$1,003,511	112	235.0	217
130	-81.3857853	41.2230827	2	N	N	2.786	139	10.3	0.8	274	$331,194	294	235.7	218
598	-81.4011931	41.3436628		N	N	3.657	272	13.6	1.0	214.5	$421,345	221	235.8	219
574	-81.4762469	41.3658851		N	N	3.245	291	12.0	2.4	171	$378,750	247	236.3	220
51	-81.3735990	41.2245875		N	N	3.637	275	13.5	1.0	216.5	$419,322	224	238.5	221
949	-81.5475106	41.3878089	3	Y	Y	1.260	44	4.7	0.4	466	$465,011	209	239.7	222
970	-81.4199189	41.3352149		N	N	3.588	276	13.3	1.0	219	$414,195	225	240.0	223
67	-81.3620532	41.2417052		N	N	3.565	277	13.2	1.0	220	$411,866	227	241.3	224
211	-81.3790035	41.3109341		N	N	3.136	296	11.6	2.3	175	$367,449	253	241.3	225
176	-81.3705223	41.2806812		N	Y	2.746	330	10.2	0.8	279	$962,682	116	241.7	226
753	-81.4157956	41.2983054	3	Y	N	2.188	37	8.1	0.7	333	$269,308	355	241.7	227
673	-81.4345544	41.3171867		N	N	3.522	279	13.1	1.0	221.5	$407,369	229	243.2	228
162	-81.3616172	41.2227739		N	N	3.495	280	13.0	1.0	222.5	$404,567	232	244.8	229
805	-81.3960831	41.2871426		N	N	3.079	302	11.4	2.2	178.5	$361,577	260	246.8	230

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank	AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)	Economic Value	Economic Rank	Average Rank	Final Rank
627	-81.3916806	41.3235843		N	Y	2.673	336	9.9	0.8	286.5	$938,094	120	247.5	231
268	-81.3890394	41.3377213		N	N	3.448	282	12.8	1.0	225	$399,730	236	247.7	232
490	-81.5119742	41.3933967		N	N	3.046	306	11.3	2.2	181	$358,154	265	250.7	233
749	-81.4222278	41.2984459		N	N	3.323	286	12.3	0.9	231.5	$386,785	241	252.8	234
973	-81.4088609	41.2602041		N	N	3.025	308	11.2	2.2	182.5	$355,940	268	252.8	235
17	-81.3603551	41.1825799	2	N	N	2.521	140	9.4	0.7	301	$303,850	321	254.0	236
97	-81.3502787	41.2808017		N	N	3.010	309	11.2	2.2	184.5	$354,440	270	254.5	237
475	-81.5023299	41.4272140		N	N	3.296	288	12.2	0.9	233	$383,991	243	254.7	238
551	-81.4715809	41.4150495		N	Y	2.573	346	9.5	0.8	296	$904,697	123	255.0	239
199	-81.3802792	41.3022051		N	N	3.254	290	12.1	0.9	235	$379,615	246	257.0	240
993	-81.4099531	41.3457980		N	N	2.985	312	11.1	2.2	187.5	$351,780	273	257.5	241
416	-81.4543932	41.3526406		N	N	3.240	292	12.0	0.9	236.5	$378,237	248	258.8	242
982	-81.3943128	41.2187176		N	N	3.210	293	11.9	0.9	237.5	$375,130	249	259.8	243
642	-81.3937608	41.3123310		N	Y	2.491	352	9.2	0.7	302.5	$877,125	126	260.2	244
151	-81.3657813	41.2197299		N	N	3.184	294	11.8	0.9	239.5	$372,454	251	261.5	245
399	-81.4723696	41.3563808		N	N	2.936	316	10.9	2.1	190.5	$346,739	279	261.8	246
577	-81.4559445	41.3646223		N	N	3.181	295	11.8	0.9	241	$372,078	252	262.7	247
514	-81.4734837	41.3575314		N	N	2.931	317	10.9	2.1	191.5	$346,202	280	262.8	248
65	-81.3654360	41.2441549		N	N	2.925	318	10.9	2.1	192.5	$345,662	281	263.8	249
488	-81.5178352	41.3838894	3	Y	Y	0.913	46	3.4	0.6	469.5	$348,675	278	264.5	250
1012	-81.3575113	41.2422105		N	N	3.136	297	11.6	0.9	243	$367,432	254	264.7	251
804	-81.3956332	41.2866165		N	N	2.925	319	10.9	2.1	193.5	$345,640	282	264.8	252
432	-81.3967843	41.3505212		N	N	3.124	298	11.6	0.9	244.5	$366,177	256	266.2	253
618	-81.4127828	41.3207893		N	Y	2.419	360	9.0	0.7	311	$852,910	130	267.0	254
504	-81.5358517	41.3683731		N	N	3.104	299	11.5	0.9	245.5	$364,130	257	267.2	255
283	-81.3904621	41.3010799		N	N	3.101	300	11.5	0.9	246.5	$363,852	258	268.2	256
889	-81.4319740	41.2636699		N	N	2.881	323	10.7	2.1	197	$341,065	287	269.0	257
87	-81.3496920	41.2462122		N	N	3.095	301	11.5	0.9	247.5	$363,238	259	269.2	258
534	-81.4070365	41.3622497		N	N	3.073	303	11.4	0.9	249.5	$360,891	261	271.2	259
743	-81.4207238	41.2945446		N	N	3.071	304	11.4	0.9	250.5	$360,734	262	272.2	260
733	-81.4215539	41.2787090		N	N	2.816	326	10.4	2.0	201	$334,318	292	273.0	261
111	-81.3897119	41.2577111		N	N	3.058	305	11.3	0.9	251.5	$359,381	263	273.2	262
917	-81.5666809	41.3599712	3	Y	Y	0.871	47	3.2	0.6	488.5	$334,452	291	275.5	263
900	-81.4030772	41.2270641		N	N	3.045	307	11.3	0.9	253	$358,065	267	275.7	264
984	-81.4014354	41.3463957		N	N	2.998	311	11.1	0.9	258.5	$353,126	272	280.5	265
471	-81.4908436	41.4293512	2 MOD	N	N	1.957	110	7.3	0.6	356	$245,416	377	281.0	266
880	-81.4332509	41.2639474		N	N	2.700	334	10.0	1.9	207.5	$322,334	303	281.5	267
160	-81.3792552	41.2238008		N	N	2.976	313	11.0	0.9	260	$350,854	274	282.3	268
599	-81.3982216	41.3443956		N	N	2.974	314	11.0	0.9	261	$350,683	275	283.3	269
797	-81.4016696	41.2967165		N	N	2.964	315	11.0	0.9	262	$349,652	277	284.7	270
400	-81.4726404	41.3613104		N	N	2.635	338	9.8	1.9	211	$315,554	307	285.3	271
297	-81.3910890	41.3489009	1-2 GRAY	N	N	2.056	149	7.6	0.6	344	$255,672	365	286.0	272
127	-81.3840573	41.2295847	1	N	N	2.088	157	7.7	0.6	341.5	$259,036	363	287.2	273
679	-81.4516956	41.3308460		N	N	2.924	320	10.8	0.8	265	$345,466	283	289.3	274
461	-81.5201634	41.4434216		N	N	2.586	343	9.6	1.8	215	$310,525	312	290.0	275
131	-81.3875764	41.2212261		N	N	2.915	321	10.8	0.8	266	$344,580	284	290.3	276
631	-81.4016060	41.3184916		N	Y	2.093	389	7.8	0.6	340.5	$743,914	142	290.5	277
741	-81.4195799	41.2913907		N	N	2.851	325	10.6	0.8	271	$337,952	288	294.7	278
968	-81.4229081	41.2781648		N	N	2.538	348	9.4	1.8	219	$305,549	318	295.0	279
182	-81.3548575	41.2839268		N	N	2.790	327	10.3	0.8	273	$331,616	293	297.7	280
542	-81.5216028	41.3649566		N	N	2.519	351	9.3	1.8	221.5	$303,561	322	298.2	281
607	-81.3981768	41.3419041		N	N	2.771	328	10.3	0.8	275.5	$329,677	295	299.5	282
54	-81.3602395	41.2272305		N	N	2.759	329	10.2	0.8	277	$328,434	296	300.7	283
181	-81.3596499	41.2799897		N	N	2.466	355	9.2	1.7	224.5	$298,144	325	301.5	284
132	-81.3910254	41.2138090	1-2 GRAY	N	N	1.843	150	6.8	0.6	369.5	$233,669	388	302.5	285
252	-81.3633104	41.3241743	3	N	N	1.355	90	5.0	0.9	348.5	$183,107	469	302.5	286
799	-81.4024714	41.2954968		N	N	2.743	331	10.2	0.8	280	$326,798	298	303.0	287
84	-81.3785399	41.2505029		N	N	2.712	332	10.1	0.8	282.5	$323,539	301	305.2	288
643	-81.3992066	41.3102510		N	Y	1.927	404	7.2	0.6	360	$688,425	153	305.7	289
27	-81.3517152	41.2294792		N	N	2.708	333	10.0	0.8	284	$323,181	302	306.3	290
412	-81.4559625	41.3757806	3	Y	N	1.501	42	5.6	0.5	430.5	$198,232	447	306.5	291
49	-81.3764761	41.2273758		N	N	2.384	361	8.8	1.7	229	$289,629	332	307.3	292
613	-81.4047808	41.3320308		N	Y	1.917	406	7.1	0.6	362	$685,075	154	307.3	293
841	-81.3925106	41.2502423		N	N	2.675	335	9.9	0.8	285.5	$319,724	304	308.2	294
431	-81.3946777	41.3495722		N	N	2.669	337	9.9	0.8	287.5	$319,097	305	309.8	295
967	-81.4280732	41.2961338		N	N	2.611	339	9.7	0.8	289	$313,114	308	312.0	296
572	-81.4775442	41.3653993		N	N	2.339	366	8.7	1.6	233.5	$284,964	337	312.2	297
647	-81.3989863	41.3047680		N	Y	1.847	412	6.9	0.6	368.5	$661,530	157	312.5	298
19	-81.3611997	41.1884264		N	N	2.597	340	9.6	0.8	290	$311,689	309	313.0	299
974	-81.4375770	41.2636553		N	N	2.596	341	9.6	0.8	291	$311,529	310	314.0	300
46	-81.3813792	41.2378579		N	N	2.593	342	9.6	0.8	292	$311,229	311	315.0	301
559	-81.4904725	41.3881003		N	N	2.577	344	9.6	0.8	294	$309,560	314	317.3	302
735	-81.4127199	41.2817453		N	N	2.574	345	9.6	0.8	295	$309,328	315	318.3	303
569	-81.4910863	41.3636862		N	N	2.562	347	9.5	0.8	297	$308,015	316	320.0	304
580	-81.4781956	41.3836336		N	Y	1.796	421	6.7	0.6	377.5	$644,504	162	320.2	305
979	-81.3984019	41.2269390	2 MOD	N	N	1.568	111	5.8	0.5	417.5	$205,133	437	321.8	306
866	-81.3987721	41.2433489		N	N	2.526	349	9.4	0.7	299	$304,371	319	322.3	307
503	-81.5358337	41.3652066		N	N	2.230	377	8.3	1.6	243	$273,660	349	323.0	308
262	-81.3771698	41.3404389		N	N	2.525	350	9.4	0.7	300	$304,182	320	323.3	309
487	-81.5167315	41.3847228	3	Y	Y	0.681	49	2.5	0.4	570.5	$270,922	352	323.8	310
725	-81.4542941	41.2853138	2 MOD	N	N	1.550	113	5.7	0.5	422.5	$203,269	443	326.2	311
172	-81.3472968	41.2106017		N	N	2.487	353	9.2	0.7	303.5	$300,260	323	326.5	312
415	-81.4541385	41.3583566		N	N	2.198	381	8.2	1.5	246	$270,401	354	327.0	313
295	-81.3907408	41.3541802		N	N	2.474	354	9.2	0.7	304.5	$298,930	324	327.5	314
59	-81.3425256	41.2562870	2	N	N	1.600	141	5.9	0.5	412	$208,481	432	328.3	315
486	-81.5337170	41.4039404		N	N	2.168	382	8.0	1.5	247.5	$267,292	356	328.5	316
610	-81.4077629	41.3366717		N	N	2.461	356	9.1	0.7	306	$297,559	326	329.3	317
401	-81.4687693	41.3594168		N	N	2.425	357	9.0	0.7	307.5	$293,892	328	330.8	318
909	-81.4049091	41.2269176		N	N	2.424	358	9.0	0.7	308.5	$293,761	329	331.8	319
585	-81.4157038	41.3667184		N	N	2.419	359	9.0	0.7	310	$293,228	330	333.0	320
746	-81.4238458	41.2993075		N	N	2.107	387	7.8	1.5	252	$260,938	361	333.3	321
923	-81.5581235	41.3728452	3	Y	Y	0.750	48	2.8	0.3	625.5	$294,174	327	333.5	322
329	-81.4771332	41.3862211		N	Y	1.654	439	6.1	0.5	397	$596,922	171	335.7	323
606	-81.3967696	41.3413783		N	N	2.363	362	8.8	0.7	313	$287,407	333	336.0	324
677	-81.4493531	41.3279319		N	N	2.357	363	8.7	0.7	314	$286,879	334	337.0	325
191	-81.3814975	41.2965134		N	N	2.355	364	8.7	0.7	315	$286,651	335	338.0	326
517	-81.4638272	41.3640165		N	N	2.053	391	7.6	1.4	257.5	$255,358	366	338.2	327
28	-81.3424258	41.2277601		N	N	2.340	365	8.7	0.7	316	$285,097	336	339.0	328
615	-81.4054618	41.3222971		N	Y	1.639	443	6.1	0.5	401	$591,714	175	339.7	329
773	-81.4248245	41.3056750		N	N	2.337	367	8.7	0.7	317.5	$284,759	338	340.8	330
136	-81.3883816	41.2175089		N	N	2.334	368	8.7	0.7	318.5	$284,418	339	341.8	331
573	-81.4746227	41.3683772		N	N	2.331	369	8.6	0.7	319.5	$284,128	340	342.8	332
25	-81.3464746	41.2259982		N	N	2.316	370	8.6	0.7	320.5	$282,568	341	343.8	333
636	-81.3928388	41.3181530		N	Y	1.619	450	6.0	0.5	408	$584,963	177	345.0	334
762	-81.4302955	41.3019841		N	N	2.271	371	8.4	0.7	322	$277,915	342	345.0	335
367	-81.5825356	41.3629623		N	N	2.267	372	8.4	0.7	323	$277,476	343	346.0	336
489	-81.5141554	41.3836927	3	Y	Y	0.596	50	2.2	0.4	608	$242,457	381	346.3	337
670	-81.4393061	41.3177373		N	N	2.260	373	8.4	0.7	324	$276,767	344	347.0	338
605	-81.3980543	41.3396330		N	N	2.251	374	8.4	0.7	325	$275,909	346	348.3	339
244	-81.3761601	41.3324471		N	N	2.242	375	8.3	0.7	326	$274,971	347	349.3	340
79	-81.3700441	41.2499288	1	N	N	1.442	158	5.3	0.5	437.5	$192,103	454	349.8	341
832	-81.3980256	41.3484607		N	N	2.241	376	8.3	0.7	327	$274,790	348	350.3	342
427	-81.4048804	41.3517493		N	N	1.926	405	7.1	1.3	269	$242,176	382	352.0	343
423	-81.4105221	41.3618327		N	N	2.209	378	8.2	0.7	329	$271,533	350	352.3	344
7	-81.3684803	41.1972022		N	N	2.204	379	8.2	0.7	330	$270,982	351	353.3	345

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank		AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)		Economic Value	Economic Rank		Average Rank	Final Rank
57	-81.3364404	41.2535733		N	N	2.200	380		8.2	0.7	331		$270,604	353		354.7	346
781	-81.4044252	41.2995651		N	N	1.884	408		7.0	1.3	272.5		$237,908	384		354.8	347
874	-81.4172831	41.2613714		N	N	1.878	410		7.0	1.3	274		$237,265	386		356.7	348
554	-81.4696448	41.4116975		N	Y	1.536	464		5.7	0.5	424.5		$557,326	185		357.8	349
420	-81.4247081	41.3565106		N	N	2.146	383		8.0	0.7	335		$265,041	357		358.3	350
913	-81.3958109	41.2218285		N	N	2.145	384		8.0	0.7	336		$264,930	358		359.3	351
405	-81.4788358	41.3667394		N	N	1.841	413		6.8	1.3	277		$233,406	389		359.7	352
535	-81.4073976	41.3562258		N	N	2.140	385		7.9	0.7	337		$264,336	359		360.3	353
792	-81.3977064	41.2962194		N	Y	1.516	466		5.6	0.5	428.5		$550,593	188		360.8	354
378	-81.4971155	41.3673844		N	N	1.827	414		6.8	1.3	278		$231,976	391		361.0	355
587	-81.3935738	41.3526224		N	N	2.131	386		7.9	0.7	338		$263,390	360		361.3	356
66	-81.3623821	41.2425867		N	N	2.102	388		7.8	0.6	339.5		$260,392	362		363.2	357
310	-81.5305480	41.3857416	3	Y	Y	0.538	51		2.0	0.3	640.5		$223,072	403		364.8	358
578	-81.4507461	41.3662421		N	N	2.066	390		7.7	0.6	343		$256,759	364		365.7	359
786	-81.3929956	41.2947742		N	Y	1.231	508		4.6	0.8	375.5		$455,188	214		365.8	360
58	-81.3407972	41.2558893		N	N	1.796	420		6.7	1.2	283		$228,811	397		366.7	361
109	-81.3912221	41.2613379	2	N	N	1.246	142		4.6	0.4	470.5		$171,876	489		367.2	362
177	-81.3660610	41.2827324		N	Y	1.223	510		4.5	0.8	379		$452,497	215		368.0	363
779	-81.4078237	41.3014443		N	N	2.043	392		7.6	0.6	345.5		$254,303	367		368.2	364
69	-81.3620868	41.2460535		N	N	2.037	393		7.6	0.6	346.5		$253,677	369		369.5	365
189	-81.3817017	41.2949296		N	N	2.036	394		7.6	0.6	347.5		$253,636	370		370.5	366
398	-81.4728423	41.3498407		N	N	1.753	424		6.5	1.2	286.5		$224,278	401		370.5	367
676	-81.4360725	41.3090729		N	N	2.022	395		7.5	0.6	348.5		$252,137	371		371.5	368
133	-81.3885681	41.2140579		N	N	1.985	396		7.4	0.6	351		$248,286	372		373.0	369
305	-81.5359075	41.4023743	1-2 GRAY	N	N	1.033	151		3.8	0.7	429.5		$149,847	541		373.8	370
95	-81.3411665	41.2661004		N	N	1.971	397		7.3	0.6	352		$246,858	373		374.0	371
981	-81.3967652	41.2206720		N	N	1.967	398		7.3	0.6	353		$246,487	374		375.0	372
644	-81.4002098	41.3104986		N	Y	1.371	482		5.1	0.5	446.5		$502,039	199		375.8	373
780	-81.4073280	41.2997408		N	N	1.964	399		7.3	0.6	354		$246,142	375		376.0	374
256	-81.3781073	41.3240925		N	N	1.957	400		7.3	0.6	355		$245,473	376		377.0	375
530	-81.4358657	41.3672025		N	N	1.943	401		7.2	0.6	357		$243,999	378		378.7	376
671	-81.4364914	41.3168281		N	N	1.937	402		7.2	0.6	358		$243,364	379		379.7	377
516	-81.4662891	41.3629998		N	N	1.933	403		7.2	0.6	359		$242,931	380		380.7	378
1001	-81.4594090	41.3252650	MOD 2	N	N	1.671	434		6.2	1.1	295		$215,873	414		381.0	379
233	-81.3787075	41.3384522	2	N	N	1.165	143		4.3	0.4	489.5		$163,503	511		381.2	380
470	-81.4898276	41.4319039		N	N	1.660	437		6.2	1.1	297		$214,681	417		383.7	381
200	-81.3780418	41.3043421		N	N	1.893	407		7.0	0.6	364		$238,758	383		384.7	382
316	-81.4910015	41.3914123		N	N	1.882	409		7.0	0.6	365.5		$237,718	385		386.5	383
338	-81.4478454	41.3900379		N	N	1.859	411		6.9	0.6	367		$235,258	387		388.3	384
384	-81.4894169	41.3748453	3	Y	Y	0.527	52		2.0	0.2	709.5		$219,366	408		389.8	385
822	-81.3928168	41.2705265		N	N	1.632	445		6.1	1.1	301.5		$211,829	423		389.8	386
142	-81.3826389	41.2059030		N	N	1.626	447		6.0	1.1	304		$211,152	425		392.0	387
56	-81.3368835	41.2580954	2	N	N	1.101	144		4.1	0.4	506		$156,887	529		393.0	388
275	-81.3912764	41.3193706	1	N	N	1.129	159		4.2	0.4	499		$159,733	521		393.0	389
549	-81.4755974	41.4346568		N	N	1.815	415		6.7	0.6	372		$230,736	392		393.0	390
231	-81.3695379	41.3385671		N	N	1.625	449		6.0	1.1	305.5		$211,063	427		393.8	391
29	-81.3410832	41.2289768		N	N	1.814	416		6.7	0.6	373		$230,640	393		394.0	392
125	-81.3900740	41.2319116		N	N	1.810	417		6.7	0.6	374		$230,213	394		395.0	393
879	-81.4332937	41.2631395		N	N	1.803	418		6.7	0.6	375		$229,509	395		396.0	394
284	-81.3914000	41.3021329		N	N	1.803	419		6.7	0.6	376		$229,458	396		397.0	395
155	-81.3749365	41.2191955		N	N	1.604	453		6.0	1.1	309		$208,910	431		397.7	396
828	-81.4357251	41.3201892		N	N	1.790	422		6.6	0.6	378.5		$228,120	398		399.5	397
433	-81.5203387	41.4090079	2 MOD	N	N	0.883	117		3.3	0.6	484		$134,313	600		400.3	398
813	-81.3980403	41.2839958		N	N	1.767	423		6.6	0.6	380.5		$225,785	400		401.2	399
901	-81.4040785	41.2280462		N	N	1.744	425		6.5	0.6	382		$223,355	402		403.0	400
55	-81.3625264	41.2238217		N	N	1.729	426		6.4	0.6	383.5		$221,874	404		404.5	401
525	-81.4817739	41.3726339		N	N	1.559	459		5.8	1.1	316		$204,249	439		404.7	402
52	-81.3580558	41.2267437	2	N	N	1.032	145		3.8	0.4	525		$149,709	545		405.0	403
742	-81.4222715	41.2939011		N	N	1.728	427		6.4	0.6	384.5		$221,715	405		405.5	404
183	-81.3554715	41.2755985		N	N	1.556	460		5.8	1.1	317		$203,969	440		405.7	405
892	-81.3979544	41.2174483		N	N	1.723	428		6.4	0.6	386		$221,246	406		406.7	406
180	-81.3628854	41.2834505		N	N	1.552	462		5.8	1.0	318.5		$203,557	442		407.5	407
897	-81.3962060	41.2294633		N	N	1.708	429		6.3	0.5	387		$219,678	407		407.7	408
632	-81.4023420	41.3194917		N	Y	1.188	520		4.4	0.4	485.5		$440,747	219		408.2	409
856	-81.4015665	41.2520193	2 MOD	N	N	0.946	114		3.5	0.3	543.5		$140,774	568		408.5	410
241	-81.3772335	41.3347373		N	N	1.692	430		6.3	0.5	388		$218,033	409		409.0	411
548	-81.4827962	41.4287949	2 MOD	N	N	0.942	115		3.5	0.3	545.5		$140,389	569		409.8	412
602	-81.3926366	41.3421588		N	N	1.691	431		6.3	0.5	389		$217,879	410		410.0	413
53	-81.3563672	41.2265450		N	N	1.686	432		6.3	0.5	390		$217,352	411		411.0	414
140	-81.3837864	41.2078405		N	N	1.674	433		6.2	0.5	391		$216,192	413		412.3	415
765	-81.4321614	41.3006763		N	N	1.668	435		6.2	0.5	392.5		$215,481	415		414.2	416
898	-81.3969036	41.2264390		N	N	1.664	436		6.2	0.5	394		$215,160	416		415.3	417
363	-81.4872998	41.4287325		N	N	1.482	469		5.5	1.0	329		$196,289	449		415.7	418
462	-81.5102978	41.4509290	1-2 GRAY	N	N	0.980	152		3.6	0.4	537		$144,355	559		416.0	419
493	-81.4940660	41.3877936		N	N	1.655	438		6.1	0.5	396		$214,146	418		417.3	420
724	-81.4548947	41.2854263	2 MOD	N	N	0.929	116		3.4	0.3	556		$139,016	580		417.3	421
500	-81.4542915	41.3858443		N	N	1.652	440		6.1	0.5	398		$213,853	419		419.0	422
589	-81.4027920	41.3484808		N	N	1.649	441		6.1	0.5	399		$213,533	420		420.0	423
664	-81.4441848	41.3253788		N	N	1.647	442		6.1	0.5	400		$213,371	421		421.0	424
705	-81.4576620	41.3441339		N	N	1.428	474		5.3	1.0	336		$190,661	455		421.7	425
771	-81.4311825	41.3051780		N	N	1.635	444		6.1	0.5	402.5		$212,158	422		422.8	426
626	-81.3933024	41.3267445		N	Y	1.102	539		4.1	0.4	505		$412,111	226		423.3	427
407	-81.4803988	41.3687991		N	N	1.409	476		5.2	0.9	338.5		$188,740	457		423.8	428
96	-81.3426715	41.2705538		N	N	1.631	446		6.1	0.5	404		$211,712	424		424.7	429
648	-81.3994945	41.3042797		N	Y	0.967	571		3.6	0.6	449		$366,671	255		425.0	430
86	-81.3815345	41.2507064		N	Y	1.087	540		4.0	0.4	507		$406,900	230		425.7	431
119	-81.3867546	41.2514893		N	N	1.625	448		6.0	0.5	406		$211,072	426		426.7	432
510	-81.4846211	41.3725062		N	N	1.387	479		5.1	0.9	341.5		$186,438	460		426.8	433
652	-81.4123642	41.3129170		N	Y	1.082	542		4.0	0.4	509		$405,278	231		427.3	434
468	-81.4965236	41.4479933		N	N	1.615	451		6.0	0.5	409		$210,060	429		429.7	435
521	-81.4621328	41.3669750		N	N	1.614	452		6.0	0.5	410		$209,955	430		430.7	436
311	-81.5099385	41.3807657	3	Y	Y	0.439	53		1.6	0.2	751		$171,745	490		431.3	437
623	-81.3950731	41.3264000		N	Y	1.054	547		3.9	0.4	515		$395,942	238		433.3	438
120	-81.3884916	41.2525285		N	N	1.583	454		5.9	0.5	413.5		$206,716	433		433.5	439
523	-81.4819853	41.3679629		N	N	1.578	455		5.9	0.5	414.5		$206,172	434		434.5	440
691	-81.4554687	41.3358610		N	N	1.573	456		5.8	0.5	415.5		$205,704	435		435.5	441
179	-81.3614987	41.2842523		N	N	1.350	487		5.0	0.9	350		$182,636	470		435.7	442
650	-81.4030704	41.3071545		N	N	1.568	457		5.8	0.5	416.5		$205,186	436		436.5	443
240	-81.3824166	41.3374364		N	N	1.336	488		5.0	0.9	351.5		$181,203	471		436.8	444
333	-81.4573155	41.4028912		N	N	1.561	458		5.8	0.5	418.5		$204,402	438		438.2	445
479	-81.4768587	41.4201311		N	N	1.324	490		4.9	0.9	355		$179,966	473		439.3	446
346	-81.4764103	41.4390609		N	N	1.555	461		5.8	0.5	420.5		$203,834	441		440.8	447
931	-81.5574744	41.3780870	3	Y	Y	0.418	54		1.6	0.2	766		$164,671	508		442.7	448
972	-81.3950480	41.2753622		N	N	1.536	463		5.7	0.5	423.5		$201,883	444		443.5	449
629	-81.3930028	41.3200357		N	Y	1.015	561		3.8	0.4	530.5		$382,778	244		445.2	450
253	-81.3677793	41.3231682		N	N	1.297	495		4.8	0.9	362		$177,107	479		445.3	451
78	-81.3711565	41.2505803	1	N	N	0.884	160		3.3	0.3	577.5		$134,396	599		445.5	452
307	-81.5056115	41.4035057		N	N	1.528	465		5.7	0.5	426.5		$201,074	445		445.5	453
419	-81.4288226	41.3750112		N	N	1.504	467		5.6	0.5	429.5		$198,580	446		447.5	454
255	-81.3799756	41.3236625		N	N	1.498	468		5.6	0.5	431.5		$197,908	448		449.2	455
147	-81.3616063	41.2104888	3	Y	Y	0.400	55		1.5	0.2	772		$158,635	524		450.3	456
558	-81.4962055	41.3890514		N	N	1.269	500		4.7	0.8	368		$174,277	484		450.7	457
345	-81.4965837	41.4577254		N	N	1.460	470		5.4	0.5	433.5		$193,945	450		451.2	458
801	-81.4027033	41.2930294		N	N	1.454	471		5.4	0.5	434.5		$193,425	451		452.2	459
170	-81.3480380	41.2077106		N	N	1.453	472		5.4	0.5	435.5		$193,284	452		453.2	460

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank	AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)	Economic Value	Economic Rank	Average Rank	Final Rank
266	-81.3835329	41.3383554		N	N	1.444	473	5.4	0.5	436.5	$192,299	453	454.2	461
10	-81.3728661	41.1951603		N	N	1.418	475	5.3	0.5	439.5	$189,647	456	456.8	462
208	-81.3689831	41.3077139		N	N	1.393	477	5.2	0.5	441.5	$187,039	458	458.8	463
2	-81.3637223	41.2012329		N	N	1.387	478	5.1	0.5	443	$186,444	459	460.0	464
222	-81.3650686	41.3377522		N	N	1.225	509	4.5	0.8	377.5	$169,702	495	460.5	465
60	-81.3435829	41.2571673	2 MOD	N	N	0.756	118	2.8	0.3	620.5	$121,124	644	460.8	466
320	-81.4958779	41.3796700	3	Y	Y	0.350	57	1.3	0.2	760.5	$141,957	565	460.8	467
497	-81.4777638	41.4027982		N	Y	0.945	574	3.5	0.3	544.5	$359,330	264	460.8	468
541	-81.5854898	41.3619972		N	N	1.382	480	5.1	0.5	444.5	$185,961	461	461.8	469
824	-81.4002789	41.2964737		N	Y	0.941	575	3.5	0.3	546.5	$358,128	266	462.5	470
655	-81.4441189	41.3290769		N	N	1.372	481	5.1	0.5	445.5	$184,866	464	463.5	471
238	-81.3767959	41.3358677		N	N	1.368	483	5.1	0.5	447.5	$184,510	465	465.2	472
669	-81.4462846	41.3191519		N	N	1.364	484	5.1	0.5	448.5	$184,089	466	466.2	473
397	-81.4866693	41.3611793		N	N	1.364	485	5.1	0.5	449.5	$184,008	467	467.2	474
293	-81.3554862	41.3244852		N	N	1.205	516	4.5	0.8	385	$167,571	503	468.0	475
270	-81.3846042	41.3187819		N	N	1.356	486	5.0	0.5	450.5	$183,198	468	468.2	476
406	-81.4774766	41.3680369		N	N	1.204	517	4.5	0.8	386.5	$167,503	504	469.2	477
919	-81.5623604	41.3712362	3	Y	Y	0.353	56	1.3	0.2	794	$143,150	562	470.7	478
683	-81.4524656	41.3320238		N	N	1.334	489	4.9	0.4	454	$180,964	472	471.7	479
301	-81.3947074	41.3494809		N	N	1.321	491	4.9	0.4	455.5	$179,615	474	473.5	480
656	-81.4462684	41.3291230		N	N	1.318	492	4.9	0.4	456.5	$179,349	475	474.5	481
496	-81.4754548	41.3950436		N	Y	0.917	589	3.4	0.3	560.5	$349,935	276	475.2	482
890	-81.4398135	41.2625880		N	N	1.317	493	4.9	0.4	457.5	$179,231	476	475.5	483
700	-81.4540739	41.3301844		N	N	1.314	494	4.9	0.4	458.5	$178,921	477	476.5	484
247	-81.3724915	41.3370783		N	N	1.154	525	4.3	0.8	397.5	$162,329	513	478.5	485
519	-81.4564123	41.3599959		N	N	1.294	496	4.8	0.4	460.5	$176,850	480	478.8	486
478	-81.4832423	41.4263143		N	N	1.288	497	4.8	0.4	461.5	$176,238	481	479.8	487
601	-81.3931167	41.3416126		N	N	1.282	498	4.8	0.4	462.5	$175,537	482	480.8	488
169	-81.3493150	41.2092541		N	N	1.272	499	4.7	0.4	463.5	$174,540	483	481.8	489
739	-81.4179310	41.2868530		N	N	1.267	501	4.7	0.4	465	$174,024	485	483.7	490
955	-81.6057901	41.3676652		N	Y	0.897	597	3.3	0.3	569	$343,417	285	483.7	491
421	-81.4150857	41.3602260		N	N	1.252	502	4.6	0.4	467	$172,492	486	485.0	492
129	-81.3898821	41.2298696		N	N	1.250	503	4.6	0.4	468	$172,298	487	486.0	493
938	-81.5762261	41.3713180		N	Y	0.896	600	3.3	0.3	572	$342,818	286	486.0	494
962	-81.4772295	41.3147165		N	N	1.248	504	4.6	0.4	469.5	$172,063	488	487.2	495
454	-81.4773092	41.4279259		N	N	1.244	505	4.6	0.4	471.5	$171,676	491	489.2	496
712	-81.4759486	41.3489231		N	N	1.113	536	4.1	0.7	407.5	$158,123	526	489.8	497
714	-81.4956324	41.3441073		N	N	1.244	506	4.6	0.4	472.5	$171,653	492	490.2	498
463	-81.5110300	41.4491804		N	N	1.109	537	4.1	0.7	409.5	$157,645	527	491.2	499
85	-81.3827102	41.2495846		N	Y	0.881	606	3.3	0.3	579	$337,823	289	491.3	500
167	-81.3527884	41.2071199		N	N	1.232	507	4.6	0.4	475	$170,362	493	491.7	501
620	-81.4001517	41.3268089		N	Y	0.876	610	3.2	0.3	583	$336,276	290	494.3	502
586	-81.3970938	41.3538063		N	N	1.219	511	4.5	0.4	477.5	$169,020	497	495.2	503
838	-81.3944460	41.2591661		N	N	1.218	512	4.5	0.4	478.5	$168,984	498	496.2	504
128	-81.3880153	41.2291661	1	N	N	0.688	161	2.6	0.3	652.5	$114,068	676	496.5	505
223	-81.3651362	41.3415853		N	N	1.207	513	4.5	0.4	479.5	$167,822	500	497.5	506
719	-81.4819926	41.3148603		N	N	1.207	514	4.5	0.4	480.5	$167,822	501	498.5	507
757	-81.4240326	41.3016416		N	N	1.205	515	4.5	0.4	481.5	$167,635	502	499.5	508
501	-81.4516594	41.3814184	1-2 GRAY	N	N	0.669	153	2.5	0.3	661	$112,103	687	500.3	509
624	-81.3935112	41.3257290		N	Y	0.847	616	3.1	0.3	590	$326,523	299	501.7	510
190	-81.3793957	41.2957551		N	N	1.193	518	4.4	0.4	483.5	$166,342	505	502.2	511
422	-81.4169487	41.3533135		N	N	1.192	519	4.4	0.4	484.5	$166,276	506	503.2	512
769	-81.4324849	41.3060508		N	N	1.045	549	3.9	0.7	425.5	$151,041	537	503.8	513
764	-81.4346706	41.3026923		N	N	1.182	521	4.4	0.4	486.5	$165,274	507	504.8	514
1	-81.3646997	41.2009756		N	N	1.176	522	4.4	0.4	487.5	$164,614	509	506.2	515
287	-81.3859818	41.2974414		N	N	1.170	523	4.3	0.4	488.5	$163,965	510	507.2	516
366	-81.5186850	41.4368779		N	N	1.162	524	4.3	0.4	490.5	$163,142	512	508.8	517
825	-81.3998130	41.2984059		N	Y	0.823	625	3.1	0.3	597	$318,616	306	509.3	518
174	-81.3407274	41.2234360		N	N	1.152	526	4.3	0.4	492	$162,170	514	510.7	519
665	-81.4425074	41.3237302		N	N	1.151	527	4.3	0.4	493	$162,015	515	511.7	520
314	-81.4820811	41.4001581		N	N	1.150	528	4.3	0.4	494	$161,924	516	512.7	521
727	-81.4440464	41.2784723		N	N	1.142	529	4.2	0.4	495	$161,107	517	513.7	522
386	-81.4940314	41.3761741	3	Y	Y	0.287	58	1.1	0.1	837.5	$121,004	646	513.8	523
334	-81.4653430	41.3995301		N	N	1.137	530	4.2	0.4	496	$160,518	518	514.7	524
678	-81.4519307	41.3295657		N	N	1.017	560	3.8	0.7	435	$148,145	550	515.0	525
711	-81.4677215	41.3489659		N	N	1.133	531	4.2	0.4	497	$160,121	519	515.7	526
540	-81.4126844	41.3519445		N	N	1.130	532	4.2	0.4	498	$159,836	520	516.7	527
48	-81.3798854	41.2256789		N	N	1.125	533	4.2	0.4	500	$159,297	522	518.3	528
408	-81.4771513	41.3706191		N	N	1.124	534	4.2	0.4	501	$159,201	523	519.3	529
881	-81.4344677	41.2627856		N	N	1.114	535	4.1	0.4	502	$158,170	525	520.7	530
736	-81.4112035	41.2800831		N	N	0.989	566	3.7	0.6	442	$145,229	556	521.3	531
789	-81.3985411	41.2937917		N	Y	0.787	640	2.9	0.3	610.5	$306,457	317	522.5	532
899	-81.4046504	41.2290570		N	N	1.108	538	4.1	0.4	504	$157,606	528	523.3	533
717	-81.4750321	41.3339958		N	N	1.084	541	4.0	0.4	508	$155,071	531	526.7	534
339	-81.4557327	41.3885545		N	N	1.077	543	4.0	0.4	510	$154,332	532	528.3	535
933	-81.5703340	41.3743328	3	Y	Y	0.264	59	1.0	0.1	847	$113,411	679	528.3	536
563	-81.5038504	41.3736551		N	N	1.074	544	4.0	0.4	511	$154,050	533	529.3	537
926	-81.5516929	41.3705287	3	Y	Y	0.264	60	1.0	0.1	848	$113,302	681	529.7	538
212	-81.3769909	41.3152937		N	N	1.067	545	4.0	0.4	512.5	$153,312	534	530.5	539
466	-81.4920248	41.4536474		N	N	1.055	546	3.9	0.4	514	$152,062	535	531.7	540
720	-81.4813502	41.3135911		N	N	1.048	548	3.9	0.4	516	$151,350	536	533.3	541
26	-81.3526485	41.2281228		N	N	1.043	550	3.9	0.4	517.5	$150,884	538	535.2	542
196	-81.3772042	41.2989102		N	N	1.038	551	3.9	0.4	518.5	$150,301	539	536.2	543
553	-81.4713633	41.4071875		N	N	1.034	552	3.8	0.4	520.5	$149,906	540	537.5	544
887	-81.4133337	41.2473545		N	N	0.936	580	3.5	0.6	460	$139,807	575	538.3	545
61	-81.3674588	41.2394009		N	N	1.033	553	3.8	0.4	522	$149,840	542	539.0	546
263	-81.3865662	41.3383754		N	N	1.033	554	3.8	0.4	523	$149,793	543	540.0	547
818	-81.3937983	41.2809332		N	N	1.033	555	3.8	0.4	524	$149,779	544	541.0	548
791	-81.3978906	41.2978317		N	Y	0.742	660	2.8	0.3	632.5	$291,311	331	541.2	549
71	-81.3586588	41.2443696		N	N	0.932	584	3.5	0.6	463	$139,331	579	542.0	550
713	-81.4791140	41.3495068		N	N	1.025	556	3.8	0.4	526	$149,003	546	542.7	551
527	-81.4809525	41.3709854		N	N	0.927	585	3.4	0.6	464.5	$138,827	581	543.5	552
16	-81.3619331	41.1813350		N	N	1.023	557	3.8	0.4	527	$148,770	547	543.7	553
843	-81.4316573	41.2632043		N	N	1.020	558	3.8	0.4	528	$148,457	548	544.7	554
88	-81.3479842	41.2489039		N	N	1.019	559	3.8	0.4	529	$148,395	549	545.7	555
965	-81.4529849	41.3047511		N	N	1.014	562	3.8	0.4	531.5	$147,844	551	548.2	556
245	-81.3716879	41.3316674		N	N	1.008	563	3.7	0.4	532.5	$147,196	552	549.2	557
135	-81.3905047	41.2169044		N	N	1.005	564	3.7	0.4	533.5	$146,857	553	550.2	558
698	-81.4557502	41.3289180		N	N	0.906	593	3.4	0.6	472.5	$136,664	588	551.2	559
351	-81.4679995	41.4291561		N	N	0.997	565	3.7	0.4	534.5	$146,127	555	551.5	560
372	-81.5170116	41.3694169		N	N	0.987	567	3.7	0.4	536	$145,004	557	553.3	561
922	-81.5625408	41.3774552	3	Y	Y	0.217	61	0.8	0.1	868	$97,885	731	553.3	562
729	-81.4218907	41.2773290		N	N	0.972	568	3.6	0.3	538	$143,443	560	555.3	563
498	-81.4773907	41.4037530		N	Y	0.696	675	2.6	0.3	646.5	$276,159	345	555.5	564
391	-81.5121355	41.3569069		N	N	0.971	569	3.6	0.3	539	$143,419	561	556.3	565
533	-81.4204707	41.3635481		N	N	0.968	570	3.6	0.3	540	$143,076	563	557.7	566
213	-81.3817520	41.3154590		N	N	0.963	572	3.6	0.3	541.5	$142,601	564	559.2	567
168	-81.3527246	41.2065342		N	N	0.947	573	3.5	0.3	542.5	$140,946	567	560.8	568
221	-81.3485564	41.2946004		N	N	0.885	605	3.3	0.6	482.5	$134,469	598	561.8	569
918	-81.5608765	41.3740026	3	Y	Y	0.192	62	0.7	0.1	879.5	$89,580	744	561.8	570
924	-81.5564853	41.3693474	3	Y	Y	0.189	63	0.7	0.1	882.5	$88,335	745	563.5	571
891	-81.3991355	41.2340952		N	N	0.941	576	3.5	0.3	547.5	$140,295	570	564.5	572
492	-81.4893553	41.3822049		N	N	0.940	577	3.5	0.3	548.5	$140,213	571	565.5	573
716	-81.4770322	41.3337437		N	N	0.939	578	3.5	0.3	549.5	$140,046	572	566.5	574
159	-81.3808804	41.2225868		N	N	0.937	579	3.5	0.3	550.5	$139,846	574	567.8	575

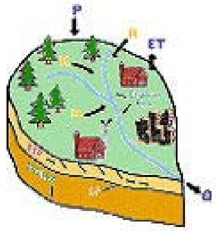
WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank	AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)	Economic Value	Economic Rank	Average Rank	Final Rank
920	-81.5615360	41.3722052	3	Y	Y	0.160	64	0.6	0.1	895	$78,831	747	568.7	576
836	-81.3946542	41.2606726		N	N	0.866	611	3.2	0.6	490.5	$132,500	606	569.2	577
413	-81.4641251	41.3551795		N	N	0.934	581	3.5	0.3	552.5	$139,539	576	569.8	578
424	-81.4133825	41.3634708		N	N	0.933	582	3.5	0.3	553.5	$139,491	577	570.8	579
520	-81.4612748	41.3553583		N	N	0.933	583	3.5	0.3	554.5	$139,431	578	571.8	580
928	-81.5503667	41.3706443	3	Y	Y	0.146	65	0.5	0.1	899	$74,049	760	574.7	581
674	-81.4311826	41.3152183		N	N	0.924	586	3.4	0.3	557.5	$138,480	582	575.2	582
219	-81.3483420	41.2855451		N	N	0.843	617	3.1	0.5	497.5	$130,147	612	575.5	583
225	-81.3543372	41.3184770		N	N	0.923	587	3.4	0.3	558.5	$138,448	583	576.2	584
927	-81.5497816	41.3714986	3	Y	Y	0.144	66	0.5	0.1	902	$73,614	761	576.3	585
893	-81.3968155	41.2166669		N	N	0.918	588	3.4	0.3	559.5	$137,890	584	577.2	586
740	-81.4242433	41.2882763		N	N	0.840	619	3.1	0.5	499.5	$129,784	614	577.5	587
595	-81.4128987	41.3439889		N	N	0.913	590	3.4	0.3	561.5	$137,402	585	578.8	588
793	-81.3994278	41.2968789		N	Y	0.630	698	2.3	0.2	672	$253,755	368	579.3	589
435	-81.5216660	41.4220817		N	N	0.833	620	3.1	0.5	503.5	$129,087	615	579.5	590
911	-81.3974184	41.2241502		N	N	0.909	591	3.4	0.3	563	$136,930	586	580.0	591
921	-81.5621568	41.3727443	3	Y	Y	0.139	67	0.5	0.1	903	$71,992	770	580.0	592
214	-81.3471105	41.3030899		N	N	0.906	592	3.4	0.3	564	$136,704	587	581.0	593
308	-81.5172332	41.3927209		N	N	0.905	594	3.4	0.3	565.5	$136,598	589	582.8	594
206	-81.3769268	41.3072503		N	N	0.827	624	3.1	0.5	507.5	$128,445	619	583.5	595
862	-81.3982467	41.2472282		N	N	0.904	595	3.4	0.3	566.5	$136,473	590	583.8	596
766	-81.4328946	41.3041447		N	N	0.897	596	3.3	0.3	568	$135,761	591	585.0	597
434	-81.5210720	41.4110252		N	N	0.819	627	3.0	0.5	511	$127,635	621	586.3	598
814	-81.3970573	41.2842656		N	N	0.897	598	3.3	0.3	570	$135,759	592	586.7	599
267	-81.3828025	41.3391834	2 MOD	N	N	0.319	119	1.2	0.1	810	$57,867	833	587.3	600
609	-81.4118598	41.3392344		N	N	0.896	599	3.3	0.3	571	$135,621	593	587.7	601
544	-81.4908547	41.4400449		N	N	0.816	629	3.0	0.5	513	$127,380	623	588.3	602
402	-81.4643140	41.3595011		N	N	0.895	601	3.3	0.3	573	$135,539	594	589.3	603
298	-81.3886006	41.3484807	1	N	N	0.358	162	1.3	0.2	790.5	$61,899	817	589.8	604
564	-81.5117830	41.3623543		N	N	0.895	602	3.3	0.3	574	$135,470	595	590.3	605
932	-81.5638233	41.3764098	3	Y	Y	0.123	68	0.5	0.1	908	$66,643	795	590.3	606
594	-81.4129141	41.3429127		N	N	0.891	603	3.3	0.3	575	$135,125	596	591.3	607
686	-81.4476485	41.3345885		N	N	0.887	604	3.3	0.3	576	$134,662	597	592.3	608
948	-81.5469030	41.3889894	3	Y	Y	0.117	69	0.4	0.1	914	$64,548	805	596.0	609
697	-81.4553681	41.3298923		N	N	0.880	607	3.3	0.3	580	$133,999	602	596.3	610
522	-81.4579007	41.3705197		N	N	0.879	608	3.3	0.3	581	$133,880	603	597.3	611
207	-81.3769026	41.2977170		N	N	0.878	609	3.3	0.3	582	$133,798	604	598.3	612
929	-81.5491238	41.3714046	3	Y	Y	0.115	70	0.4	0.1	916	$63,920	810	598.7	613
239	-81.3808000	41.3383723		N	N	0.788	639	2.9	0.5	524.5	$124,417	633	598.8	614
775	-81.4243142	41.3042764		N	N	0.860	612	3.2	0.3	585.5	$131,939	607	601.5	615
989	-81.4006607	41.3496074		N	N	0.856	613	3.2	0.3	586.5	$131,453	608	602.5	616
288	-81.3898092	41.2850724		N	Y	0.566	722	2.1	0.2	696	$232,411	390	602.7	617
752	-81.4173317	41.2968948	3	Y	Y	0.106	71	0.4	0.1	919	$60,987	822	604.0	618
774	-81.4253782	41.3049274		N	N	0.849	614	3.2	0.3	588	$130,784	610	604.0	619
778	-81.4086514	41.2999782		N	N	0.848	615	3.1	0.3	589	$130,707	611	605.0	620
1013	-81.3595427	41.2440488		N	N	0.770	647	2.9	0.5	531	$122,549	640	606.0	621
118	-81.3863300	41.2523802		N	N	0.842	618	3.1	0.3	591.5	$130,042	613	607.5	622
947	-81.5747992	41.3785195	3	Y	Y	0.100	72	0.4	0.1	924	$58,696	829	608.3	623
226	-81.3561714	41.3232631		N	N	0.757	649	2.8	0.5	535	$121,200	643	609.0	624
980	-81.3955718	41.2200587		N	N	0.828	621	3.1	0.3	593.5	$128,602	616	610.2	625
445	-81.4618353	41.4129734		N	Y	0.546	730	2.0	0.2	704	$225,830	399	611.0	626
796	-81.4032043	41.2971289		N	N	0.827	622	3.1	0.3	594.5	$128,513	617	611.2	627
930	-81.5490838	41.3709214	3	Y	Y	0.096	73	0.4	0.1	927	$57,603	836	612.0	628
373	-81.5098713	41.3734178		N	N	0.827	623	3.1	0.3	595.5	$128,500	618	612.2	629
360	-81.4820519	41.4306804		N	N	0.819	626	3.0	0.3	598	$127,674	620	614.7	630
138	-81.3833847	41.2184235		N	N	0.818	628	3.0	0.3	599.5	$127,599	622	616.5	631
477	-81.4882497	41.4272283		N	N	0.816	630	3.0	0.3	601	$127,372	624	618.3	632
228	-81.3571990	41.3235122		N	N	0.742	659	2.8	0.5	542	$119,731	655	618.7	633
978	-81.3966999	41.2256473		N	N	0.815	631	3.0	0.3	602	$127,262	625	619.3	634
232	-81.3735537	41.3402928		N	N	0.815	632	3.0	0.3	603	$127,201	626	620.3	635
481	-81.4731857	41.4085767		N	Y	0.518	737	1.9	0.2	712.5	$216,544	412	620.5	636
770	-81.4321423	41.3054793		N	N	0.810	633	3.0	0.3	604	$126,704	627	621.3	637
410	-81.4585109	41.3721750		N	N	0.738	662	2.7	0.5	544.5	$119,267	658	621.5	638
220	-81.3481463	41.2879961		N	N	0.809	634	3.0	0.3	605	$126,599	628	622.3	639
983	-81.3999644	41.3481386		N	N	0.806	635	3.0	0.3	606	$126,313	629	623.3	640
667	-81.4472950	41.3221185		N	N	0.796	636	3.0	0.3	607	$125,255	630	624.3	641
726	-81.4533859	41.2847029		N	N	0.794	637	2.9	0.3	608	$125,111	631	625.3	642
260	-81.3697207	41.3169447		N	N	0.723	666	2.7	0.5	551	$117,726	662	626.3	643
860	-81.3961912	41.2529084		N	N	0.790	638	2.9	0.3	609	$124,633	632	626.3	644
450	-81.4669095	41.4043066		N	N	0.717	667	2.7	0.4	552	$117,081	663	627.3	645
925	-81.5557503	41.3695171	3	Y	Y	0.078	74	0.3	0.0	937	$51,559	873	628.0	646
657	-81.4476195	41.3298886		N	N	0.786	641	2.9	0.3	611.5	$124,240	634	628.8	647
324	-81.4911149	41.3897409		N	N	0.781	642	2.9	0.3	613	$123,740	635	630.0	648
934	-81.5730810	41.3736345	3	Y	Y	0.076	75	0.3	0.0	939	$50,771	876	630.0	649
90	-81.3715511	41.2745074		N	Y	0.501	744	1.9	0.2	719.5	$210,654	428	630.5	650
886	-81.3991517	41.2438185		N	N	0.773	643	2.9	0.3	614	$122,937	636	631.0	651
1000	-81.4607942	41.3245327		N	N	0.773	644	2.9	0.3	615	$122,868	637	632.0	652
809	-81.4038596	41.2912761		N	N	0.773	645	2.9	0.3	616	$122,856	638	633.0	653
157	-81.3826121	41.2126771	1-2 GRAY	N	N	0.232	154	0.9	0.1	862.5	$49,112	884	633.5	654
877	-81.4254944	41.2602604		N	N	0.772	646	2.9	0.3	617	$122,769	639	634.0	655
763	-81.4329553	41.3021266		N	N	0.767	648	2.8	0.3	619	$122,239	641	636.0	656
946	-81.5737283	41.3779011	3	Y	Y	0.063	76	0.2	0.0	943	$46,670	894	637.7	657
459	-81.5057653	41.3734813		N	N	0.756	650	2.8	0.3	621.5	$121,090	645	638.8	658
758	-81.4261515	41.3018832		N	N	0.754	651	2.8	0.3	622.5	$120,942	647	640.2	659
660	-81.4466238	41.3273711		N	N	0.751	652	2.8	0.3	623.5	$120,657	648	641.2	660
728	-81.4252077	41.2783556		N	N	0.751	653	2.8	0.3	624.5	$120,652	649	642.2	661
835	-81.3945038	41.2612609		N	N	0.683	682	2.5	0.4	567	$113,566	678	642.3	662
570	-81.4912119	41.3623002		N	N	0.750	654	2.8	0.3	626.5	$120,469	650	643.5	663
323	-81.4899719	41.3867566		N	N	0.749	655	2.8	0.3	627.5	$120,461	651	644.5	664
14	-81.3605927	41.1790180		N	N	0.749	656	2.8	0.3	628.5	$120,441	652	645.5	665
321	-81.4906856	41.3828510		N	N	0.677	684	2.5	0.4	571.5	$112,926	682	645.8	666
935	-81.5717460	41.3733818	3	Y	Y	0.046	77	0.2	0.0	946	$40,906	915	646.0	667
122	-81.3898845	41.2445203		N	N	0.749	657	2.8	0.3	629.5	$120,384	653	646.5	668
205	-81.3775650	41.3075370		N	N	0.677	685	2.5	0.4	572.5	$112,921	683	646.8	669
873	-81.4121333	41.2584014		N	N	0.746	658	2.8	0.3	630.5	$120,149	654	647.5	670
944	-81.5847842	41.3754705		N	Y	0.481	754	1.8	0.2	729.5	$185,772	462	648.5	671
635	-81.4029201	41.3135339		N	Y	0.481	755	1.8	0.2	730.5	$185,481	463	649.5	672
18	-81.3572661	41.1823819		N	N	0.741	661	2.8	0.3	633.5	$119,634	657	650.5	673
936	-81.5721826	41.3735061	3	Y	Y	0.035	78	0.1	0.0	948	$37,222	929	651.7	674
21	-81.3348273	41.2276578		N	N	0.737	663	2.7	0.3	635	$119,202	659	652.3	675
395	-81.4921341	41.3550115		N	N	0.735	664	2.7	0.3	636	$118,963	660	653.3	676
839	-81.3966247	41.2544822		N	N	0.733	665	2.7	0.3	637	$118,786	661	654.3	677
355	-81.4895377	41.4370499		N	N	0.716	668	2.7	0.3	639	$117,031	664	657.0	678
198	-81.3824654	41.3028088		N	N	0.714	669	2.6	0.3	640	$116,761	665	658.0	679
823	-81.4119922	41.2676145		N	N	0.714	670	2.6	0.3	641	$116,738	666	659.0	680
950	-81.5489518	41.3820396	3	Y	Y	0.021	79	0.1	0.0	951	$32,590	948	659.3	681
188	-81.3841138	41.2938196		N	N	0.707	671	2.6	0.3	642	$116,040	667	660.0	682
756	-81.4228989	41.3016622		N	N	0.703	672	2.6	0.3	643	$115,635	668	661.0	683
954	-81.6071678	41.3671215		N	Y	0.461	766	1.7	0.2	740.5	$178,910	478	661.5	684
767	-81.4334752	41.3048440		N	N	0.702	673	2.6	0.3	644	$115,549	669	662.0	685
403	-81.4747333	41.3669081		N	N	0.699	674	2.6	0.3	645	$115,201	670	663.0	686
404	-81.4760510	41.3680454		N	N	0.696	676	2.6	0.3	647.5	$114,899	671	664.8	687
411	-81.4575662	41.3734038		N	N	0.694	677	2.6	0.3	648.5	$114,731	672	665.8	688
690	-81.4553823	41.3369519		N	N	0.691	678	2.6	0.3	649.5	$114,399	673	666.8	689
513	-81.4839722	41.3557180		N	N	0.690	679	2.6	0.3	650.5	$114,328	674	667.8	690

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank		AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)		Economic Value	Economic Rank		Average Rank	Final Rank
902	-81.4008152	41.2280444		N	N	0.689	680		2.6	0.3	651.5		$114,207	675		668.8	691
666	-81.4475356	41.3237246		N	N	0.684	681		2.5	0.3	654		$113,704	677		670.7	692
306	-81.5582298	41.3934060		N	N	0.606	708		2.2	0.4	602		$105,636	706		672.0	693
827	-81.4529149	41.3289508		N	N	0.681	683		2.5	0.3	655.5		$113,389	680		672.8	694
292	-81.3634832	41.3122323		N	N	0.676	686		2.5	0.3	658		$112,862	684		676.0	695
592	-81.4069089	41.3464895		N	N	0.596	712		2.2	0.4	607		$104,566	710		676.3	696
654	-81.4362587	41.3313981		N	N	0.676	687		2.5	0.3	659		$112,850	685		677.0	697
495	-81.4748842	41.3933761		N	Y	0.434	782		1.6	0.2	757		$169,954	494		677.7	698
215	-81.3450677	41.3033919		N	N	0.670	688		2.5	0.3	660		$112,256	686		678.0	699
89	-81.3573489	41.2717309		N	N	0.666	689		2.5	0.3	662		$111,803	688		679.7	700
751	-81.4184311	41.2964278		N	Y	0.432	784		1.6	0.2	759		$169,217	496		679.7	701
202	-81.3804612	41.3059939		N	N	0.664	690		2.5	0.3	663.5		$111,608	689		680.8	702
464	-81.5066736	41.4337904		N	N	0.658	691		2.4	0.3	665		$110,968	690		682.0	703
543	-81.5083186	41.4515464		N	N	0.652	692		2.4	0.3	666		$110,362	691		683.0	704
638	-81.3920819	41.3146241		N	Y	0.428	788		1.6	0.2	762.5		$168,141	499		683.2	705
649	-81.4023382	41.3059494		N	N	0.650	693		2.4	0.3	667		$110,198	692		684.0	706
494	-81.4775335	41.3828625		N	N	0.649	694		2.4	0.3	668		$110,094	693		685.0	707
672	-81.4368483	41.3190603		N	N	0.649	695		2.4	0.3	669		$110,013	694		686.0	708
581	-81.4639189	41.3688718		N	N	0.639	696		2.4	0.2	670		$108,988	695		687.0	709
748	-81.4258645	41.2998680		N	N	0.630	697		2.3	0.2	671		$108,087	696		688.0	710
760	-81.4295933	41.3046618		N	N	0.629	699		2.3	0.2	673		$107,961	697		689.7	711
448	-81.4796727	41.4144921		N	N	0.627	700		2.3	0.2	674		$107,749	698		690.7	712
696	-81.4552676	41.3305977		N	N	0.626	701		2.3	0.2	675		$107,686	699		691.7	713
915	-81.3948690	41.2194005		N	N	0.622	702		2.3	0.2	676		$107,281	700		692.7	714
853	-81.4023304	41.2589589		N	N	0.621	703		2.3	0.2	677		$107,194	701		693.7	715
393	-81.5178444	41.3530189		N	N	0.613	704		2.3	0.2	678		$106,368	702		694.7	716
875	-81.4168887	41.2609687		N	N	0.553	729		2.1	0.3	631.5		$100,082	726		695.5	717
688	-81.4520547	41.3346834		N	N	0.613	705		2.3	0.2	679		$106,347	703		695.7	718
299	-81.3871330	41.3485145		N	N	0.611	706		2.3	0.2	680		$106,163	704		696.7	719
715	-81.4781918	41.3327322		N	N	0.607	707		2.3	0.2	681		$105,679	705		697.7	720
453	-81.4514699	41.4054152		N	N	0.604	709		2.2	0.2	682.5		$105,410	707		699.5	721
795	-81.4021592	41.2982773		N	N	0.603	710		2.2	0.2	683.5		$105,311	708		700.5	722
883	-81.4375118	41.2625477		N	N	0.598	711		2.2	0.2	684.5		$104,787	709		701.5	723
439	-81.4740431	41.4167113		N	Y	0.392	800		1.5	0.2	775.5		$156,166	530		701.8	724
777	-81.4098440	41.3009230		N	N	0.592	713		2.2	0.2	686.5		$104,193	711		703.5	725
699	-81.4538653	41.3297397		N	N	0.592	714		2.2	0.2	687.5		$104,182	712		704.5	726
473	-81.4715738	41.4346793		N	N	0.584	715		2.2	0.2	689		$103,308	713		705.7	727
963	-81.4576799	41.3158578		N	N	0.526	735		2.0	0.3	650.5		$97,314	734		706.5	728
684	-81.4536196	41.3320575		N	N	0.581	716		2.2	0.2	690		$103,019	714		706.7	729
884	-81.3925110	41.2492986		N	N	0.578	717		2.1	0.2	691		$102,741	715		707.7	730
257	-81.3811820	41.3256762		N	N	0.575	718		2.1	0.2	692		$102,446	716		708.7	731
977	-81.3969426	41.2254796		N	N	0.572	719		2.1	0.2	693		$102,048	717		709.7	732
417	-81.4464873	41.3650863		N	N	0.517	739		1.9	0.3	654		$96,434	737		710.0	733
951	-81.6039726	41.3647953		N	Y	0.357	817		1.3	0.2	755.5		$144,515	558		710.2	734
442	-81.4643486	41.4163139		N	N	0.571	720		2.1	0.2	694		$102,014	718		710.7	735
347	-81.4662214	41.4339478		N	N	0.568	721		2.1	0.2	695		$101,647	719		711.7	736
693	-81.4570030	41.3317689		N	N	0.561	723		2.1	0.2	697		$100,915	720		713.3	737
375	-81.5074165	41.3756983		N	N	0.560	724		2.1	0.2	698		$100,896	721		714.3	738
117	-81.3863832	41.2530212		N	N	0.560	725		2.1	0.2	699		$100,868	722		715.3	739
126	-81.3892914	41.2308369		N	N	0.560	726		2.1	0.2	700		$100,854	723		716.3	740
596	-81.4155317	41.3431775		N	N	0.556	727		2.1	0.2	701.5		$100,400	724		717.5	741
484	-81.4756189	41.4050386		N	Y	0.364	812		1.4	0.2	787		$146,803	554		717.7	742
30	-81.3423893	41.2268186		N	N	0.555	728		2.1	0.2	702.5		$100,348	725		718.5	743
171	-81.3451194	41.2086791		N	N	0.546	731		2.0	0.2	705		$99,403	728		721.3	744
658	-81.4476214	41.3286825		N	N	0.540	732		2.0	0.2	706		$98,786	729		722.3	745
694	-81.4582819	41.3302374		N	N	0.532	733		2.0	0.2	707.5		$97,910	730		723.5	746
276	-81.3837060	41.3172083		N	N	0.527	734		2.0	0.2	708.5		$97,427	733		725.2	747
888	-81.4178030	41.2442749		N	N	0.485	752		1.8	0.3	671.5		$74,750	755		726.2	748
661	-81.4462587	41.3275261		N	N	0.521	736		1.9	0.2	711.5		$96,781	735		727.5	749
639	-81.3929097	41.3139413		N	Y	0.347	821		1.3	0.2	797.5		$140,970	566		728.2	750
826	-81.4114248	41.2994359		N	N	0.518	738		1.9	0.2	713.5		$96,525	736		729.2	751
759	-81.4290870	41.3041571		N	N	0.480	756		1.8	0.3	676.5		$74,175	757		729.8	752
389	-81.5231886	41.3642536		N	N	0.512	740		1.9	0.2	715.5		$95,913	738		731.2	753
939	-81.5759604	41.3705063		N	Y	0.344	822		1.3	0.2	798.5		$139,936	573		731.2	754
335	-81.4555426	41.3964953		N	N	0.505	741		1.9	0.2	716.5		$95,164	739		732.2	755
217	-81.3577442	41.3079318		N	N	0.504	742		1.9	0.2	717.5		$95,063	740		733.2	756
1010	-81.3587014	41.2434598		N	N	0.502	743		1.9	0.2	718.5		$94,848	741		734.2	757
15	-81.3626208	41.1790100		N	N	0.500	745		1.9	0.2	721		$94,647	742		736.0	758
718	-81.4743062	41.3196028		N	N	0.467	763		1.7	0.3	686.5		$72,851	766		738.5	759
358	-81.4857239	41.4335332		N	N	0.498	746		1.8	0.2	722		$76,025	749		739.0	760
682	-81.4494266	41.3315738		N	N	0.491	747		1.8	0.2	723		$75,327	750		740.0	761
124	-81.3917398	41.2315656		N	N	0.490	748		1.8	0.2	724		$75,274	751		741.0	762
348	-81.4788597	41.4339138		N	N	0.489	749		1.8	0.2	725		$75,090	752		742.0	763
353	-81.4831503	41.4370396		N	N	0.487	750		1.8	0.2	726		$74,956	753		743.0	764
322	-81.4922685	41.3862156		N	N	0.486	751		1.8	0.2	727		$74,794	754		744.0	765
960	-81.6026677	41.3729128		N	Y	0.326	829		1.2	0.1	806		$134,155	601		745.3	766
443	-81.4640303	41.4176036		N	N	0.485	753		1.8	0.2	728.5		$74,718	756		745.8	767
611	-81.4074104	41.3344282		N	Y	0.322	832		1.2	0.1	809		$132,636	605		748.7	768
508	-81.5191796	41.3670137		N	N	0.479	757		1.8	0.2	732		$74,076	758		749.0	769
394	-81.5182955	41.3545130		N	N	0.479	758		1.8	0.2	733		$74,076	759		750.0	770
216	-81.3578109	41.3050628		N	N	0.445	775		1.7	0.3	699		$70,713	778		750.7	771
186	-81.3666767	41.2876395		N	Y	0.318	834		1.2	0.1	812		$131,424	609		751.7	772
701	-81.4535260	41.3309002		N	N	0.474	759		1.8	0.2	734		$73,611	762		751.7	773
271	-81.3859477	41.3203919		N	N	0.472	760		1.7	0.2	735		$73,360	763		752.7	774
914	-81.3945405	41.2206803		N	N	0.440	776		1.6	0.3	703.5		$70,207	779		752.8	775
976	-81.3970714	41.2213628		N	N	0.469	761		1.7	0.2	736		$73,119	764		753.7	776
224	-81.3596324	41.3201384		N	N	0.469	762		1.7	0.2	737		$73,109	765		754.7	777
833	-81.4725778	41.3079576		N	N	0.464	764		1.7	0.2	738.5		$72,596	767		756.5	778
685	-81.4487654	41.3330331		N	N	0.462	765		1.7	0.2	739.5		$72,362	768		757.5	779
865	-81.4002266	41.2441584		N	N	0.460	767		1.7	0.2	741.5		$72,209	769		759.2	780
359	-81.4839616	41.4320920		N	N	0.457	768		1.7	0.2	742.5		$71,882	771		760.5	781
846	-81.3944841	41.2571066		N	N	0.450	769		1.7	0.2	743.5		$71,185	772		761.5	782
317	-81.4948874	41.3917915		N	N	0.430	786		1.6	0.3	713		$69,176	787		762.0	783
802	-81.4010047	41.2926926		N	N	0.450	770		1.7	0.2	744.5		$71,170	773		762.5	784
731	-81.4208115	41.2772202		N	N	0.449	771		1.7	0.2	745.5		$71,095	774		763.5	785
302	-81.4985349	41.4649516		N	N	0.449	772		1.7	0.2	746.5		$71,054	775		764.5	786
456	-81.5500251	41.4002071		N	N	0.428	789		1.6	0.3	715.5		$68,978	789		764.5	787
272	-81.3840327	41.3206990		N	N	0.448	773		1.7	0.2	747.5		$70,997	776		765.5	788
123	-81.3885794	41.2383415		N	N	0.448	774		1.7	0.2	748.5		$70,938	777		766.5	789
876	-81.4249779	41.2603049		N	N	0.439	777		1.6	0.2	752		$70,020	780		769.7	790
336	-81.4477058	41.3960087		N	N	0.438	778		1.6	0.2	753		$69,908	781		770.7	791
896	-81.3987959	41.2320131		N	N	0.437	779		1.6	0.2	754		$69,826	782		771.7	792
341	-81.4545978	41.3888480		N	N	0.436	780		1.6	0.2	755		$69,803	783		772.7	793
511	-81.4886719	41.3632647		N	N	0.434	781		1.6	0.2	756		$69,579	784		773.7	794
721	-81.4540992	41.3103131		N	N	0.433	783		1.6	0.2	758		$69,414	785		775.3	795
194	-81.3797831	41.2982603		N	N	0.430	785		1.6	0.2	760		$69,197	786		777.0	796
738	-81.4139202	41.2856240		N	N	0.395	799		1.5	0.2	733		$65,601	800		777.3	797
808	-81.4001121	41.2947411		N	Y	0.290	857		1.1	0.1	834.5		$121,959	642		777.8	798
344	-81.4542561	41.3838214		N	N	0.429	787		1.6	0.2	761.5		$69,011	788		778.8	799
675	-81.4353466	41.3137504		N	N	0.422	790		1.6	0.2	764		$68,351	790		781.3	800
505	-81.5358441	41.3698272		N	N	0.419	791		1.6	0.2	765		$68,017	791		782.3	801
265	-81.3840578	41.3394821		N	N	0.414	792		1.5	0.2	767		$67,524	792		783.7	802
761	-81.4289093	41.3014304		N	N	0.411	793		1.5	0.2	768		$67,186	793		784.7	803
958	-81.6022800	41.3712939		N	Y	0.283	861		1.0	0.1	839.5		$119,676	656		785.5	804
383	-81.4882058	41.3781435		N	N	0.408	794		1.5	0.2	769		$66,895	794		785.7	805

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank		AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)		Economic Value	Economic Rank		Average Rank	Final Rank
349	-81.4768501	41.4314380		N	N	0.401	795		1.5	0.2	770		$66,161	796		787.0	806
524	-81.4827398	41.3729729		N	N	0.379	808		1.4	0.2	744		$63,986	809		787.0	807
465	-81.4849777	41.4431186		N	N	0.400	796		1.5	0.2	771		$66,142	797		788.0	808
441	-81.4697517	41.4148340		N	N	0.400	797		1.5	0.2	773		$66,060	798		789.3	809
392	-81.5165761	41.3525192		N	N	0.399	798		1.5	0.2	774		$65,982	799		790.3	810
851	-81.4010593	41.2563129		N	N	0.363	813		1.3	0.2	751		$62,366	814		792.7	811
444	-81.4630340	41.4182884		N	N	0.389	801		1.4	0.2	776.5		$65,012	801		792.8	812
296	-81.3922253	41.3492051		N	N	0.389	802		1.4	0.2	777.5		$64,971	802		793.8	813
506	-81.5346982	41.3723985		N	N	0.389	803		1.4	0.2	778.5		$64,943	803		794.8	814
878	-81.4334288	41.2555515		N	N	0.386	804		1.4	0.2	779.5		$64,698	804		795.8	815
882	-81.4358956	41.2632730		N	N	0.382	805		1.4	0.2	780.5		$64,240	806		797.2	816
134	-81.3892171	41.2170230		N	N	0.381	806		1.4	0.2	781.5		$64,187	807		798.2	817
507	-81.5130973	41.3710823		N	N	0.380	807		1.4	0.2	782.5		$64,114	808		799.2	818
662	-81.4473508	41.3266429		N	N	0.376	809		1.4	0.2	784		$63,687	811		801.3	819
164	-81.3767574	41.2222086		N	N	0.376	810		1.4	0.2	785		$63,674	812		802.3	820
815	-81.3985345	41.2818899		N	N	0.374	811		1.4	0.2	786		$63,481	813		803.3	821
710	-81.4641049	41.3488558		N	N	0.362	814		1.3	0.2	788.5		$62,253	815		805.8	822
668	-81.4477384	41.3227255		N	N	0.360	815		1.3	0.2	789.5		$62,050	816		806.8	823
209	-81.3728780	41.3116738		N	N	0.358	816		1.3	0.2	791.5		$61,802	818		808.5	824
907	-81.4051822	41.2280811		N	N	0.357	818		1.3	0.2	793		$61,700	819		810.0	825
325	-81.4926074	41.3902657		N	N	0.352	819		1.3	0.2	795		$61,283	820		811.3	826
365	-81.5057953	41.4426358		N	N	0.350	820		1.3	0.2	796.5		$61,011	821		812.5	827
352	-81.4820441	41.4386847		N	N	0.340	823		1.3	0.1	799.5		$60,030	823		815.2	828
476	-81.4898480	41.4278820		N	N	0.334	824		1.2	0.1	801		$59,424	824		816.3	829
518	-81.4615460	41.3631734		N	N	0.334	825		1.2	0.1	802		$59,378	825		817.3	830
708	-81.4617369	41.3458213		N	N	0.318	835		1.2	0.2	783		$57,806	835		817.7	831
327	-81.4865320	41.3866236		N	N	0.330	826		1.2	0.1	803		$59,052	826		818.3	832
451	-81.4565656	41.4063023		N	N	0.329	827		1.2	0.1	804		$58,886	827		819.3	833
452	-81.4568024	41.4072966		N	N	0.327	828		1.2	0.1	805		$58,743	828		820.3	834
328	-81.4864701	41.3820704		N	N	0.325	830		1.2	0.1	807		$58,491	830		822.3	835
273	-81.3840323	41.3194768		N	N	0.324	831		1.2	0.1	808		$58,379	831		823.3	836
446	-81.4760045	41.4045893		N	Y	0.224	884		0.8	0.1	865.5		$100,054	727		825.5	837
707	-81.4586610	41.3458281		N	N	0.319	833		1.2	0.1	811		$57,859	834		826.0	838
309	-81.5268482	41.3879705		N	N	0.314	836		1.2	0.1	813.5		$57,442	837		828.8	839
787	-81.3940545	41.2873343		N	Y	0.216	887		0.8	0.1	869		$97,433	732		829.3	840
340	-81.4551374	41.3888426		N	N	0.314	837		1.2	0.1	814.5		$57,375	838		829.8	841
388	-81.4899544	41.3617712		N	N	0.314	838		1.2	0.1	815.5		$57,374	839		830.8	842
242	-81.3736105	41.3340394		N	N	0.313	839		1.2	0.1	816.5		$57,308	840		831.8	843
368	-81.5406494	41.3712521		N	N	0.313	840		1.2	0.1	817.5		$57,305	841		832.8	844
343	-81.4552088	41.3853390		N	N	0.313	841		1.2	0.1	818.5		$57,263	842		833.8	845
863	-81.3980992	41.2455329		N	N	0.307	842		1.1	0.1	819.5		$56,689	843		834.8	846
722	-81.4542656	41.3096865		N	N	0.307	843		1.1	0.1	820.5		$56,657	844		835.8	847
905	-81.4164760	41.2365305		N	N	0.301	844		1.1	0.1	821.5		$56,029	845		836.8	848
436	-81.4758528	41.4275596		N	N	0.300	845		1.1	0.1	822.5		$55,999	846		837.8	849
440	-81.4707192	41.4143493		N	Y	0.200	895		0.7	0.1	877		$92,276	743		838.3	850
437	-81.4744557	41.4256754		N	N	0.298	846		1.1	0.1	823.5		$55,783	847		838.8	851
689	-81.4532054	41.3344251		N	N	0.298	847		1.1	0.1	824.5		$55,765	848		839.8	852
414	-81.4565492	41.3583132		N	N	0.297	848		1.1	0.1	825.5		$55,685	849		840.8	853
350	-81.4732367	41.4284758		N	N	0.297	849		1.1	0.1	826.5		$55,633	850		841.8	854
472	-81.4725324	41.4347065		N	N	0.296	850		1.1	0.1	827.5		$55,577	851		842.8	855
342	-81.4638027	41.3868287		N	N	0.295	851		1.1	0.1	828.5		$55,514	852		843.8	856
732	-81.4203132	41.2774672		N	N	0.295	852		1.1	0.1	829.5		$55,501	853		844.8	857
376	-81.5058572	41.3718324		N	N	0.295	853		1.1	0.1	830.5		$55,489	854		845.8	858
480	-81.4583381	41.4131929		N	Y	0.173	905		0.6	0.1	889.5		$83,213	746		846.8	859
659	-81.4472157	41.3273597		N	N	0.295	854		1.1	0.1	831.5		$55,470	855		846.8	860
750	-81.4205560	41.2984651		N	N	0.291	855		1.1	0.1	832.5		$55,091	856		847.8	861
313	-81.4896514	41.3950185		N	N	0.291	856		1.1	0.1	833.5		$55,051	857		848.8	862
158	-81.3805640	41.2188634		N	N	0.290	858		1.1	0.1	835.5		$54,918	858		850.5	863
512	-81.4896051	41.3556287		N	N	0.289	859		1.1	0.1	836.5		$54,810	859		851.5	864
975	-81.3932903	41.2221740		N	N	0.286	860		1.1	0.1	838.5		$54,578	860		852.8	865
953	-81.6086035	41.3654855		N	Y	0.155	913		0.6	0.1	898		$77,023	748		853.0	866
449	-81.4873943	41.4131701		N	N	0.263	868		1.0	0.1	824.5		$52,201	867		853.2	867
303	-81.5552493	41.3992377		N	N	0.279	862		1.0	0.1	840.5		$53,825	861		854.5	868
469	-81.4889923	41.4382301		N	N	0.277	863		1.0	0.1	841.5		$53,670	862		855.5	869
871	-81.4129093	41.2467821		N	N	0.275	864		1.0	0.1	842.5		$53,483	863		856.5	870
706	-81.4597051	41.3455108		N	N	0.273	865		1.0	0.1	843.5		$53,212	864		857.5	871
396	-81.4887099	41.3525881		N	N	0.268	866		1.0	0.1	844.5		$52,734	865		858.5	872
330	-81.4734060	41.3832378		N	N	0.268	867		1.0	0.1	845.5		$52,720	866		859.5	873
390	-81.5104433	41.3591899		N	N	0.262	869		1.0	0.1	849.5		$52,151	868		862.2	874
304	-81.5546605	41.3995561		N	N	0.262	870		1.0	0.1	850.5		$52,109	869		863.2	875
385	-81.4868302	41.3766508		N	N	0.261	871		1.0	0.1	851.5		$52,007	870		864.2	876
364	-81.4989527	41.4312554		N	N	0.259	872		1.0	0.1	852.5		$51,810	871		865.2	877
807	-81.4005405	41.2955610		N	N	0.257	873		1.0	0.1	853.5		$51,663	872		866.2	878
482	-81.4771029	41.4082348		N	N	0.254	874		0.9	0.1	854.5		$51,328	874		867.5	879
687	-81.4452634	41.3355269		N	N	0.251	875		0.9	0.1	855.5		$51,006	875		868.5	880
326	-81.4866127	41.3872793		N	N	0.245	876		0.9	0.1	856.5		$50,354	877		869.8	881
867	-81.4042864	41.2470607		N	N	0.244	877		0.9	0.1	857.5		$50,342	878		870.8	882
908	-81.4054231	41.2273883		N	N	0.241	878		0.9	0.1	858.5		$49,986	879		871.8	883
817	-81.3950767	41.2807299		N	N	0.239	879		0.9	0.1	859.5		$49,750	881		873.2	884
709	-81.4623653	41.3460711		N	N	0.235	880		0.9	0.1	860.5		$49,428	882		874.2	885
557	-81.4995321	41.3879380		N	N	0.234	881		0.9	0.1	861.5		$49,324	883		875.2	886
854	-81.4031299	41.2525854		N	N	0.220	885		0.8	0.1	856.5		$47,896	887		876.2	887
555	-81.4650216	41.4110660		N	N	0.230	882		0.9	0.1	863.5		$48,883	885		876.8	888
768	-81.4330189	41.3065983		N	N	0.226	883		0.8	0.1	864.5		$48,483	886		877.8	889
590	-81.4084547	41.3474664		N	N	0.219	886		0.8	0.1	867		$47,802	888		880.3	890
357	-81.4929945	41.4396982		N	N	0.215	888		0.8	0.1	870		$47,367	889		882.3	891
251	-81.3677102	41.3334469		N	N	0.214	889		0.8	0.1	871		$47,250	890		883.3	892
249	-81.3704694	41.3363053		N	N	0.210	890		0.8	0.1	872		$46,812	891		884.3	893
990	-81.4170753	41.3449941		N	N	0.209	891		0.8	0.1	873		$46,781	892		885.3	894
447	-81.4803571	41.4129825		N	N	0.209	892		0.8	0.1	874		$46,759	893		886.3	895
903	-81.3979778	41.2241317		N	N	0.204	893		0.8	0.1	875		$46,211	895		887.7	896
455	-81.5729693	41.3835358		N	N	0.201	894		0.7	0.1	876		$45,969	896		888.7	897
418	-81.4310396	41.3753130		N	N	0.193	896		0.7	0.1	878.5		$45,132	897		890.5	898
356	-81.4889724	41.4385555		N	N	0.190	897		0.7	0.1	880.5		$44,799	899		892.2	899
858	-81.3990859	41.2531641		N	N	0.189	898		0.7	0.1	881.5		$44,705	900		893.2	900
195	-81.3795330	41.2990265		N	N	0.188	899		0.7	0.1	883.5		$44,662	901		894.5	901
702	-81.4549926	41.3240872		N	N	0.186	900		0.7	0.1	884.5		$44,465	902		895.5	902
230	-81.3640383	41.3308938		N	N	0.183	901		0.7	0.1	885.5		$44,158	903		896.5	903
956	-81.6024210	41.3704107		N	Y	0.098	933		0.4	0.1	926		$58,144	832		897.0	904
374	-81.5087163	41.3745116		N	N	0.182	902		0.7	0.1	886.5		$44,007	904		897.5	905
872	-81.4147092	41.2516392		N	N	0.178	904		0.7	0.1	883		$43,611	907		898.0	906
857	-81.4009264	41.2526987		N	N	0.182	903		0.7	0.1	887.5		$43,988	906		898.8	907
250	-81.3690130	41.3355540		N	N	0.173	906		0.6	0.1	890.5		$43,093	908		901.5	908
695	-81.4562349	41.3309372		N	N	0.170	907		0.6	0.1	891.5		$42,799	909		902.5	909
847	-81.3942020	41.2562878		N	N	0.164	908		0.6	0.1	892.5		$42,236	910		903.5	910
315	-81.4804126	41.4001756		N	N	0.162	909		0.6	0.1	893.5		$42,012	911		904.5	911
772	-81.4296360	41.3059171		N	N	0.161	910		0.6	0.1	891.5		$41,896	912		904.5	912
730	-81.4211870	41.2775174		N	N	0.160	911		0.6	0.1	896		$41,752	913		906.7	913
243	-81.3734124	41.3353566		N	N	0.159	912		0.6	0.1	897		$41,643	914		907.7	914
864	-81.3981522	41.2444018		N	N	0.145	914		0.5	0.1	900		$40,287	917		910.3	915
859	-81.3973426	41.2533039		N	N	0.145	915		0.5	0.1	901		$40,259	918		911.3	916
457	-81.5014609	41.4032829		N	N	0.135	916		0.5	0.1	904		$39,245	919		913.0	917
852	-81.4014159	41.2581418		N	N	0.132	917		0.5	0.1	905		$38,992	920		914.0	918
916	-81.3950510	41.2252708		N	N	0.130	918		0.5	0.1	906		$38,726	921		915.0	919
387	-81.4862442	41.3679039		N	N	0.129	919		0.5	0.1	907		$38,619	922		916.0	920

WETLAND ID	Centroid Longitude	Centroid Latitude	ORAM Category	T&E Species?	Managed Area?	Area in Acres	Ecological Rank		AVGWLF Total Volume Processed	Basin Volume (ac-ft)	Hydro Rank (Average)		Economic Value	Economic Rank		Average Rank	Final Rank
943	-81.5794021	41.3722129		N	N	0.122	**920**		0.5	0.1	**909**		$37,965	**923**		917.3	**921**
229	-81.3607917	41.3287240		N	N	0.121	**921**		0.4	0.1	**910**		$37,851	**924**		918.3	**922**
438	-81.4700005	41.4276289		N	N	0.121	**922**		0.4	0.1	**911**		$37,841	**925**		919.3	**923**
850	-81.4019854	41.2550863		N	N	0.119	**923**		0.4	0.1	**912**		$37,626	**926**		920.3	**924**
904	-81.3971783	41.2238494		N	N	0.119	**924**		0.4	0.1	**913**		$37,599	**927**		921.3	**925**
1005	-81.4784971	41.3791047		N	Y	0.073	**945**		0.3	0.0	**940.5**		$49,798	**880**		921.8	**926**
681	-81.4498405	41.3308662		N	N	0.116	**925**		0.4	0.1	**915**		$37,372	**928**		922.7	**927**
362	-81.4880836	41.4298513		N	N	0.115	**926**		0.4	0.1	**917.5**		$37,191	**930**		924.5	**928**
354	-81.4879052	41.4368718		N	N	0.109	**927**		0.4	0.1	**917.5**		$36,647	**931**		925.2	**929**
248	-81.3693147	41.3369446		N	N	0.105	**928**		0.4	0.1	**920**		$36,190	**932**		926.7	**930**
361	-81.4869924	41.4302031		N	N	0.104	**929**		0.4	0.1	**921**		$36,106	**933**		927.7	**931**
371	-81.5304680	41.3754074		N	N	0.102	**930**		0.4	0.1	**922**		$35,930	**934**		928.7	**932**
625	-81.3942376	41.3266612		N	Y	0.058	**947**		0.2	0.0	**944**		$45,043	**898**		929.7	**933**
870	-81.4129590	41.2498495		N	N	0.102	**931**		0.4	0.1	**923**		$35,887	**935**		929.7	**934**
426	-81.4032426	41.3583599		N	N	0.099	**932**		0.4	0.1	**925**		$35,650	**936**		931.0	**935**
945	-81.5837071	41.3753715		N	Y	0.055	**948**		0.2	0.0	**945**		$44,001	**905**		932.7	**936**
369	-81.5398682	41.3712736		N	N	0.096	**934**		0.4	0.1	**928**		$35,310	**937**		933.0	**937**
906	-81.4158467	41.2365285		N	N	0.096	**935**		0.4	0.1	**929**		$35,297	**938**		934.0	**938**
24	-81.3360583	41.2315171		N	N	0.096	**936**		0.4	0.1	**930**		$35,285	**939**		935.0	**939**
869	-81.4107681	41.2497252		N	N	0.092	**937**		0.3	0.1	**931**		$34,878	**940**		936.0	**940**
377	-81.5049383	41.3677533		N	N	0.091	**938**		0.3	0.1	**932**		$34,850	**941**		937.0	**941**
957	-81.6028978	41.3696013		N	Y	0.046	**949**		0.2	0.0	**947**		$40,863	**916**		937.3	**942**
458	-81.4458354	41.3936519		N	N	0.086	**940**		0.3	0.0	**933.5**		$34,282	**943**		938.8	**943**
855	-81.4026499	41.2515674		N	N	0.087	**939**		0.3	0.0	**936**		$34,413	**942**		939.0	**944**
942	-81.5801725	41.3723759		N	N	0.081	**941**		0.3	0.0	**934.5**		$33,836	**944**		939.8	**945**
258	-81.3812113	41.3244348		N	N	0.080	**942**		0.3	0.0	**935.5**		$33,663	**945**		940.8	**946**
868	-81.4076442	41.2436437		N	N	0.080	**943**		0.3	0.0	**939**		$33,647	**946**		942.7	**947**
941	-81.5798127	41.3724624		N	N	0.078	**944**		0.3	0.0	**938**		$33,478	**947**		943.0	**948**
680	-81.4501904	41.3304530		N	N	0.065	**946**		0.2	0.0	**942**		$32,210	**949**		945.7	**949**
723	-81.4622192	41.2897744		N	N	0.032	**950**		0.1	0.0	**949**		$28,797	**950**		949.7	**950**
894	-81.4000293	41.2185990		N	N	0.030	**951**		0.1	0.0	**950**		$28,646	**951**		950.7	**951**

Appendix C: AVGWLF Documentation



AVGWLF Overview

The recognition of the importance of non-point sources of pollution has led to increased efforts over the last two decades to identify and quantify non-point source pollutant loads, especially at the watershed level. Typical techniques for determining the extent and magnitude of non-point source pollution problems include long-term surface water monitoring and computer-based simulation modeling. Due to the time and expense associated with surface water monitoring, however, simulation modeling has been relied upon more frequently to provide needed information for the development and implementation of non-point source control programs. Watershed simulation models, in fact, are commonly considered to be essential tools for evaluating the sources and controls of sediment and nutrient loading to surface waters. Such models provide a framework for integrating the data that describe the processes and land-surface characteristics that determine pollutant loads transported to nearby water bodies.

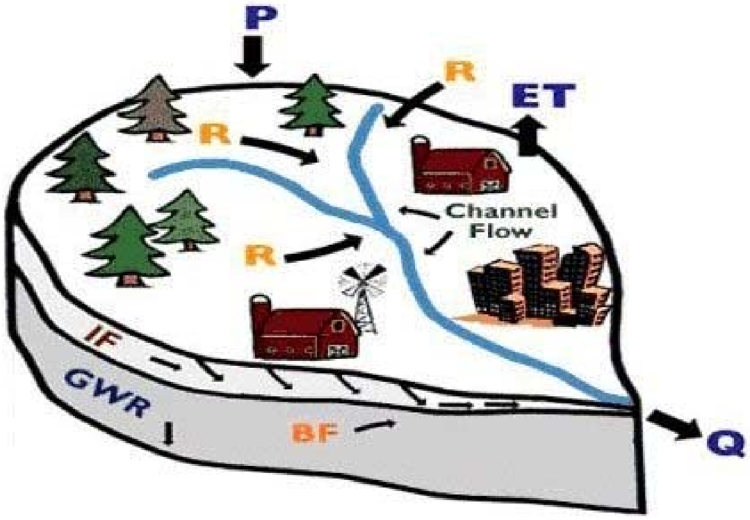
The utilization of watershed models, however, is a difficult, tedious task because of the broad spatial and temporal scales that must be considered, as well as the large amount of data that must be compiled, integrated, analyzed, and interpreted. Fortunately, the last two decades of model development have coincided with rapid advancements in the development and use of geographic information system (GIS) technology. This technology provides the means for compiling, organizing, manipulating, analyzing, and presenting spatially-referenced model input and output data. Due to the many inherent benefits, GIS software has been used to support literally hundreds of watershed modeling efforts over the last 10-15 years.

Over the last 5-10 years, the Pennsylvania Department of Environmental Protection (DEP) has recognized the indispensability of GIS technology, and has endeavored to integrate it into all of the agency's internal program areas. Towards this end, Penn State has been assisting DEP in the development and implementation of various GIS-based watershed assessment tools. One such tool facilitates the use of the GWLF model via a GIS software (ArcView) interface. This tool (called AVGWLF) has recently been selected by DEP to help support its ongoing TMDL projects within Pennsylvania. The general approach in such projects is to: 1) derive input data for GWLF for use in an "impaired" watershed, 2) simulate nutrient and sediment loads within the impaired watershed, 3) compare simulated loads within the impaired watershed against loads simulated for a nearby "reference" watershed that exhibits similar landscape, development and agricultural patterns, but which also has been deemed to be unimpaired, and 4) identify and evaluate pollution mitigation strategies that could be applied in the impaired watershed to achieve pollutant loads similar to those calculated for the reference watershed. The primary bases of comparison between impaired and reference watersheds are the average annual nutrient and sediment loads estimated for each.

THE GWLF MODEL

The core watershed simulation model for this GIS-based application is the GWLF (Generalized Watershed Loading Function) model developed by Haith and Shoemaker (1987). The GWLF model provides the ability to simulate runoff, sediment, and nutrient (N and P) loadings from a watershed given variable-size source areas (e.g., agricultural, forested, and developed land). It also has algorithms for calculating septic system loads, and allows for the inclusion of point source discharge data. It is a continuous simulation model which uses daily time steps for weather data and water balance calculations. Monthly calculations are made for sediment and nutrient loads, based on the daily water balance accumulated to monthly values.

AVGWLF



GWLF is considered to be a combined distributed/lumped parameter watershed model. For surface loading, it is distributed in the sense that it allows multiple land use/cover scenarios, but each area is assumed to be homogenous in regard to various attributes considered by the model. Additionally, the model does not spatially distribute the source areas, but simply aggregates the loads from each area into a watershed total; in other words there is no spatial routing. For sub-surface loading, the model acts as a lumped parameter model using a water balance approach. No distinctly separate areas are considered for sub-surface flow contributions. Daily water balances are computed for an unsaturated zone as well as a saturated sub-surface zone, where infiltration is simply computed as the difference between precipitation and snowmelt minus surface runoff plus evapotranspiration.

With respect to the major processes simulated, GWLF models surface runoff using the SCS-CN approach with daily weather (temperature and precipitation) inputs. Erosion and sediment yield are estimated using monthly erosion calculations based on the USLE algorithm (with monthly rainfall-runoff coefficients) and a monthly composite of KLSCP values for each source area (e.g., land cover/soil type combination). A sediment delivery ratio based on watershed size and a transport capacity based on average daily runoff are then applied to the calculated erosion to determine sediment yield for each source area. Surface nutrient losses are determined by applying dissolved N and P coefficients to surface runoff and a sediment coefficient to the yield portion for each agricultural source area. Point source discharges can also contribute to dissolved losses and are specified in terms of kilograms per month. Manured areas, as well as septic systems, can also be considered. Urban nutrient inputs are all assumed to be solid-phase, and the model uses an exponential accumulation and washoff function for these loadings. Sub-surface losses are calculated using dissolved N and P coefficients for shallow groundwater contributions to stream nutrient loads, and the sub-surface sub-model only considers a single, lumped-parameter contributing area. Evapo-transpiration is determined using daily weather data and a cover factor dependent upon land use/cover type. Finally, a water balance is performed daily using supplied or computed precipitation, snowmelt, initial unsaturated zone storage, maximum available zone storage, and evapotranspiration values.

In addition to the original model algorithms described above, a new streambank erosion routine was also implemented as part of AVGWLF. This routine is based on an approach often used in the field of geomorphology in which monthly streambank erosion is estimated by first calculating a watershed-specific lateral erosion rate using the equation of the form

$$LER = aq^{0.6}$$

where LER = an estimated lateral erosion rate
a = an empirically-derived constant related to the mass of soil eroded from the streambank depending upon various watershed conditions, and
q = monthly stream flow in cubic meters per second.

After a value for LER has been computed, the total sediment load generated via streambank erosion is then calculated by multiplying the above erosion rate by the total length of streams in the watershed (in meters), the average streambank height (in meters), and the average soil bulk density (in kg/m3).

For execution, the model requires three separate input files containing transport-, nutrient-, and weather-related data. The transport (TRANSPRT.DAT) file defines the necessary parameters for each source area to be considered (e.g., area size, curve number, etc.) as well as global parameters (e.g., initial storage, sediment delivery ratio, etc.) that apply to all source areas. The nutrient (NUTRIENT.DAT) file specifies the various loading parameters for the different source areas identified (e.g., number of septic systems, urban source area accumulation rates, manure concentrations, etc.). The weather (WEATHER.DAT) file contains daily average temperature and total precipitation values for each year simulated.

GIS-BASED DERIVATION OF INPUT DATA FOR GWLF

As described previously, the use of GIS software for deriving input data for watershed simulation models such as GWLF is becoming fairly standard practice due to the inherent advantages of using GIS for manipulating spatial data. In this case, a customized interface developed by Penn State for the ArcView GIS package is used to parameterize input data for the GWLF model (Evans et al., 2002). In utilizing this interface, the user is prompted to identify required GIS files and to provide other information related to “non-spatial” model parameters (e.g., beginning and end of the growing season; and the months during which manure is spread on agricultural land). This information is subsequently used to automatically derive values for required model input parameters which are then written to the TRANSPORT.DAT and NUTRIENT.DAT input files needed to execute the GWLF model. Also accessed through the interface is a statewide weather database that contains twenty (25) years of temperature and precipitation data for seventy-eight (78) weather stations around Pennsylvania. This database is used to create the necessary WEATHER.DAT input file for a given watershed simulation.

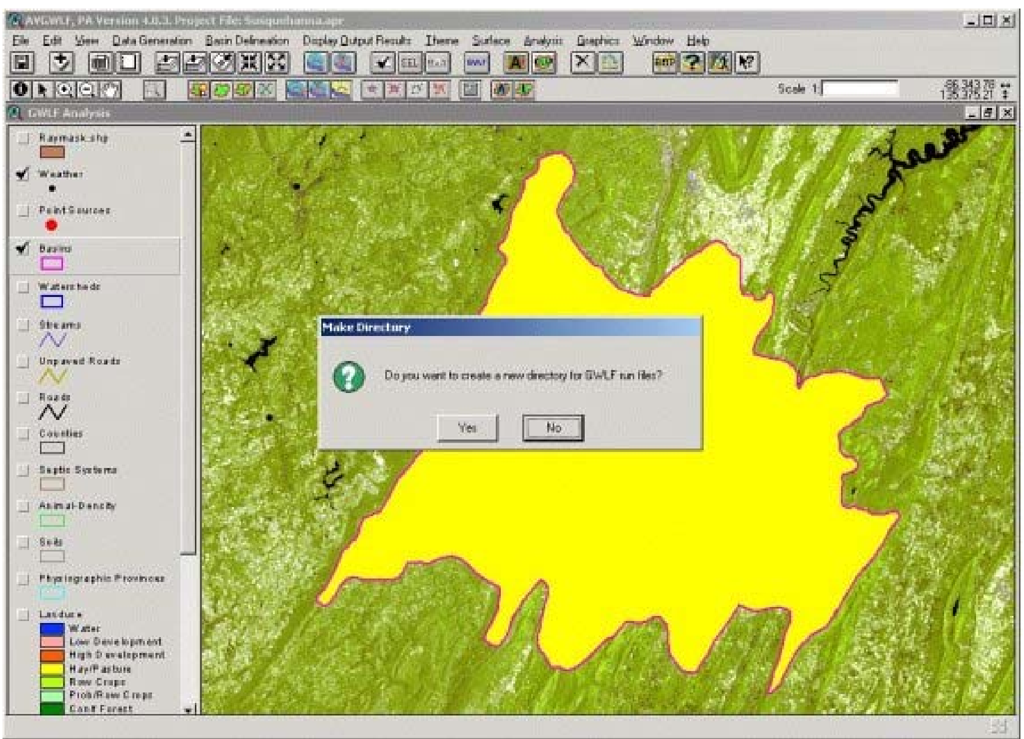
Information sources for GWLF model parameterization

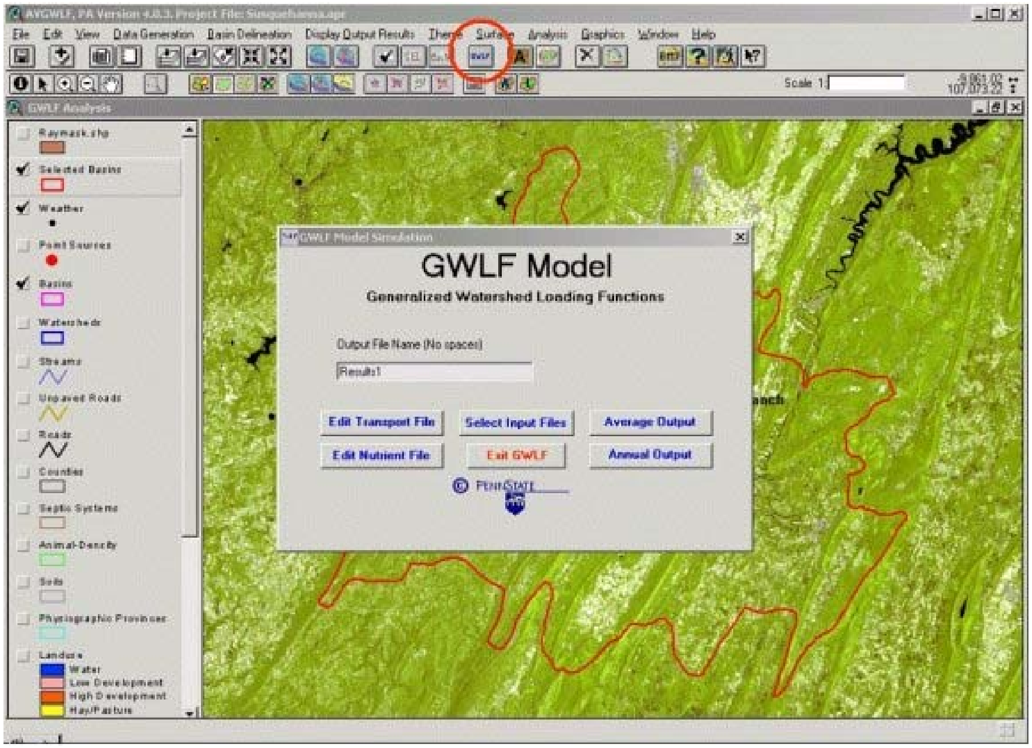
WEATHER.DAT file	Historical weather data from National Weather Service monitoring stations
TRANSPORT.DAT file	
Basin size	GIS/derived from basin boundaries
Land use/cover distribution	GIS/derived from land use/cover map
Curve numbers by source area	GIS/derived from land cover and soil maps
USLE (KLSCP) factors by source area	GIS/derived from soil, DEM, and land cover
ET cover coefficients	GIS/derived from land cover
Erosivity coefficients	GIS/ derived from physiography map

Daylight hrs. by month	Computed automatically for stateInput by user
Growing season months	Default value of 10 cm
Initial saturated storage	Default value of 0 cm
Initial unsaturated storage	Default value of 0.1
Recession coefficient	Default value of 0
Seepage coefficient	Default value of 0
Initial snow amount (cm water)	GIS/based on basin size
Sediment delivery ratio Soil water (available water capacity	GIS/derived from soil map

NUTRIENT.DAT file

Dissolved N in runoff by land cover type	Default values/adjusted using AEU density
Dissolved P in runoff by land cover type	Default values/adjusted using AEU density
N/P concentrations in manure runoff	Default values/adjusted using AEU density
N/P buildup in urban areas	Default values (from GWLF Manual)
N and P point source loads	GIS/derived from NPDES point coverage
Background N/P concentrations in GW	GIS/derived from new background N map
Background P concentrations in soil	GIS/derived from soil P loading map
Background N concentrations in soil	Based on map in GWLF Manual
Months of manure spreading	Input by user
Population on septic systems	GIS/derived from census tract map
Per capita septic system loads (N/P)	Default values (from GWLF Manual)





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