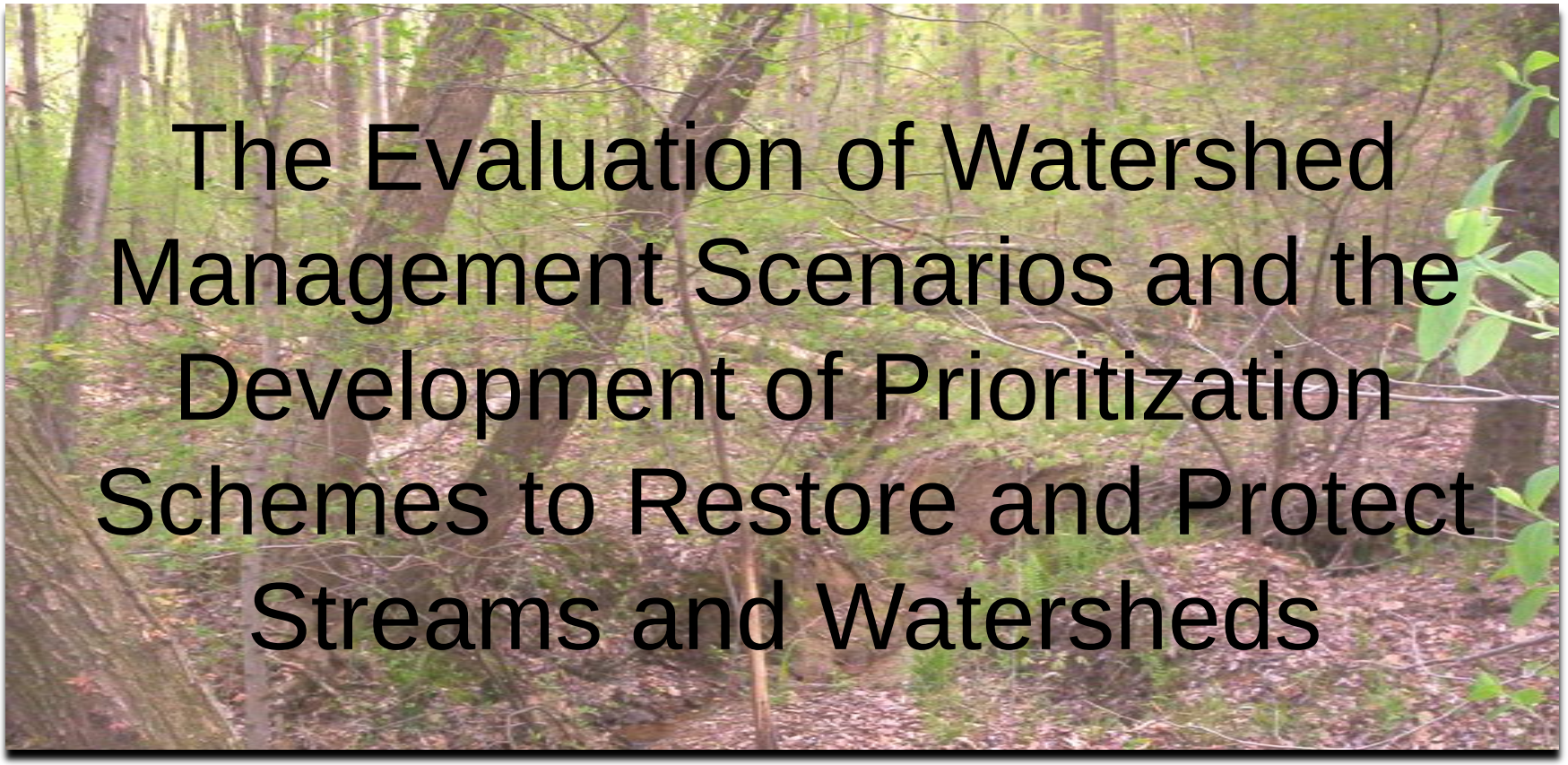

The Evaluation of Watershed Management Scenarios and the Development of Prioritization Schemes to Restore and Protect Streams and Watersheds

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A Changing Landscape

Local jurisdictions are experiencing a variety of stressors and continued changes in land use

Regulatory Mandates

Local jurisdictions also face numerous regulatory requirements

Big Question?

How can local jurisdictions choose streams and subwatersheds that are in need of restoration or preservation with the limited resources available to them?

A Method for Evaluating Watersheds

Select indicators of importance to the local jurisdiction

Quantitative

- Landcover
- Imperviousness

Qualitative

- Steep slopes layer (DEM derived)
- Wetland layers (MD DNR)
- FEMA 100 year floodplain
- Greenway
- Critical area layer
- Regulatory stream buffer layer

A Method for Evaluation

- **Quantitative Evaluation:** Water Quality Equation Based on Simple Method
  - **Literature Values for EMCs and BMP Efficiencies**
- **Qualitative Evaluation:** GIS Data
- **Spreadsheet** combining the equation and GIS results and series of rules

Quantitative Evaluation

Landcover &
Imperviousness

Calculate Runoff

Calculate Pollutant Load

Calculation of Pollutant Load

Water Quality Equation Based on **Simple Method**

First, the runoff coefficient for each land use type must be derived with the equation:

$$Rvu = 0.05 + (0.009 * Iu)$$

Where: **Rvu = Runoff coefficient for land use type u, inchesrun/inchesrain.**
Iu = Percent Imperviousness applicable to the scenario modeled.

The pollutant loads are then calculated with the following equation:

$$L = Su\ (P*Pj*Rvu*Cu*Au*2.72/12)$$

Where: **L = Pollutant loads for the watershed understudy, lbs/year**
P = Precipitation, inches/year (42.9 inches for Washington, D.C. Region)
Pj = Ratio of storms producing runoff (default 0.9)
Rvu = Runoff coefficient for land use type u, inchesrun/inchesrain
Cu = Event Mean Concentration for land use type u, milligrams/liter
Au = Area of land use type u, acres

Literature Values

Literature Values for EMCs and BMP Efficiencies

Code	Landcover	TMDL Category	% Impervious	TN	TP
PAS	Pasture	NPS Agriculture	0.00	1.71	1.00
SRC	Single Row Crop	NPS Agriculture	1.00	1.71	1.00
AIR	BWI Airport	NPS Urban	85.00	2.24	0.30
CIT	City of Annapolis	NPS Urban	0.00	0.00	0.00
COM	Commercial	NPS Urban	85.00	2.24	0.30
IND	Industrial	NPS Urban	72.00	2.22	0.19
R11	Residential 1 acre	NPS Urban	13.00	2.74	0.32
R11C	Residential 1 acre with Cluster Development	NPS Urban	8.00	1.95	0.24
R11CD	Residential 1 acre with High Density Cluster Development	NPS Urban	10.00	2.19	0.27
R12	Residential 1/2 acre	NPS Urban	18.00	2.74	0.32
R14	Residential 1/4 acre	NPS Urban	20.00	2.74	0.32
R18	Residential 1/8 acre	NPS Urban	34.00	2.74	0.32
R20	Residential 20 acre - equivalent to RA zoning	NPS Urban	2.00	1.15	0.15
R21	Residential 2 acre	NPS Urban	13.00	2.74	0.32
R21C	Residential 2 acre with Cluster Development	NPS Urban	6.00	1.95	0.24
R21CD	Residential 2 acre with High Density Cluster Development	NPS Urban	8.00	2.19	0.27
RWD	Residential Woods	NPS Urban	6.00	1.55	0.19
TRN	Transportation	NPS Urban	75.00	2.59	0.43
FRW	Forested Wetlands	Other NPS	0.00	1.15	0.15
OPS	Open Space	Other NPS	1.00	1.15	0.15
OPW	Open Wetlands	Other NPS	0.00	1.15	0.15
UTL	Utility	Other NPS	75.00	2.59	0.43
WAT	Water	Other NPS	0.00	1.20	0.03
WDS	Woods	Other NPS	0.00	1.15	0.15

AA Co BMP Code	County Name	TN	TP	BMP Group
DP	Detention Structure (Dry Pond)	5	10	Detention Dry
UGVAULT	Underground Storage	5	10	Detention Dry
UGS	Underground Storage	5	10	Detention Dry
ED	Extended Detention	20	20	Extended Detention Dry
EDSD	Extended Detention Structure Dry	20	20	Extended Detention Dry
MB	Microbasin - Extended Detention Structure Dry	20	20	Extended Detention Dry
ASCD	Attenuation Swale/Check Dam	40	60	Filtration
ATTENSWA	Attenuation Swale	40	60	Filtration
STMCEPTOR	Stormceptor	40	60	Filtration
WQINLET	Water Quality Inlet (OGS)	40	60	Filtration
POSAND	Pocket Sand Filter	40	60	Filtration
GBMP	Bioretention Facility	40	60	Filtration
ATTTRENCH	Attenuation Trench	50	70	Infiltration
DW	Dry Well	50	70	Infiltration
DWIT	Dry Well - Infiltration Trench	50	70	Infiltration
DWITCE	Dry Well - Infiltration Trench with Complete Exfiltration	50	70	Infiltration
DWITCE	Dry Well - Infiltration Trench with Complete Exfiltration	50	70	Infiltration
DWITCW	Dry Well - Infiltration Trench with Complete Exfiltration	50	70	Infiltration
DWITPE	Dry Well - Infiltration Trench with Partial Exfiltration	50	70	Infiltration
DWITWQE	Dry Well - Infiltration Trench with Water Quality Exfiltration	50	70	Infiltration
EDSDITCE	Extended Detention Structure Dry, Infiltration Trench with Complete Exfiltration	50	70	Infiltration
IB	Infiltration Basin	50	70	Infiltration
IITCE	Infiltration Trench with Complete Exfiltration	50	70	Infiltration
INPOND	Infiltration Basin No Outfall	50	70	Infiltration
IT	Infiltration Trench	50	70	Infiltration
ITVSW	Infiltration Trench, Extended Detention	50	70	Infiltration
ITCE	Infiltration Trench with Complete Exfiltration	50	70	Infiltration
ITCEMB	Infiltration Trench with Complete Exfiltration, Microbasin	50	70	Infiltration
ITPE	Infiltration Trench with Partial Exfiltration	50	70	Infiltration
ITWQE	Infiltration Trench with Water Quality Exfiltration	50	70	Infiltration
OGS	Oil Grit Seperator	50	70	Infiltration
OGSITCE	Oil Grit Seperator Infiltration Trench with Complete Exfiltration	50	70	Infiltration
PNDTR	Same as infiltration basin	50	70	Infiltration
PP	Porous Pavement	50	70	Infiltration
SB	Infiltration Basin	50	70	Infiltration
WQITPE	Water Quality Infiltration Trench with Partial Exfiltration	50	70	Infiltration
WQP	Water Quality Trench	50	70	Infiltration
LS	Level Spreader	0	0	Other
OTHER	Other	0	0	Other
Redevelop	Redevelopment	0	0	Other
Pretreatment	Pretreatment	0	0	Other
Credits	Credits	0	0	Other
PL	Plantings	0	0	Other
EDSW	Extended Detention Structure Wet	20	45	Wet Structures
EXPOND	Wet Pond	20	45	Wet Structures
SM	Shallow Marsh	20	45	Wet Structures
SW	Wet Structure	20	45	Wet Structures
WP	Retention Structure (Wet Pond)	20	45	Wet Structures

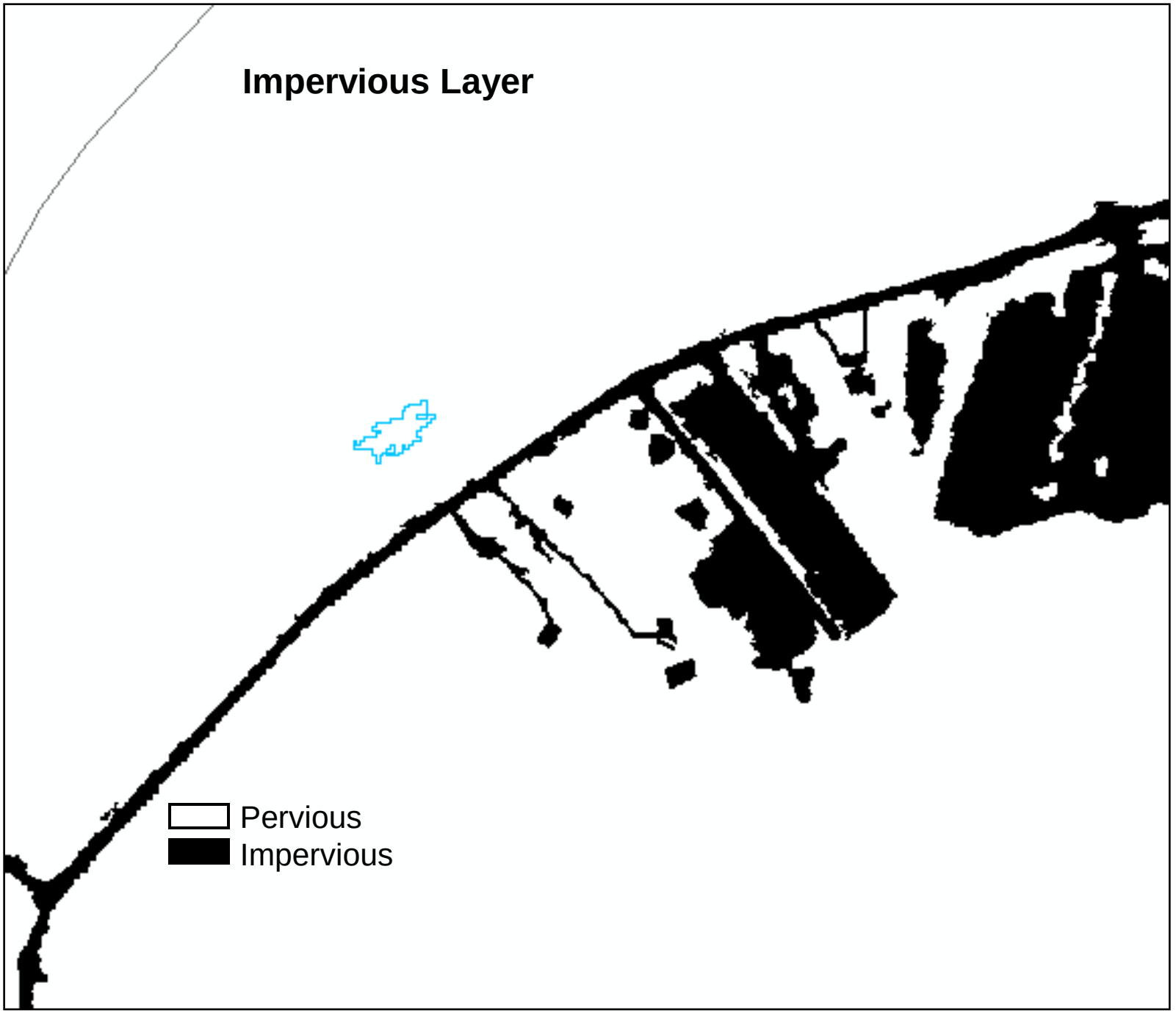
Literature Values, cont.

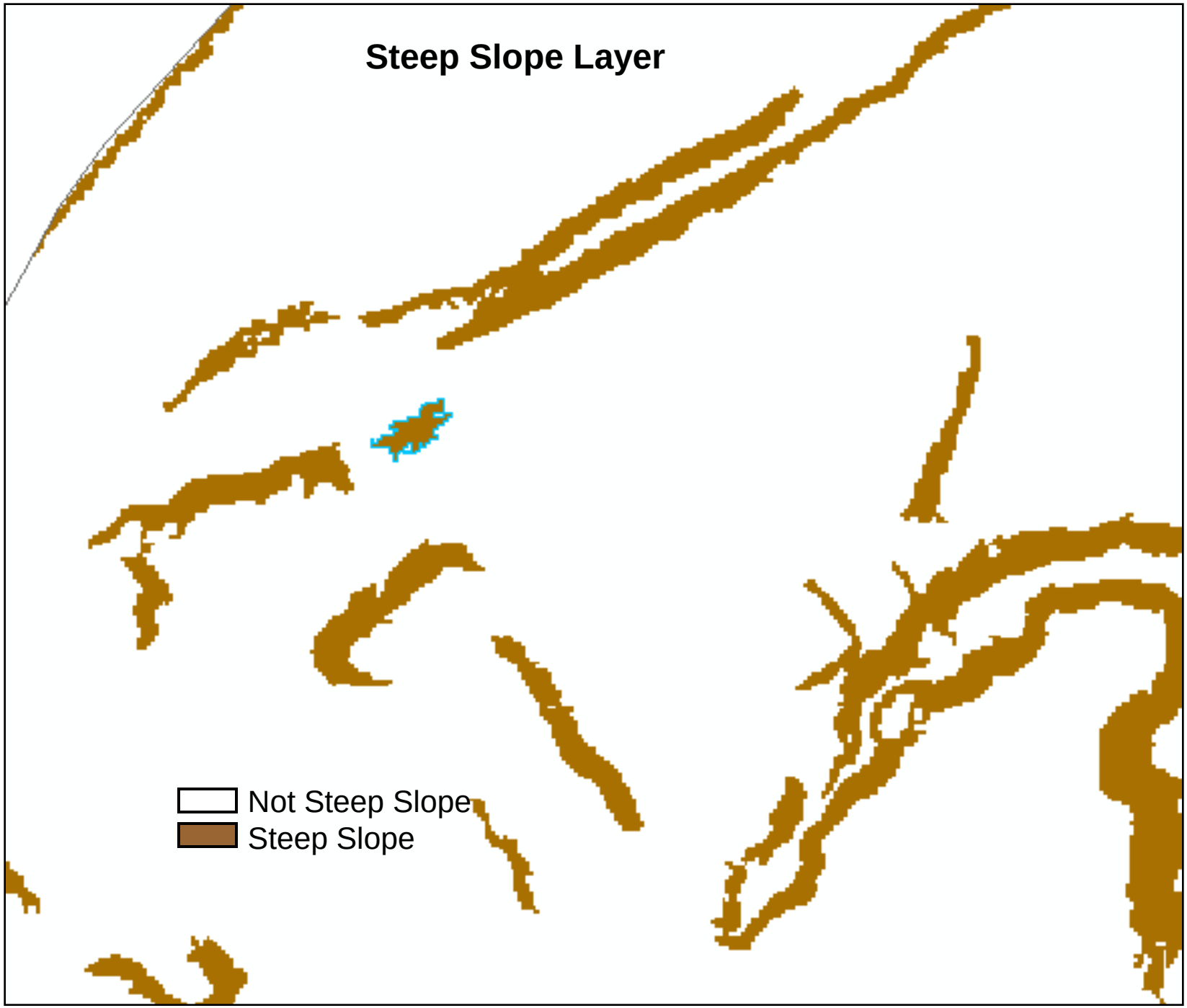
- Residential ½ acre
- 18% impervious
- TN: 2.74 mg/L
- TP: 0.32 mg/L

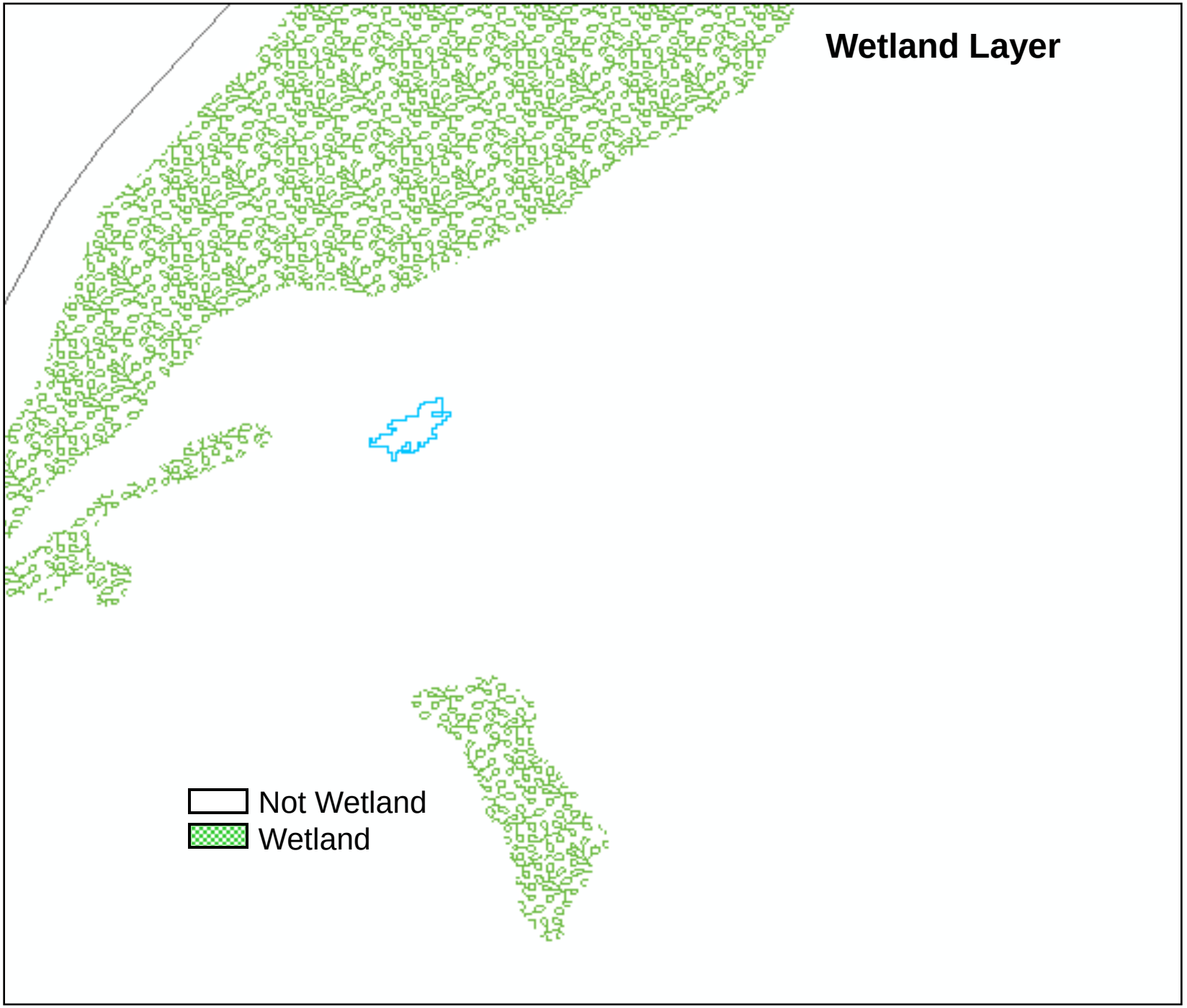
Qualitative Evaluation

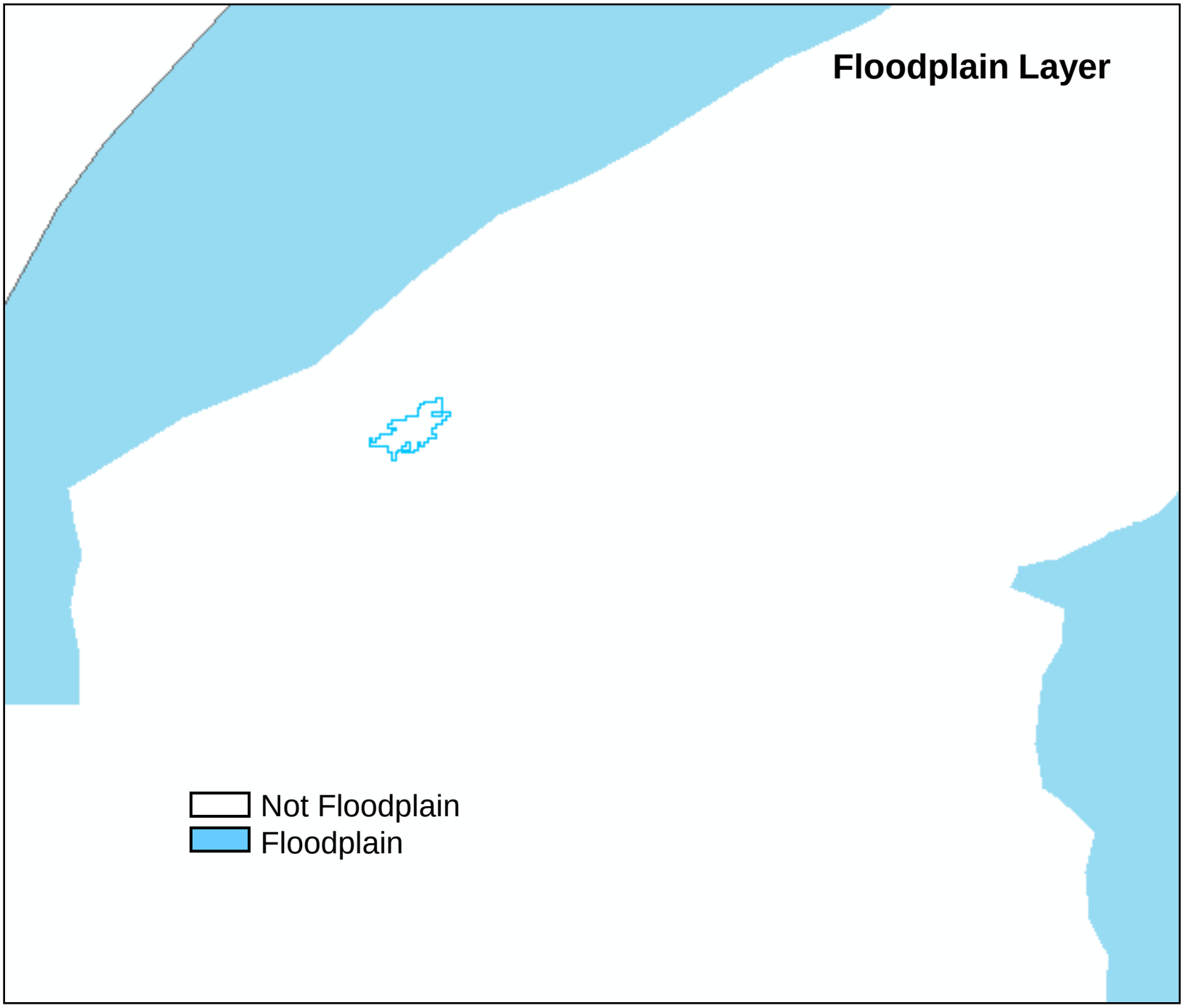
Collect and Evaluate GIS Databases of Indicators:

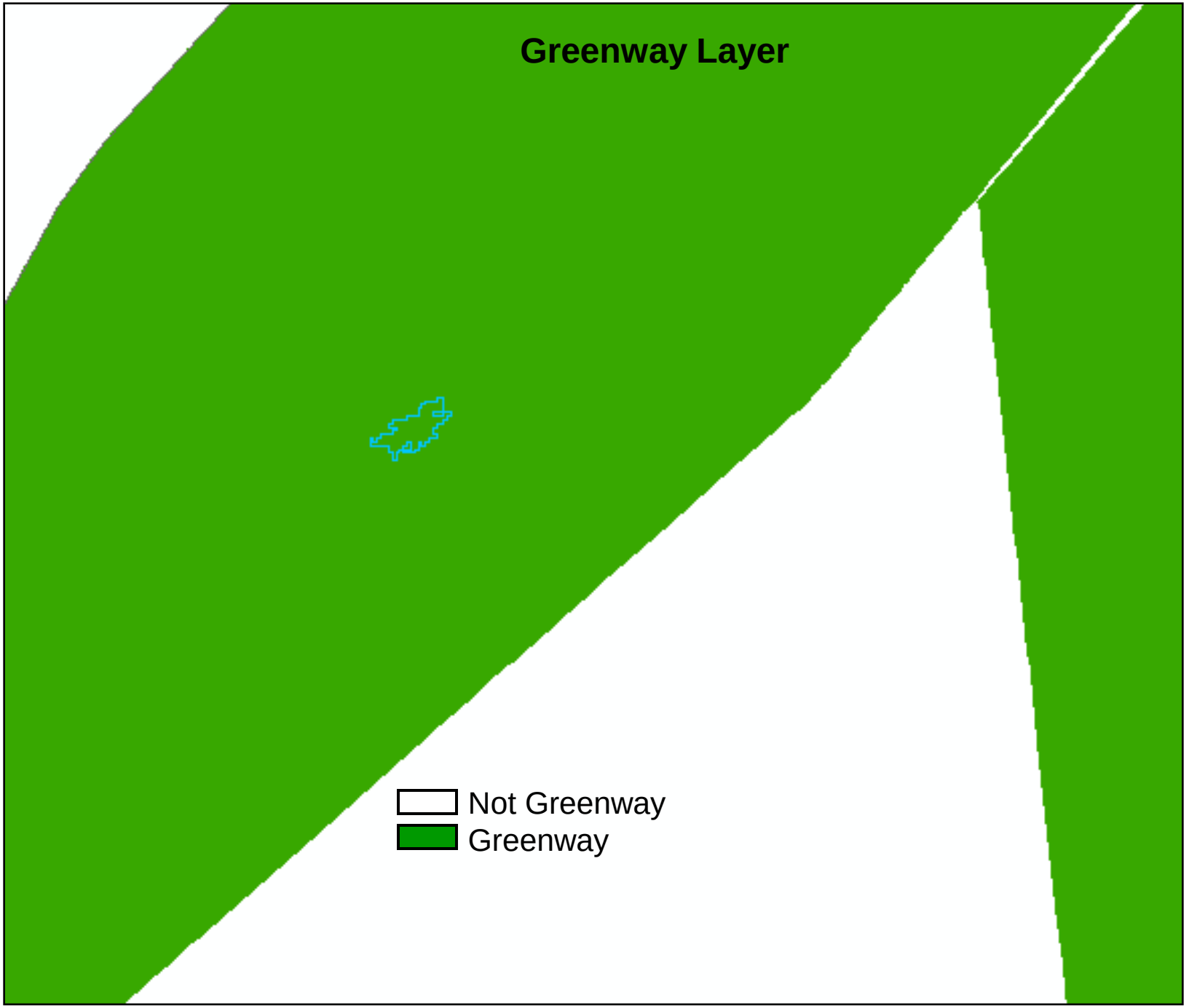
Example of how a polygon representing a piece of land is attributed in the GIS system for restoration or preservation assessment.

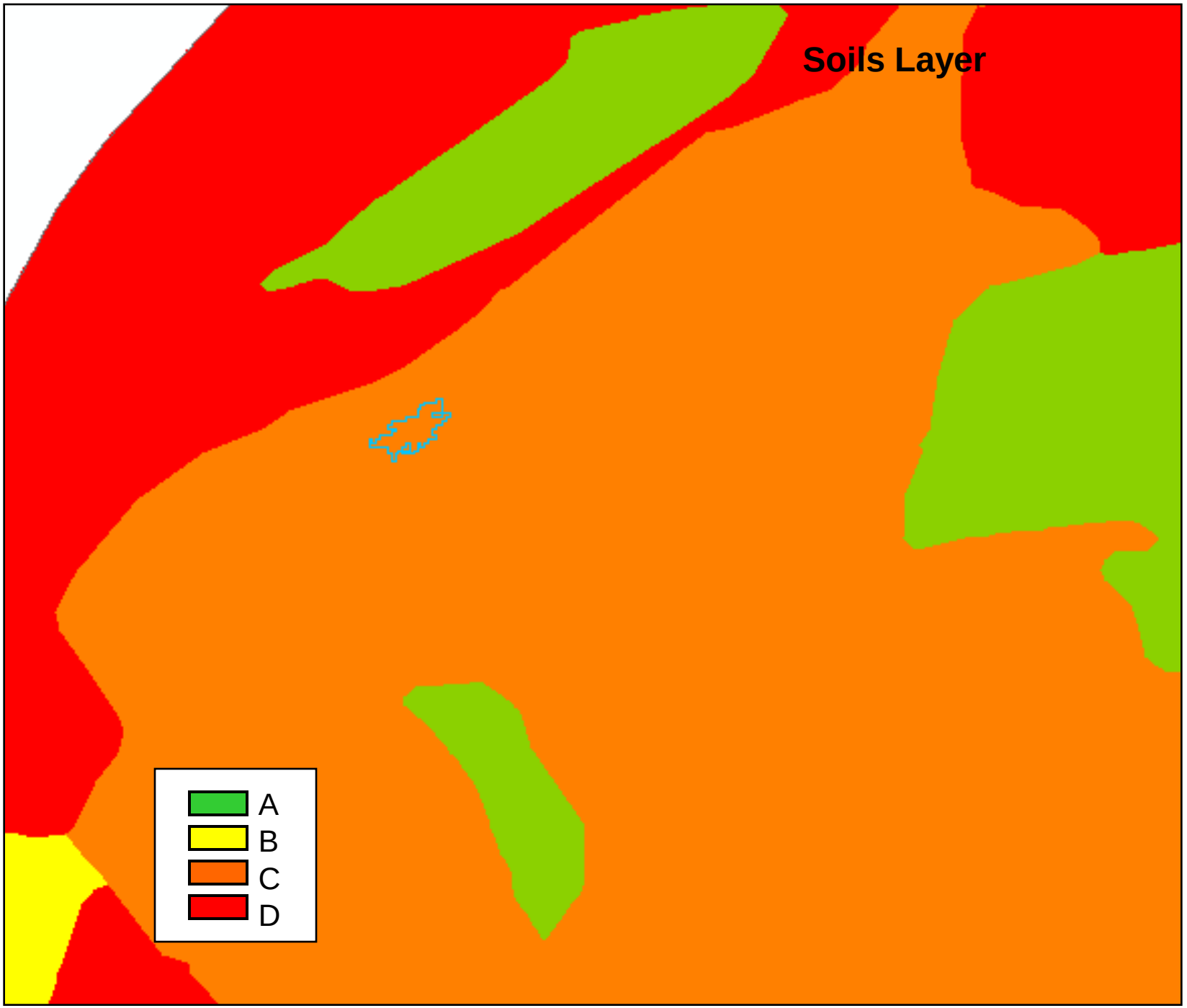

Impervious Layer
Pervious
Impervious

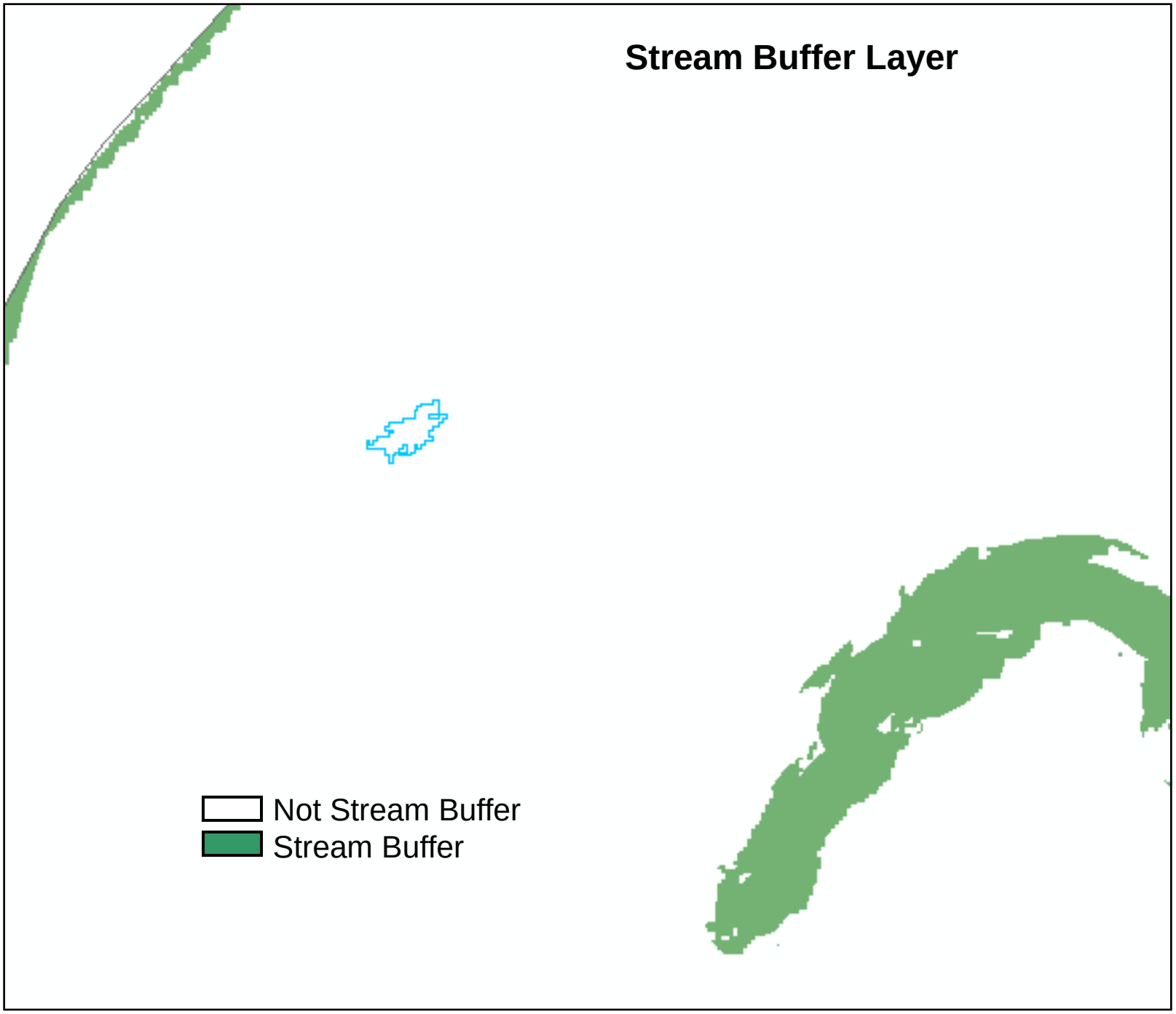

Steep Slope Layer
Not Steep Slope
Steep Slope


Wetland Layer
Not Wetland
Wetland


Floodplain Layer
Not Floodplain
Floodplain


Greenway Layer
Not Greenway
Greenway


Soils Layer
A
B
C
D

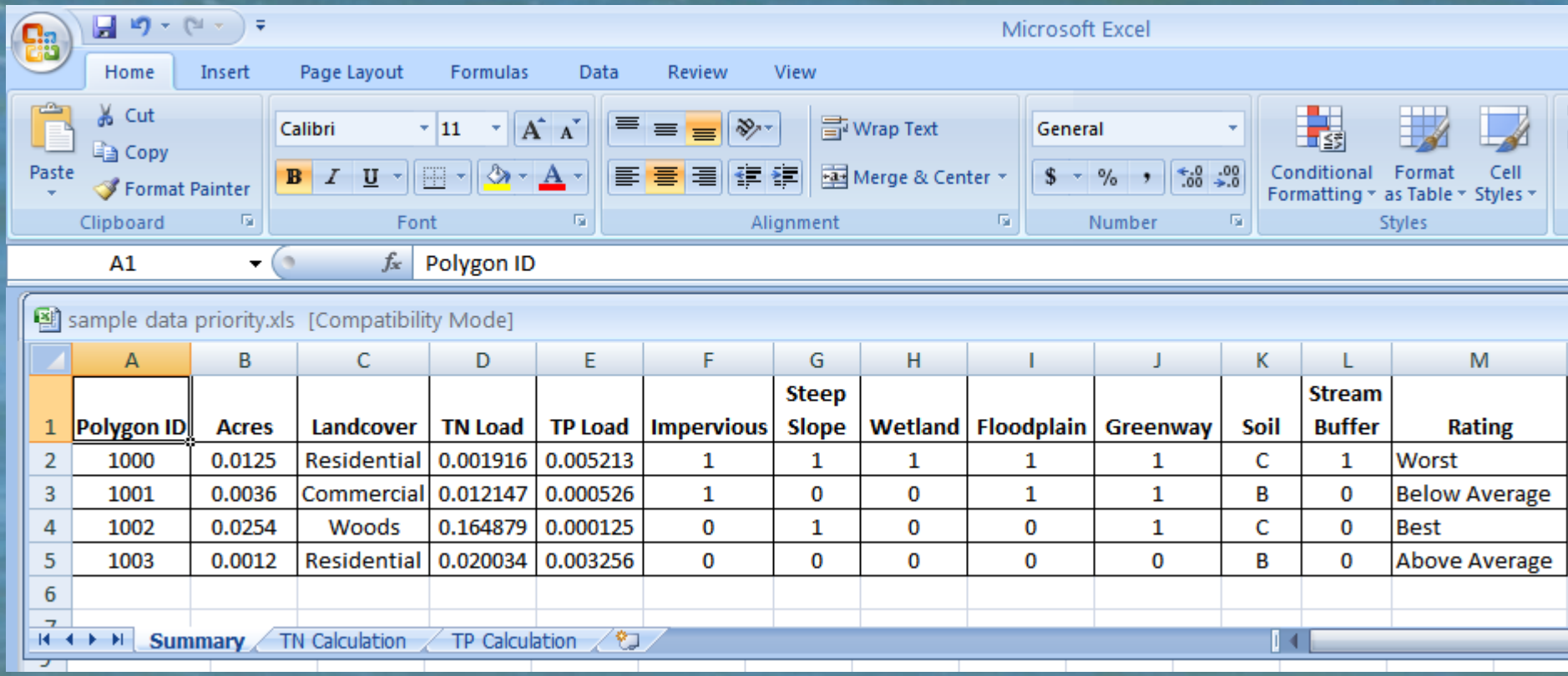

Stream Buffer Layer
Not Stream Buffer
Stream Buffer

All Layers

GIS Layer	Has Attribute
Impervious	No
Steep Slope	Yes
Wetland	No
Floodplain	No
Greenway	Yes
Soil Group	C
Stream Buffer	No

Analysis of Indicators

Spreadsheet combining the equation and GIS results and series of rules:



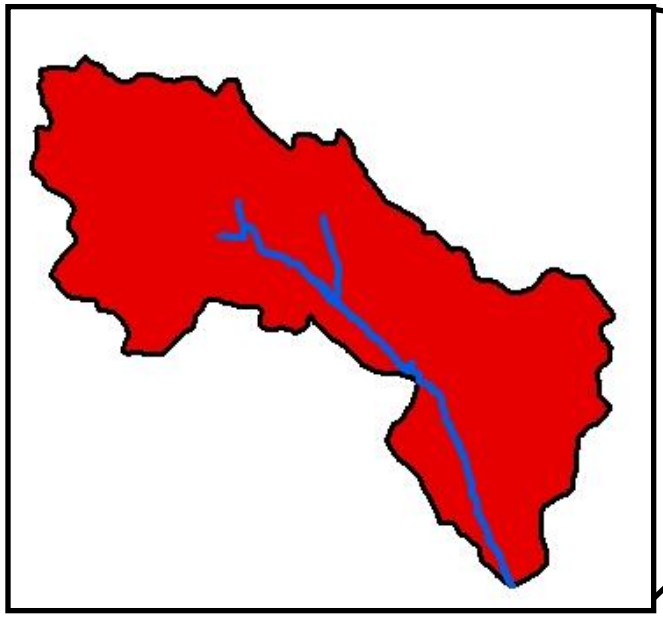
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Polygon ID	Acres	Landcover	TN Load	TP Load	Impervious	Steep Slope	Wetland	Floodplain	Greenway	Soil	Stream Buffer	Rating
2	1000	0.0125	Residential	0.001916	0.005213	1	1	1	1	1	C	1	Worst
3	1001	0.0036	Commercial	0.012147	0.000526	1	0	0	1	1	B	0	Below Average
4	1002	0.0254	Woods	0.164879	0.000125	0	1	0	0	1	C	0	Best
5	1003	0.0012	Residential	0.020034	0.003256	0	0	0	0	0	B	0	Above Average
6													

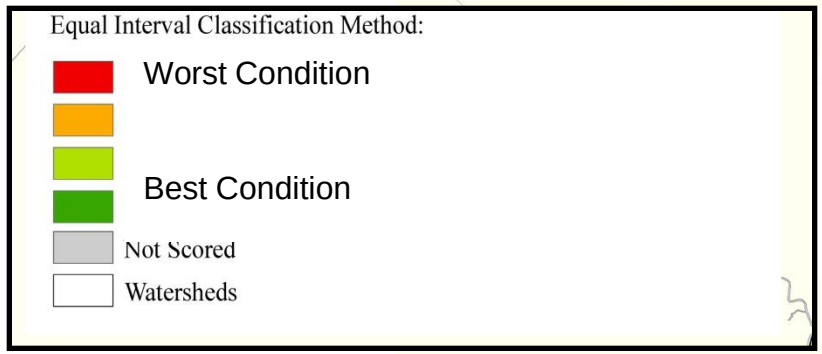
Can add weights to particular indicators, if desired.

Prioritization Scheme for Restoration

Subwatershed Characterization of Condition

Severn Mainstem 1

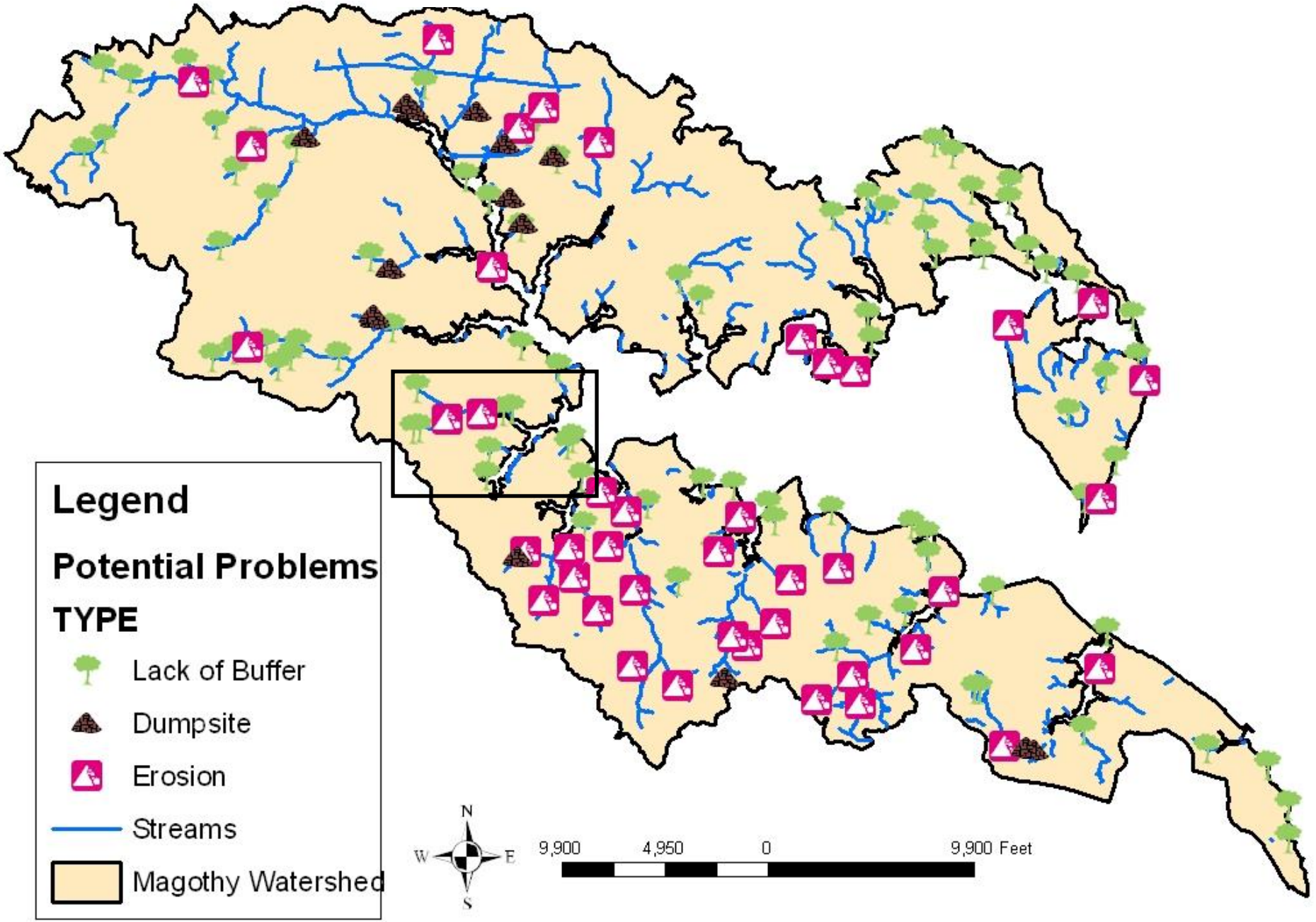




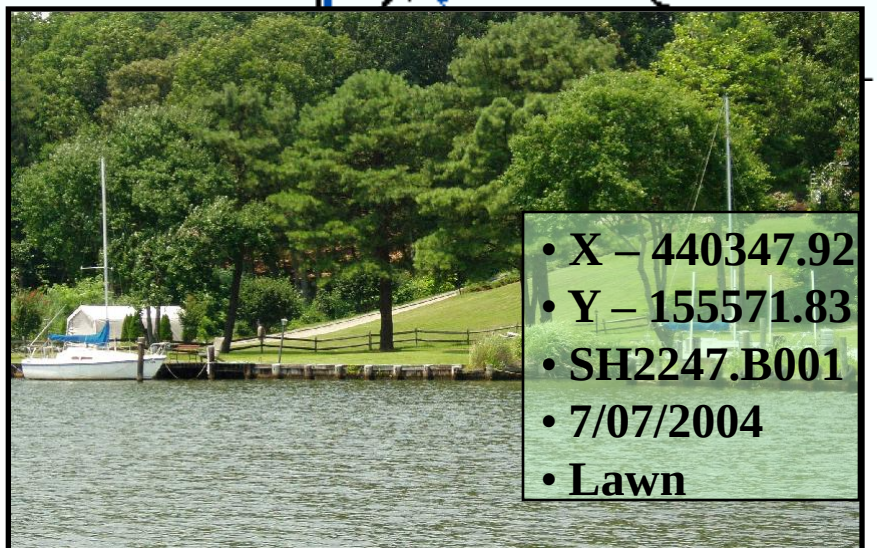
A Method for Evaluating Streams

Choose Indicators of Importance

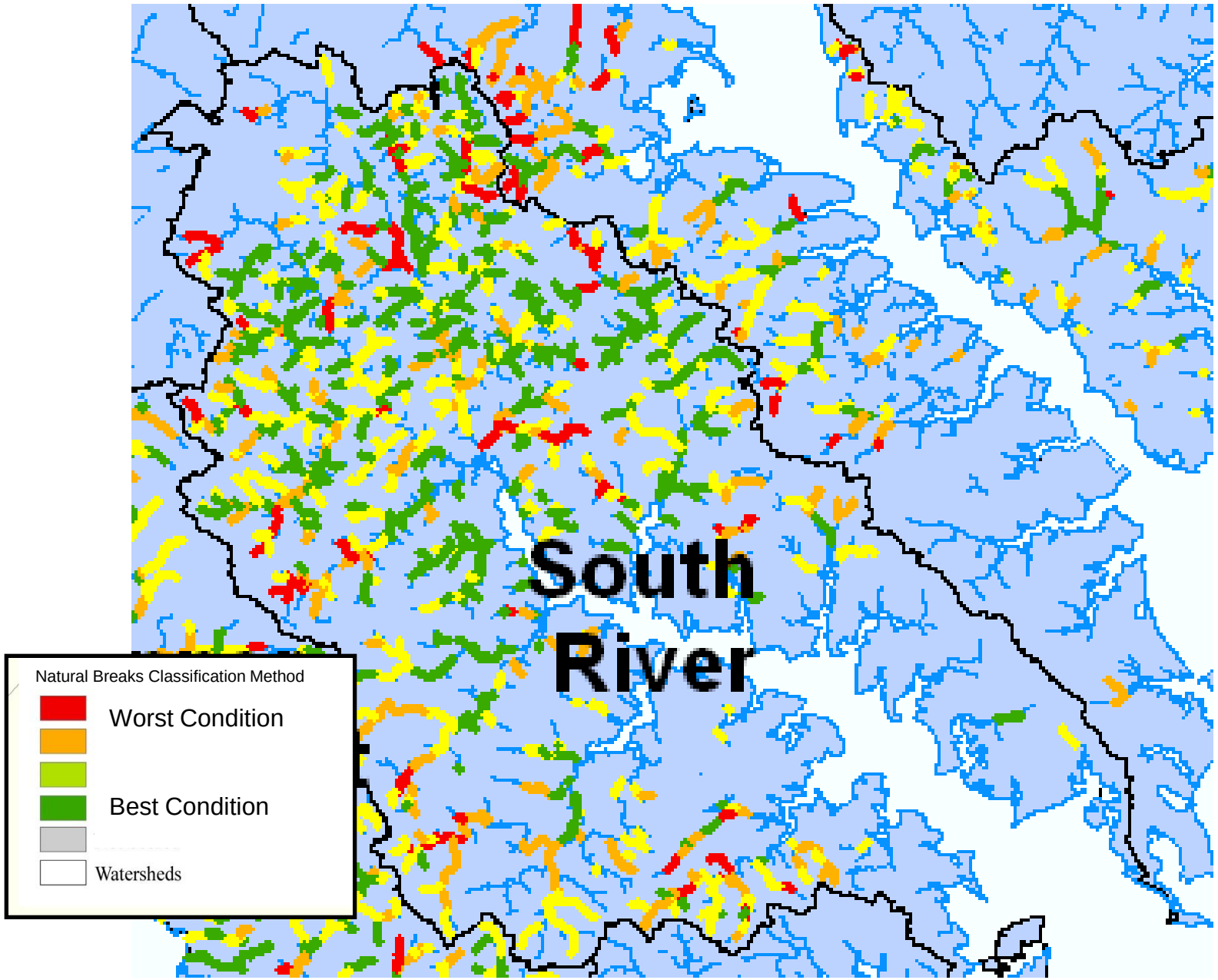
Areas of Impacted Streams




• X – 439780.856
• Y – 156405.803
• MGC009.E001
• 6/22/2004
• Widening
•Exposed Bank


• X – 440347.92
• Y – 155571.83
• SH2247.B001
• 7/07/2004
• Lawn

Evaluation of Streams for Restoration



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