GEOMORPHIC ANALYSIS OF DRY RUN CREEK WATERSHED, CEDAR FALLS, IA

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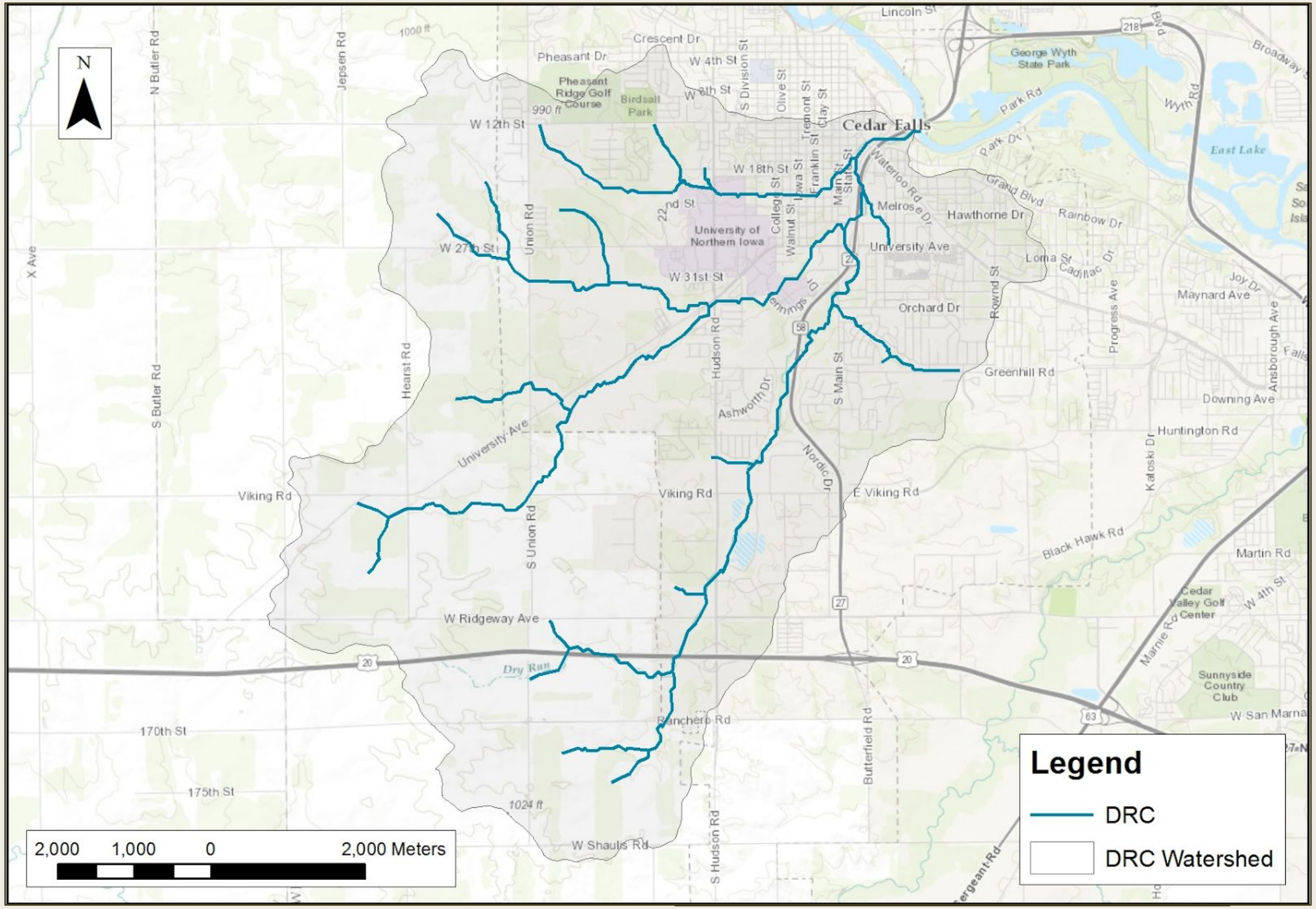
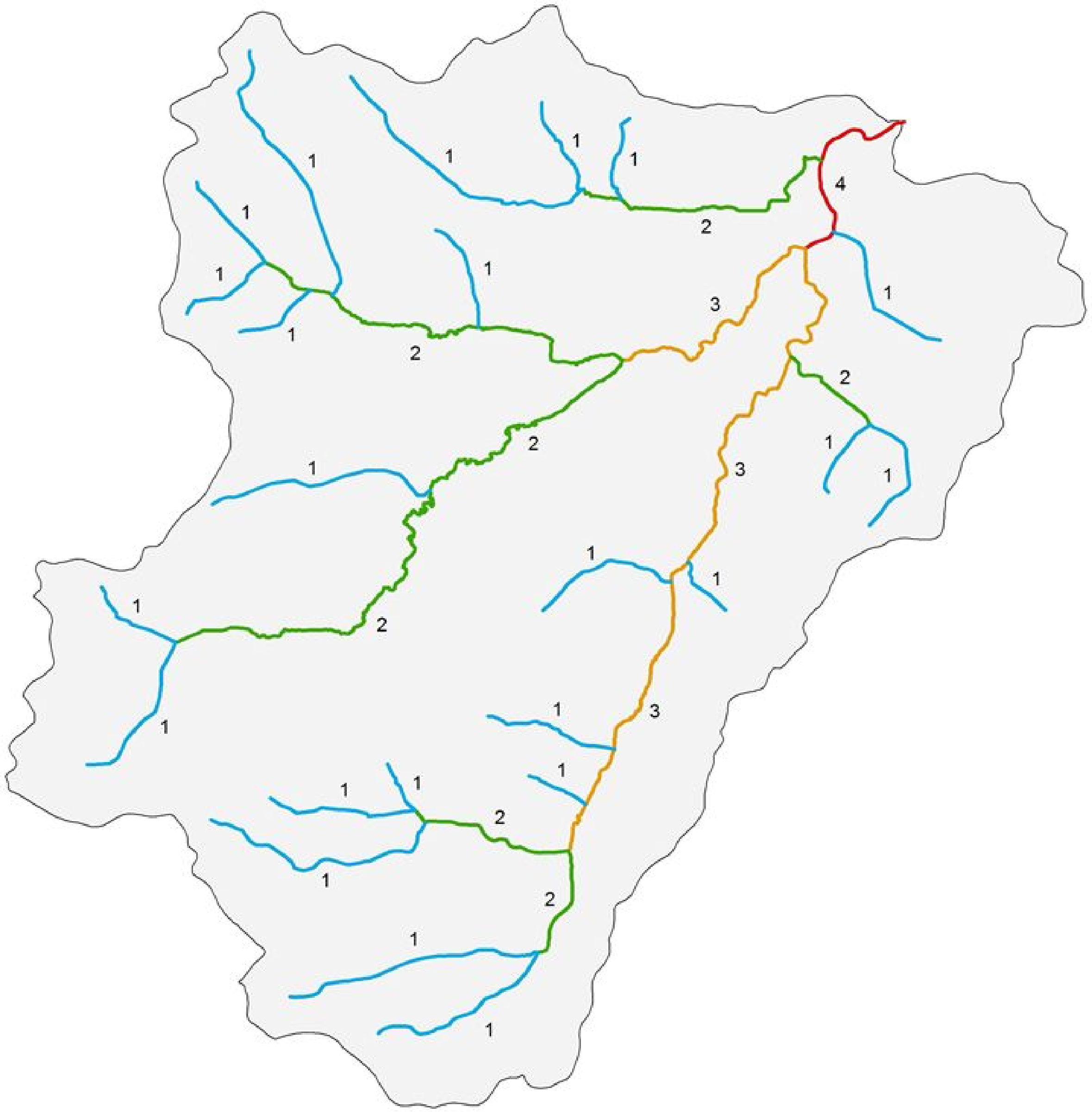
STUDY AREA



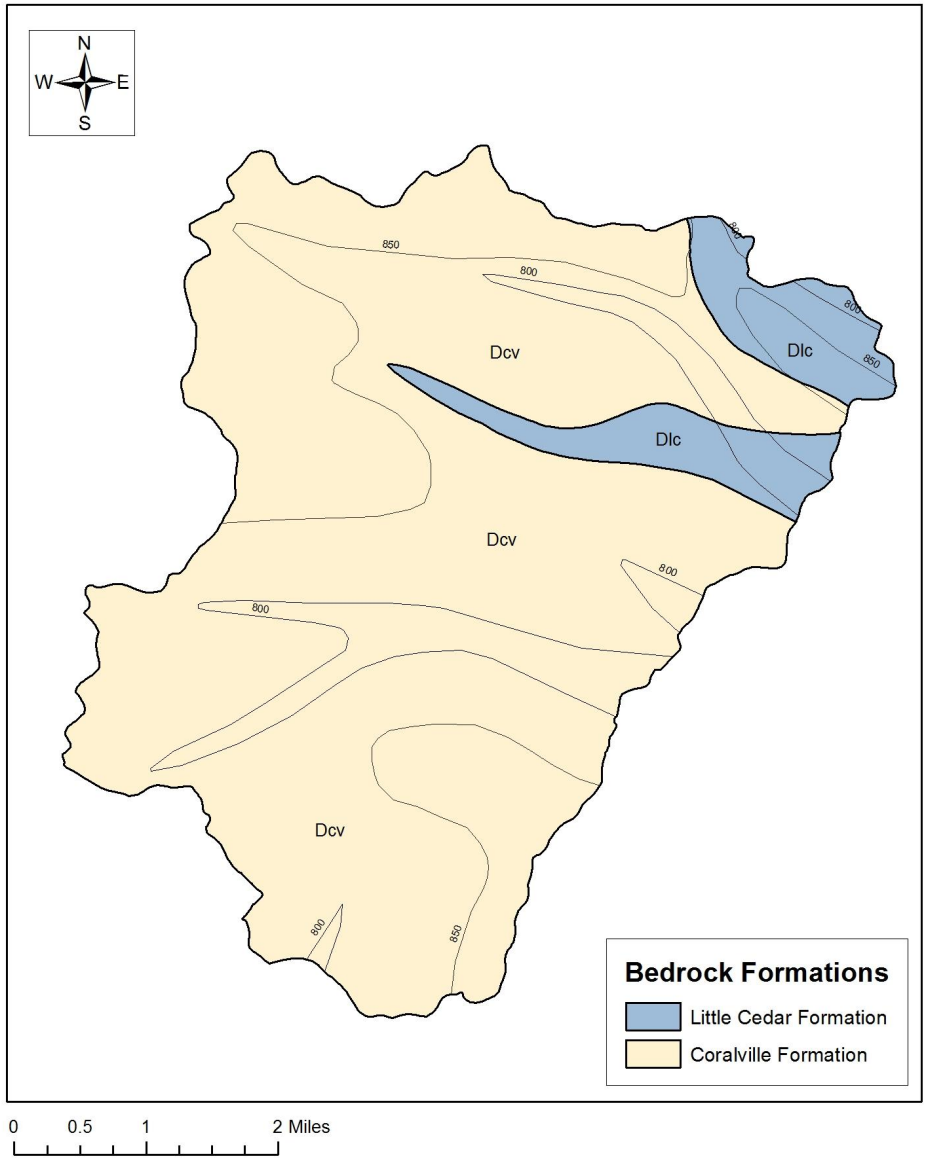
N
2,000 1,000 0 2,000 Meters
Legend
DRC
DRC Watershed
Cedar Falls
Lincoln St
Crescent Dr
Pheasant Dr
W 4th St
Pheasant Ridge Golf Course
Birdsall Park
W 12th St
W 18th St
W 27th St
W 31st St
University of Northern Iowa
George Wyth State Park
East Lake
Park Rd
Wyth Rd
Broadway
Hawthorne Dr
University Ave
Rainbow Dr
Orchard Dr
Greenhill Rd
Downing Ave
Huntington Rd
Viking Rd
E Viking Rd
Black Hawk Rd
Martin Rd
W Ridgeway Ave
Dry Run
Ranchero Rd
170th St
175th St
W Shaulis Rd
N Butler Rd
S Butler Rd
Jepsen Rd
Hearst Rd
Union Rd
S Union Rd
Hudson Rd
S Hudson Rd
S Main St
Nordic Dr
Butterfield Rd
Cedar Valley Golf Center
Sunnyside Country Club
X Ave
1000 ft
990 ft
1024 ft



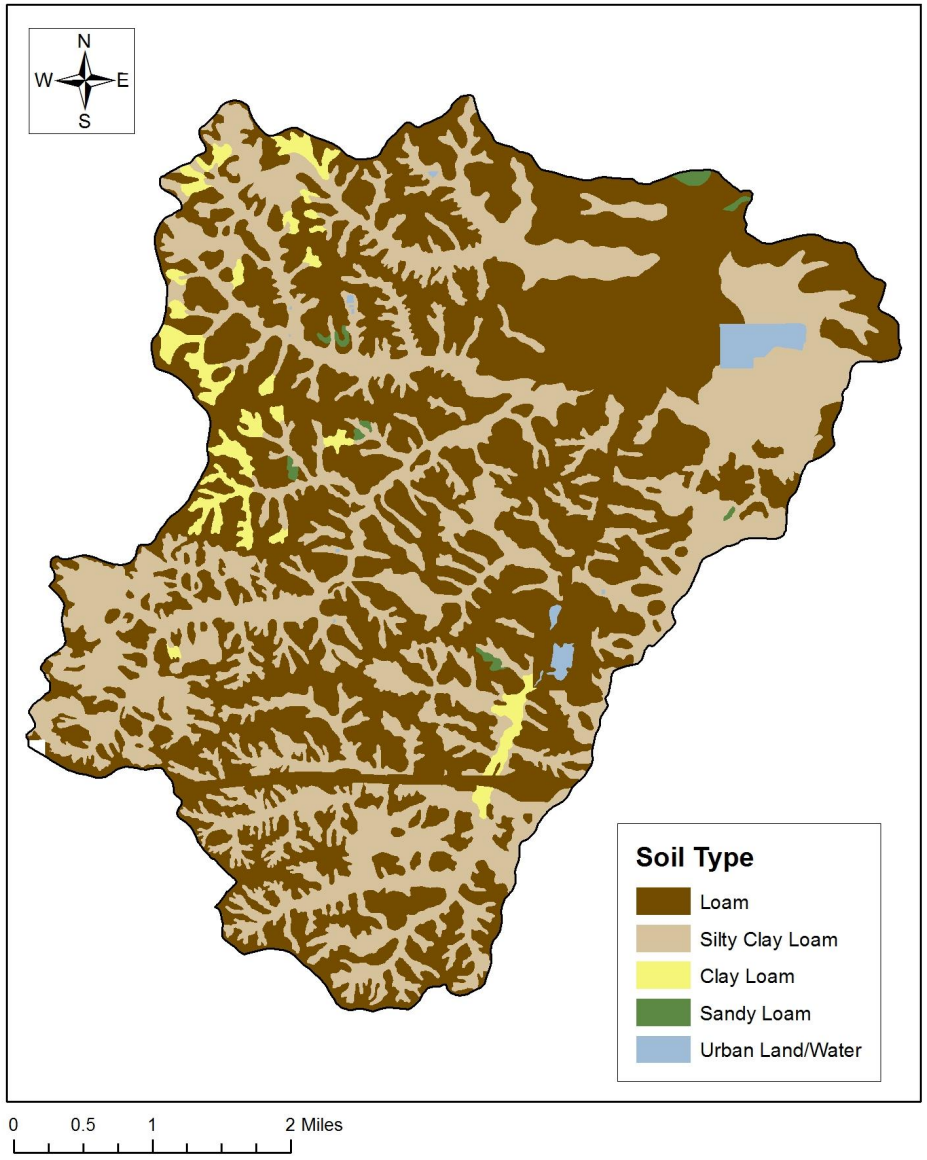
Stream Orders	1	2	3	4
Segments	23	6	2	1
∑ Lengths (ft / miles)	107328.3 / 20.33	59082.23 / 11.19	32438.98 / 6.14	6824.35 / 1.29
∑ Area (sq. ft / sq. mile)	351,748,853.40 / 12.62	462,130,703.08 / 16.58	532,115,736.44 / 19.09	662,984,015.83 / 23.78
Basin Shape (range)	0.33 to 3.75	0.29 tp 3.97	0.46 to 3.75	14.24

Stream Orders	1st : 2nd	2nd :3rd	3rd : 4th	∑ Basin
Length Ratio $R_L = L_0/L_{0+1}$	1.8 : 1	1.8 : 1	4.8 : 1	
Bifurcation Ratio $R_B = N_0/N_{0+1}$	4.3 : 1	3.0 : 1	2.0 : 1	
Basin shape Rf = A0/LB^2 =Area/Length^2				0.73
Drainage Density D = ∑L/A				1.38 miles
Relief Ratio $R_h = H/L_0$				= 180 /42600 = 0.0004
Ruggedness # R = DH				= 1.38 * 0.03 = 0.47

DRC Bedrock Geology



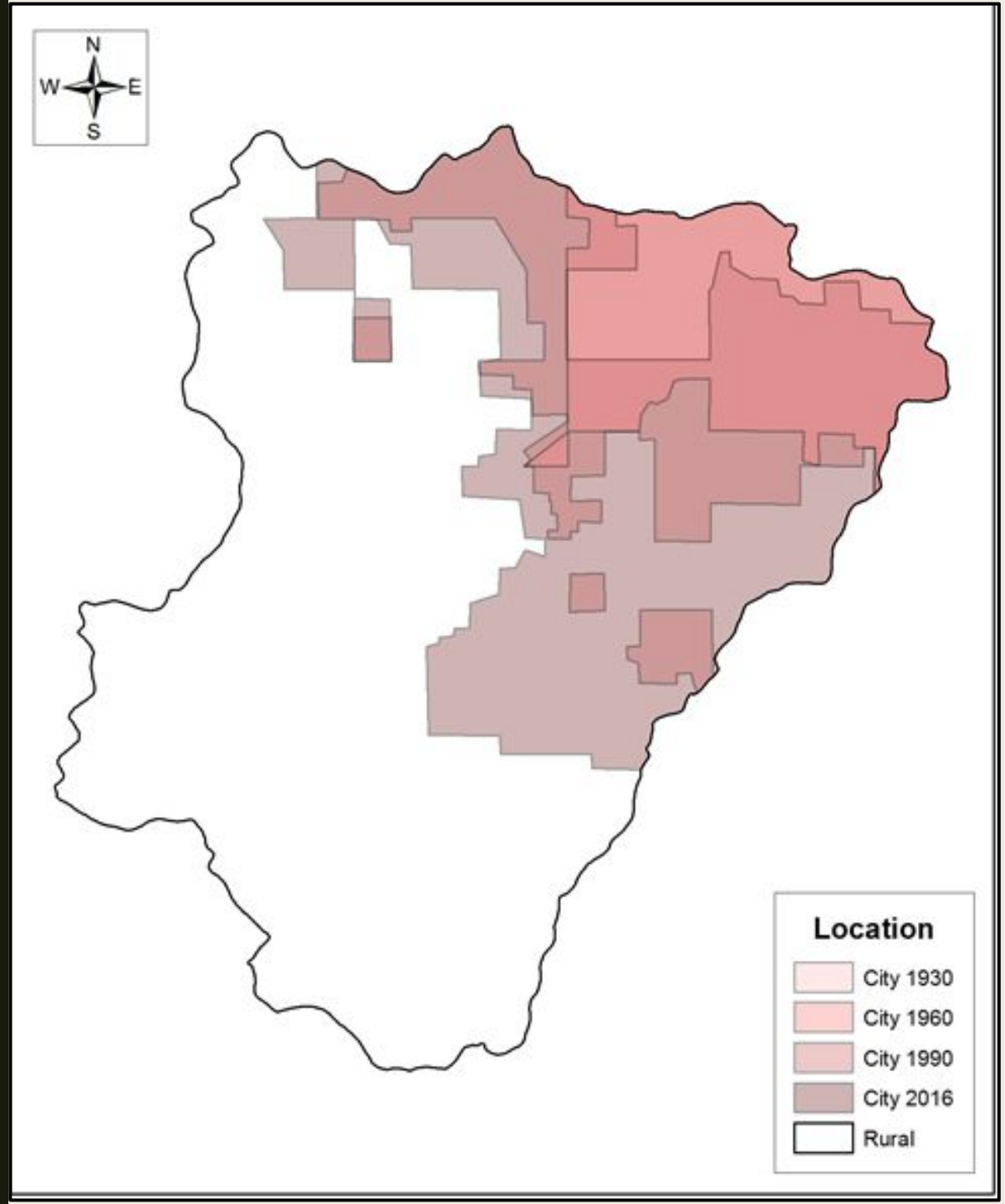
DRC Soils Map



Soil Classification Tabulation

Parent Materials	Soil Classification	Area (Acres)	Percent of Watershed
Loam	Aredale, Bassett, Donnan, Floyd, Kenyon, Lawler, Marquis, Orthents, Readlyn, Sparta, Spillville-Coland, Saude, Waukee	8503.12	55.87%
Silty Clay Loam	Clyde, Clyde-Floyd, Colo, Colo-Ely, Dinsdale, Klinger, Klingmore, Maxfield, Maxmore, Nevin, Sawmill, Wiota	6142.69	40.36%
Sandy Loam	Burkhardt, Dickinson, Finchford, Lilah, Olin	384.44	2.53%
Clay Loam	Marshan, Tripoli	51.77	0.34%
Urban Land/Water	NA	137.98	0.9%

Table XX. Relative percentages of DRC primary parent materials and soil series.



1930 Land Use Tabulation

Land Use	Area (Acres)	Percent of Watershed
Rural	14,400.24	94.61%
Urban	819.76	5.39%

1960 Land Use Tabulation

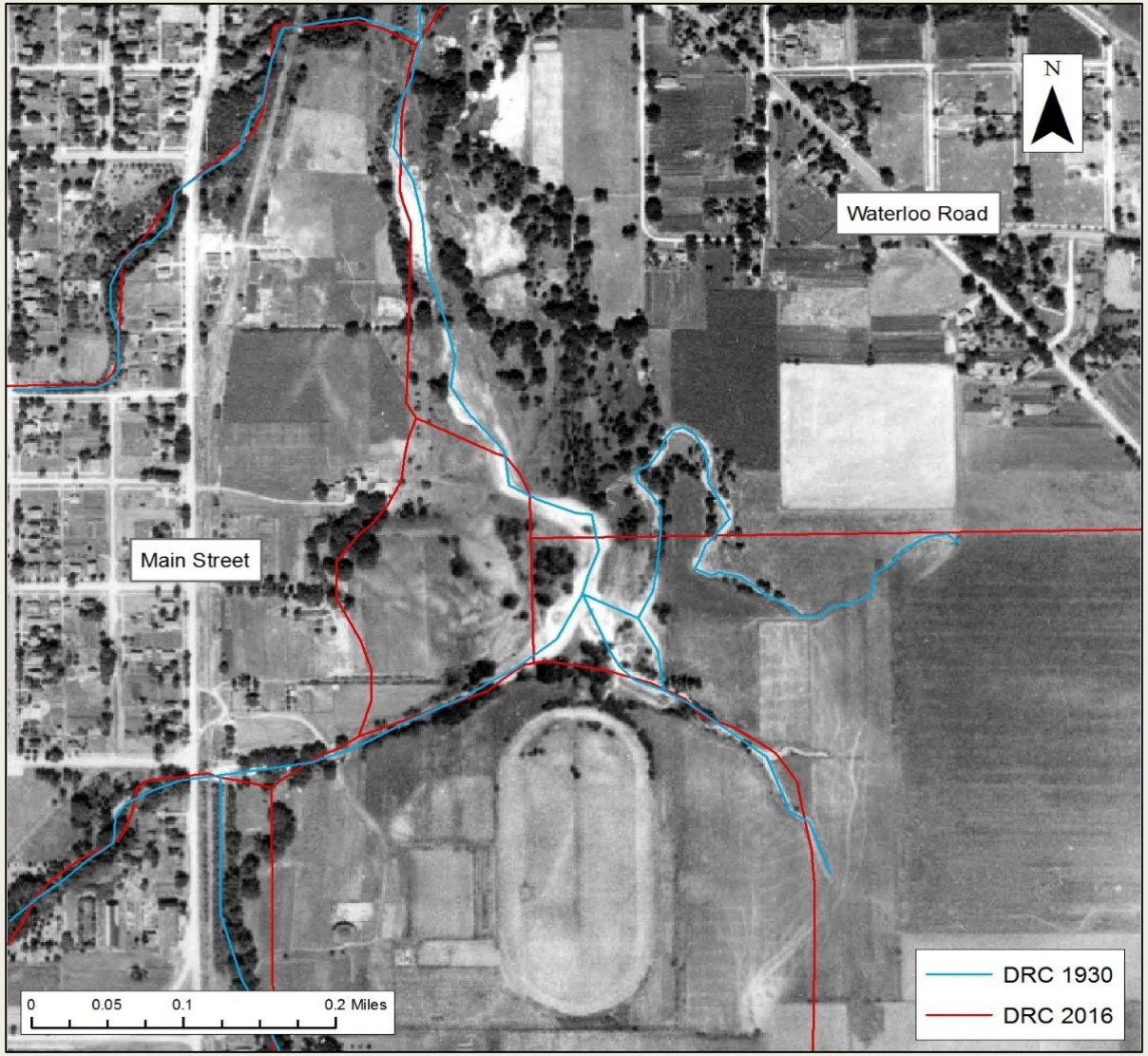
Land Use	Area (Acres)	Percent of Watershed
Rural	13,033.5	85.63%
Urban	2,186.5	14.37%

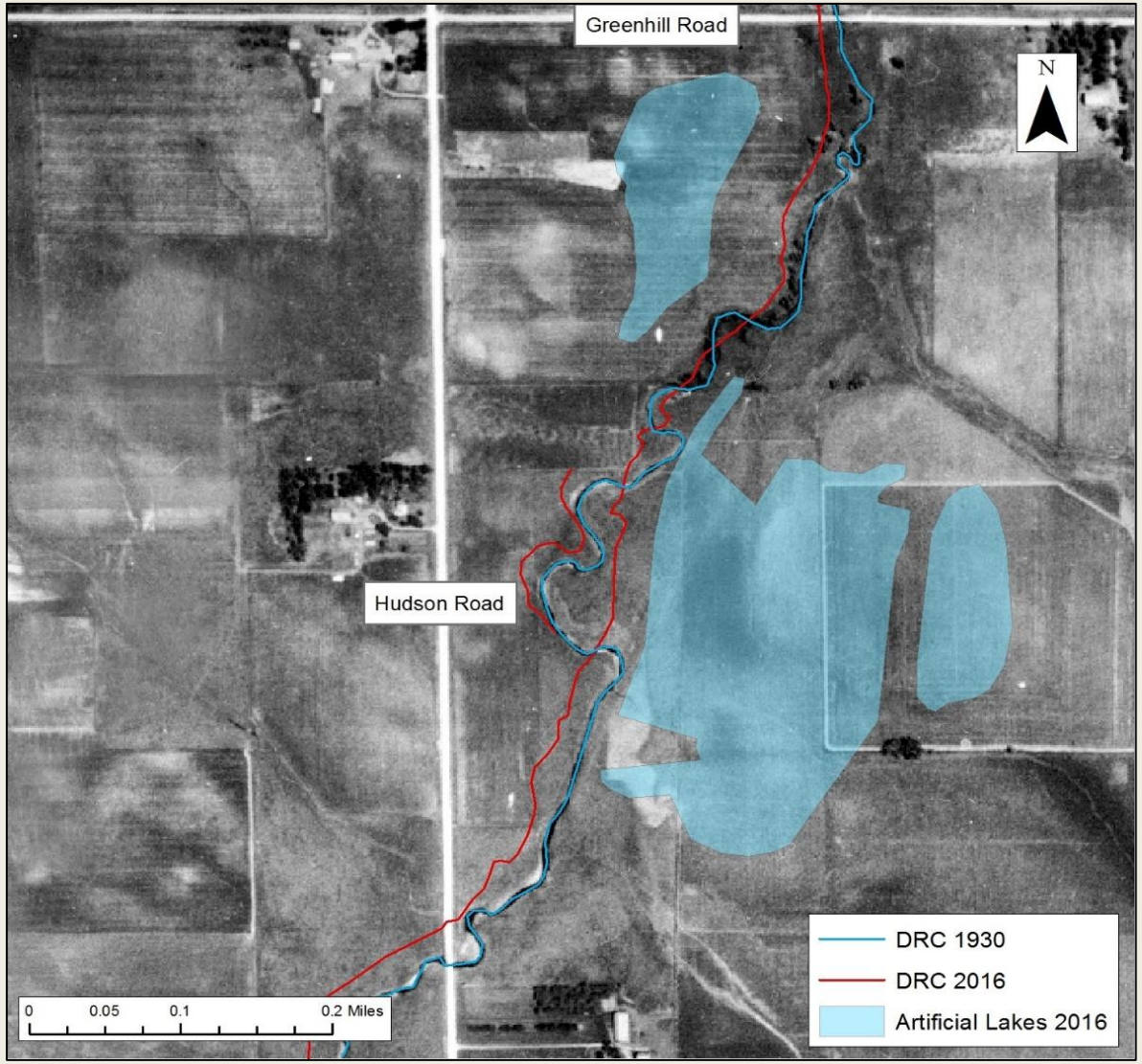
1990 Land Use Tabulation

Land Use	Area (Acres)	Percent of Watershed
Rural	11,370.76	74.71%
Urban	3,849.24	25.29%

2016 Land Use Tabulation

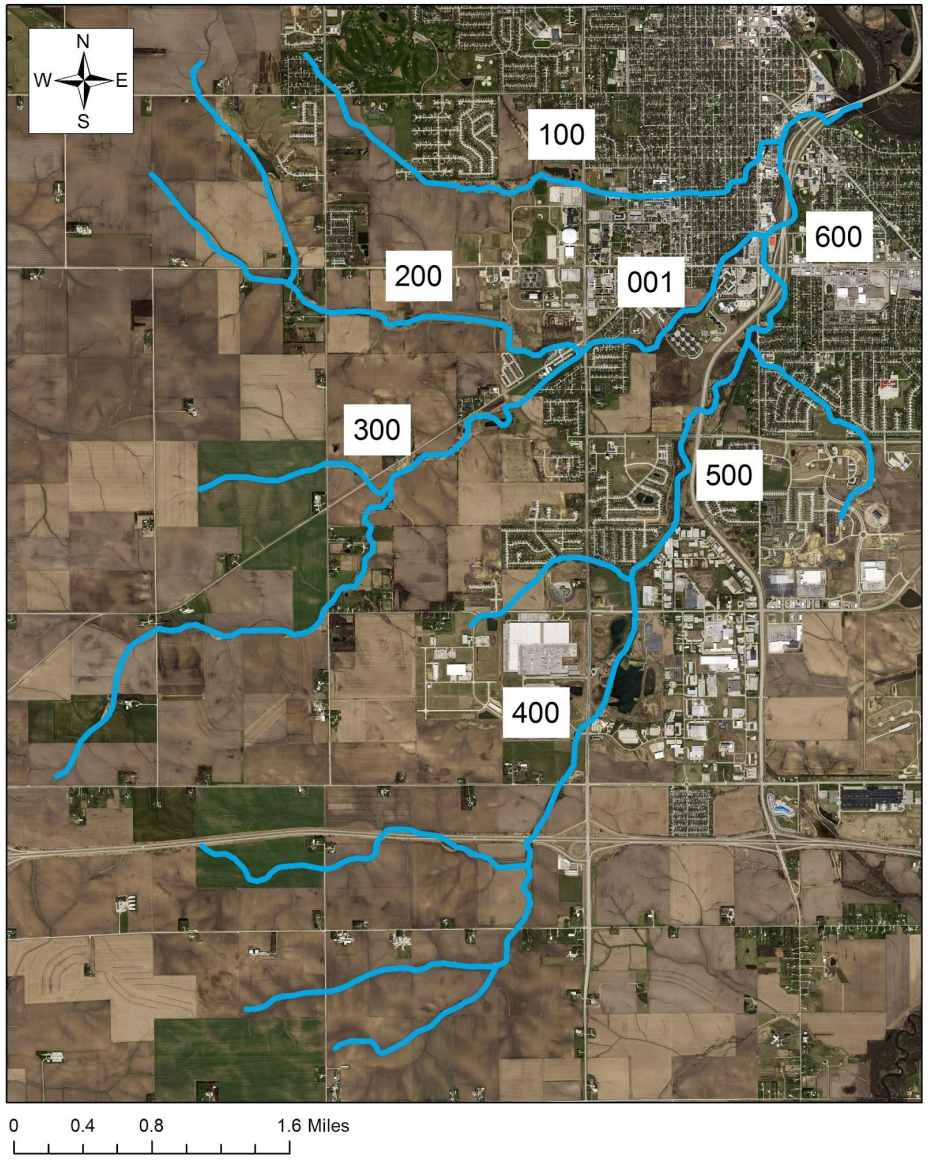
Land Use	Area (Acres)	Percent of Watershed
Rural	8,526.83	56.02%
Urban	6,693.17	43.98%


N
Waterloo Road
Main Street
0
0.05
0.1
0.2 Miles
DRC 1930
DRC 2016

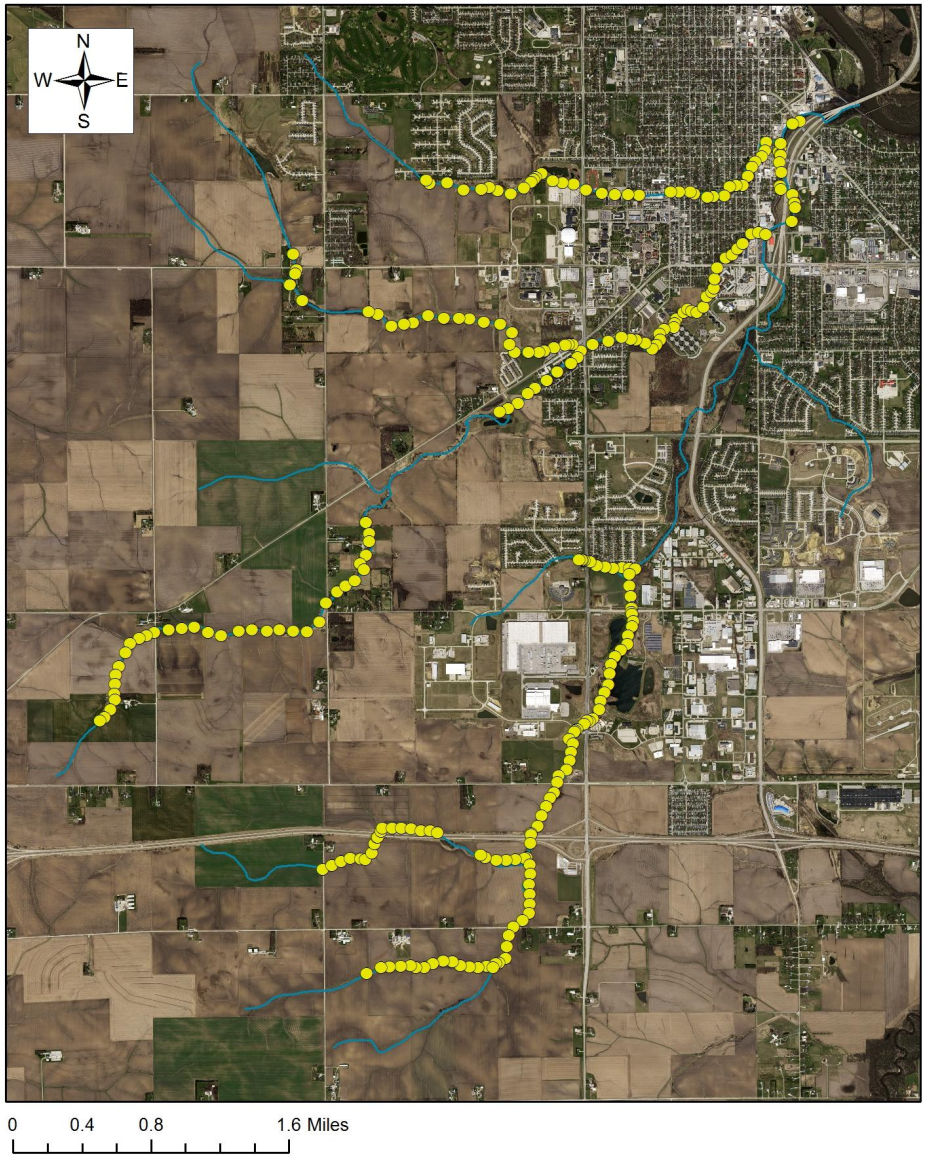

Greenhill Road
N
Hudson Road
0
0.05
0.1
0.2 Miles
DRC 1930
DRC 2016
Artificial Lakes 2016

Field Methods

DRC Study Segments



DRC Analysis Sample Sites

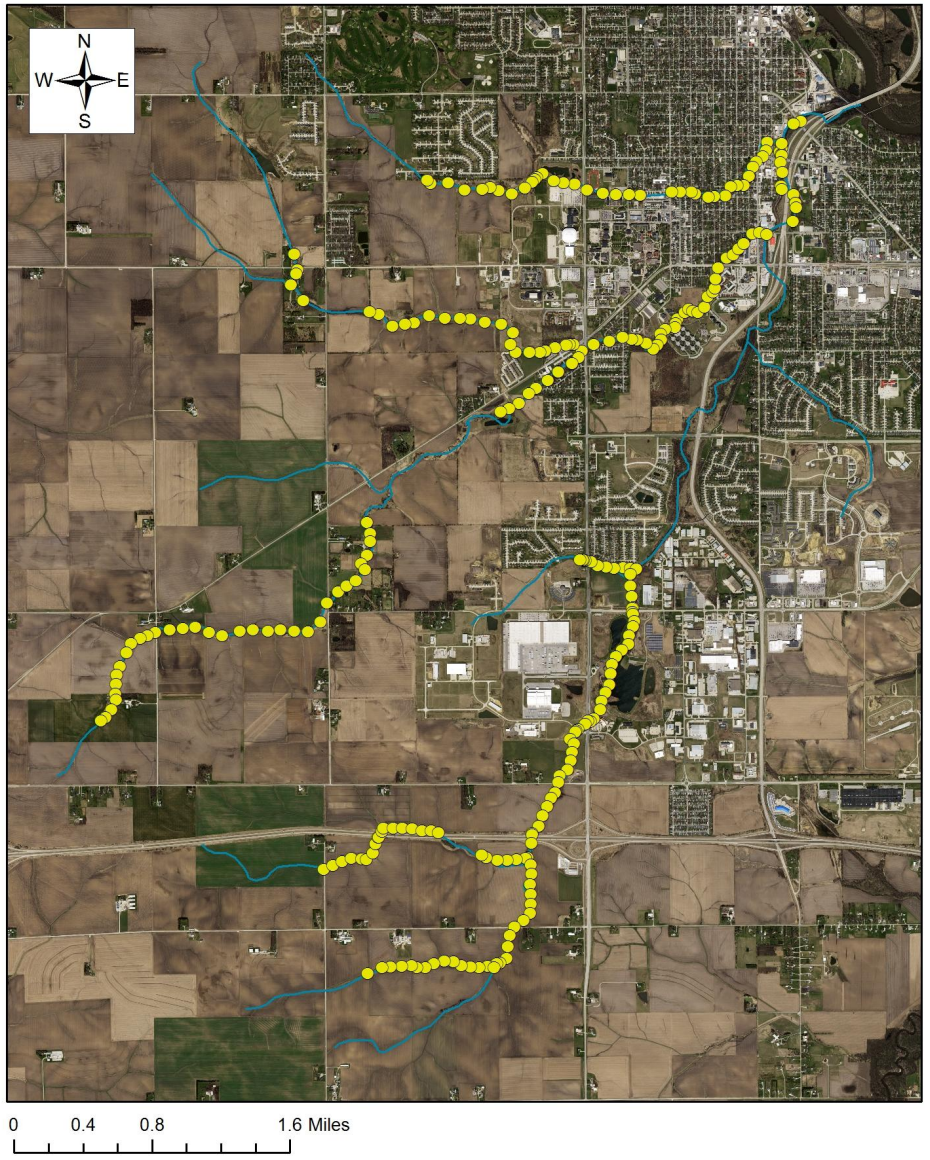


- Land Use
- Point Source Runoff
- Channel Bedload
- Bank Sediment
- Turbidity
- In-Stream Habitat
- Bank Height
- Stream Width and Depth
- Canopy Cover

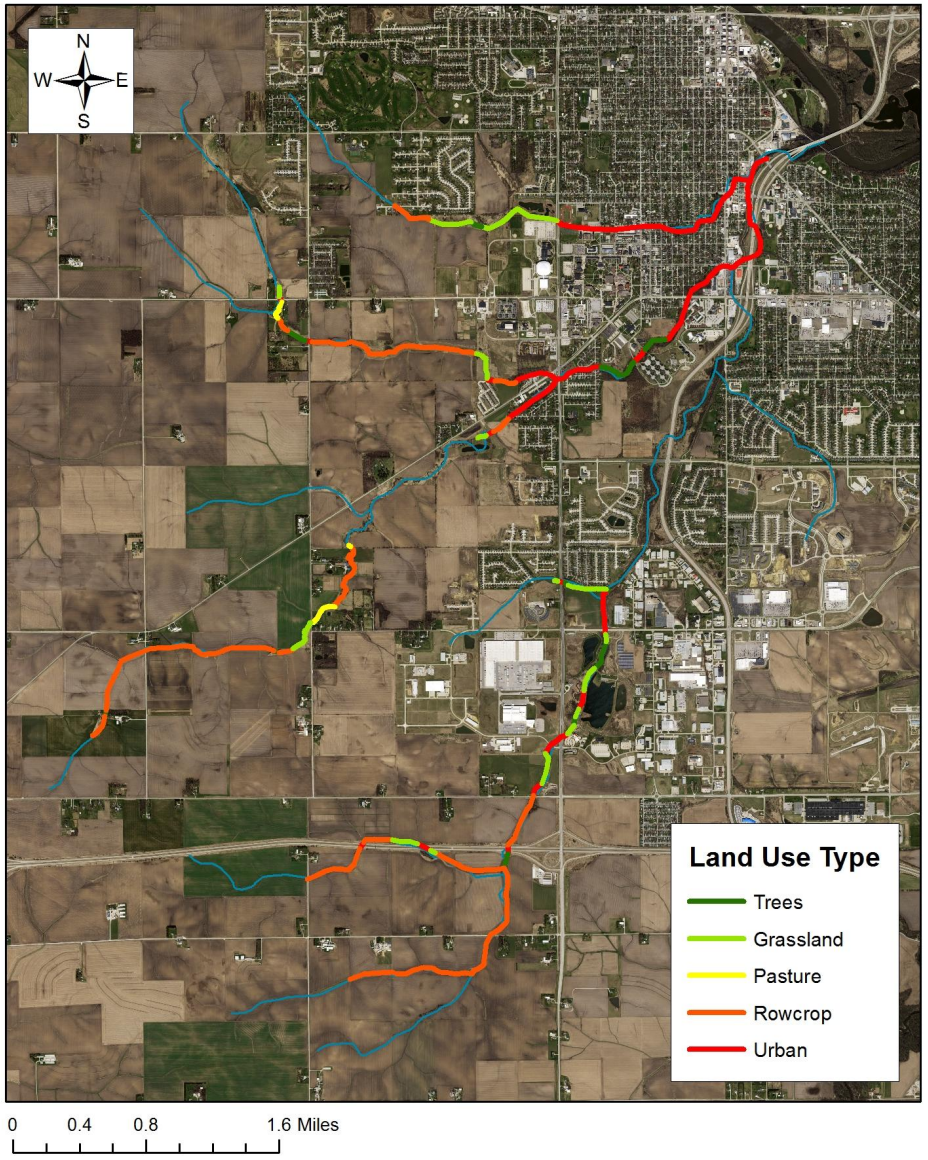
GIS Methodology

OBJECTID	ID	LANDUSELEF	LUSERIGHTB	RIPARGRASS	POINTSOURCE	TREECANOPY	AVGBH	BANKSEDIME	BANKSTABIL	HYDROVAR	Pools_1m	BEDLOAD	COARSEBEDL	TURBIDITY	STREAMHABI	AvgStreDepth	StreamWidth	POINT_X	POINT_Y	Long	Lat
226	100	Urban	Urban	3	Urban	1	410	7	Artstable	1.5	1	4	2	7	1	10	NA	545745.131795	4708031.663090	92.263521	42.312381
227	101	Urban	Urban	3	NA	2	245	7	2.5	2	1	5	2	4	2	45	NA	545606.835940	4708045.543470	92.264106	42.312442
228	102	Urban	Urban	3	Urban	2	275	7	Artstable	2	1	4	2	2	1	NA	NA	545595.705917	4707965.291090	92.264157	42.312184
229	103	Urban	Urban	NA	Urban	NA	NA	NA	Artstable	NA	NA	NA	NA	NA	NA	NA	NA	545567.127510	4707910.135270	92.264284	42.311200
230	104	Urban	Urban	NA	Urban	NA	NA	NA	Artstable	NA	NA	NA	NA	NA	NA	NA	NA	545503.264186	4707861.352330	92.264563	42.311845
231	105	Urban	Urban	3	NA	3	130	7	4	1.5	1	4	2	3	2	15	NA	545474.850848	4707814.072880	92.264692	42.311694
232	106	Urban	Urban	3	NA	3	385	7	3	2.5	1	2	1	2	2	30	NA	545437.775975	4707729.748220	92.264857	42.311419
233	107	Urban	Urban	3	NA	2	230	6	4	1	1	4	2	5	2	10	NA	545391.284077	4707641.383310	92.265000	42.311139
234	108	Urban	Urban	NA	Urban	NA	NA	NA	Artstable	NA	NA	NA	NA	NA	NA	NA	NA	545326.279453	4707639.908660	92.265349	42.311129
235	109	Urban	Urban	NA	Urban	NA	NA	NA	Artstable	NA	NA	NA	NA	NA	NA	NA	NA	545267.415546	4707633.518270	92.265607	42.311109
236	110	Urban	Urban	2	NA	1	NA	7	Artstable	1.5	1	NA	NA	NA	NA	NA	NA	545220.107693	4707545.140000	92.265813	42.310826
237	111	Urban	Urban	NA	Urban	1	280	NA	Artstable	2	1	NA	NA	NA	NA	NA	NA	545111.658689	4707536.854150	92.270292	42.310801
238	112	Urban	Urban	NA	Urban	2	252.5	NA	Artstable	1.5	1	4	2	6	2	20	4	545056.935199	4707531.950750	92.270537	42.310786
239	113	Urban	Urban	NA	Urban	1	170	7	4	1	1	1	2	5	1	2.4	7.5	544937.738475	4707562.494940	92.271052	42.310887
240	114	Urban	Urban	NA	Urban	1	170	NA	Artstable	NA	NA	NA	NA	NA	NA	25	5	544896.587067	4707578.571480	92.271123	42.310034
241	115	Urban	Urban	NA	Urban	1	NA	NA	Artstable	NA	NA	NA	NA	NA	NA	NA	NA	544795.924631	4707579.590710	92.274677	42.310945
242	116	Urban	Urban	NA	Urban	NA	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA	544713.849871	4707578.741190	92.272035	42.310947
243	117	Urban	Urban	NA	Urban	1	230	6	Artstable	1	1	3	2	6	1	10	3.3	544424.030662	4707548.423860	92.273299	42.310851
244	118	Urban	Urban	NA	Urban	1	200	6	Artstable	1	1	5	2	6	1	NA	8	544316.856988	4707555.414110	92.273775	42.310875
245	119	Urban	Urban	NA	Urban	1	250	7	2	1	1	1	1	4	2	25	2.2	544198.098608	4707558.925270	92.274293	42.310892
246	120	Urban	Urban	3	NA	NA	175	6	3	1.5	1	4	2	3	2	20	4.5	544071.626683	4707570.492130	92.274849	42.310930
247	121	Urban	Urban	NA	Urban	1	230	7	2	1.5	1	7	3	1	1	15	6.2	543923.899200	4707599.392510	92.275494	42.311028
248	122	Grassland	Grassland	3	NA	1	65	6	1	2	1	3	1	3	2	5.7	3.8	543811.162686	4707657.581770	92.275982	42.311218
249	123	Grassland	Grassland	3	NA	1	45	7	1	2	4	7	1	2	4	86	5.8	543707.826074	4707669.611730	92.280436	42.311259
250	124	Grassland	Grassland	3	NA	1	45	7	1.5	1.5	1	7	1	2	2	24.7	3.8	543612.509825	4707684.034610	92.280056	42.311308
251	125	Grassland	Grassland	3	NA	1	97.5	7	1.5	2	4	6	2	3	4	64	3.8	543508.293348	4707750.899090	92.281312	42.311522
252	126	Grassland	Grassland	3	NA	1	65	7	2	1.5	1	7	3	7	3	24.3	3.3	543457.736590	4707716.611410	92.281535	42.311420
253	127	Grassland	Grassland	3	NA	2	142.5	2	Artstable	3	1	1	1	7	3	20.7	3.2	543434.871450	4707697.415500	92.281634	42.311357
254	128	Grassland	Grassland	3	NA	3	190	6	2.5	3	1	1	1	7	4	9.7	2.4	543414.921655	4707674.584510	92.281748	42.311307
255	129	Grassland	Grassland	3	NA	2	90	7	1	2	1	6	2	7	2	9.7	8.5	543346.130447	4707617.035090	92.282025	42.311097
256	130	Grassland	Grassland	3	NA	1	155	1	Artstable	2	1.5	2	3	7	4	13	1.7	543224.821054	4707561.369960	92.282559	42.310912
257	131	Trees	Trees	3	NA	3	140	7	3	1	1	6	2	7	3	13.3	1.5	543100.634425	4707591.127940	92.283109	42.311024
258	132	Grassland	Grassland	3	Urban	1	182.5	7	Artstable	2.5	1	5	1	7	3	9	10	543019.116158	4707624.133110	92.283458	42.311127
259	133	Grassland	Grassland	3	NA	1	170	7	Artstable	1	1	4	2	7	2	13.3	0.9	542949.463996	4707608.127450	92.283760	42.311074
260	134	Grassland	Grassland	3	NA	1	145	7	3	2	1	6	2	7	4	33	1.7	542781.316902	4707600.129960	92.284502	42.311055
261	135	Urban	Roworop	3	NA	2	140	7	4	1.5	1	4	2	7	3	14	2.5	542628.511943	4707666.042890	92.285184	42.311258
262	136	Urban	Roworop	3	NA	1	160	7	4	1	1	2	2	5	2	12	1.3	542463.637785	4707658.989200	92.285896	42.311249
263	137	Urban	Urban	NA	NA	NA	NA	NA	Artstable	NA	NA	NA	NA	NA	NA	NA	NA	542433.058212	4707692.312010	92.290023	42.311357

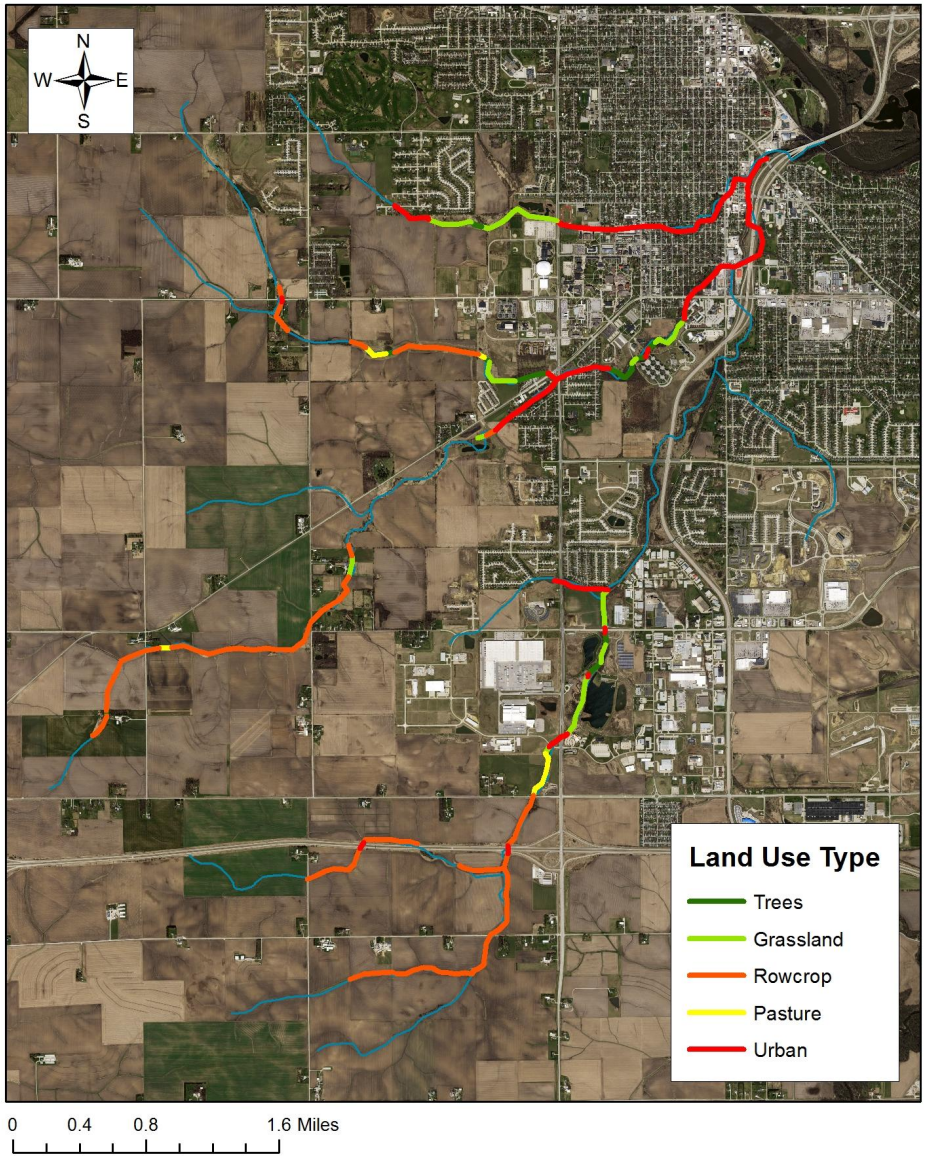
DRC Analysis Sample Sites



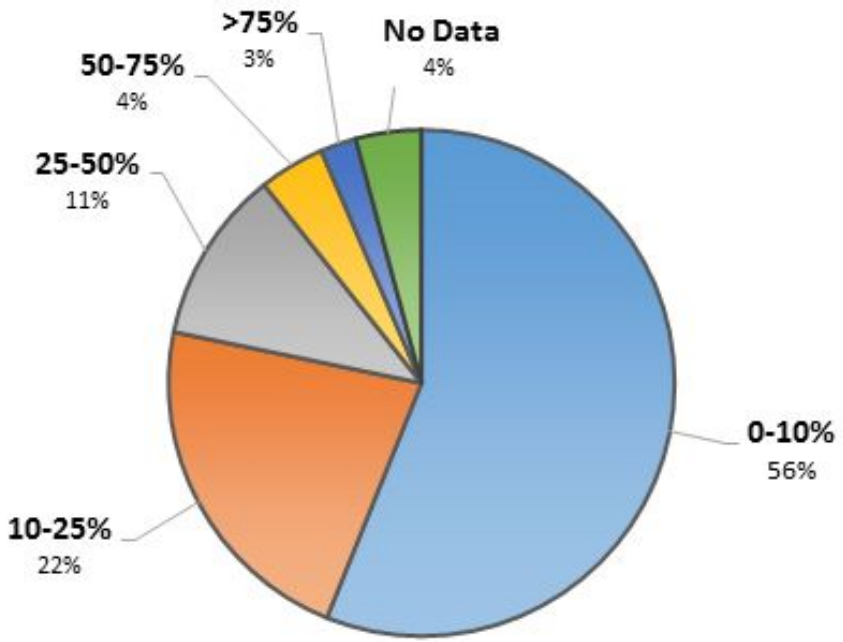
Land Use Right Bank



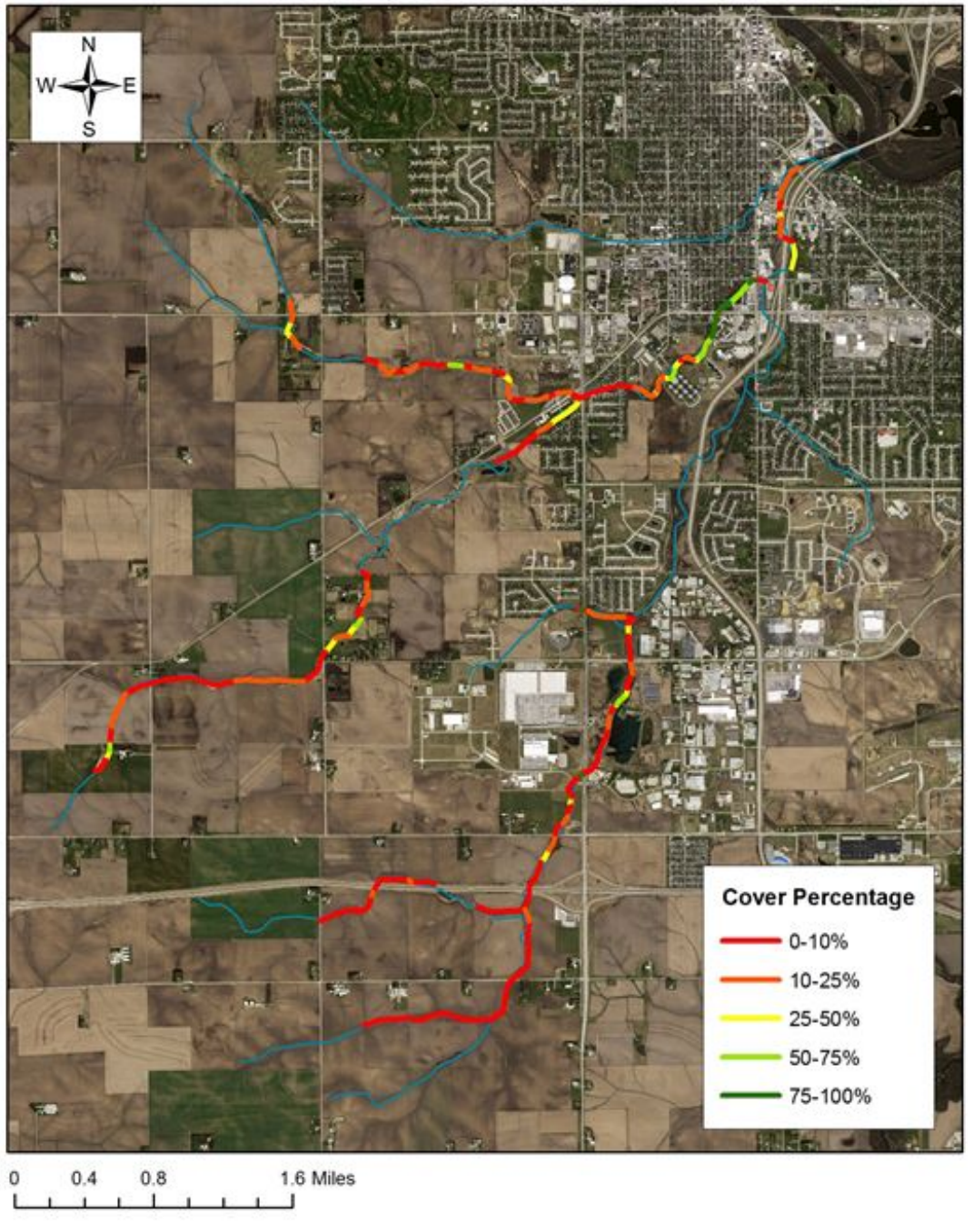
Land Use Left Bank



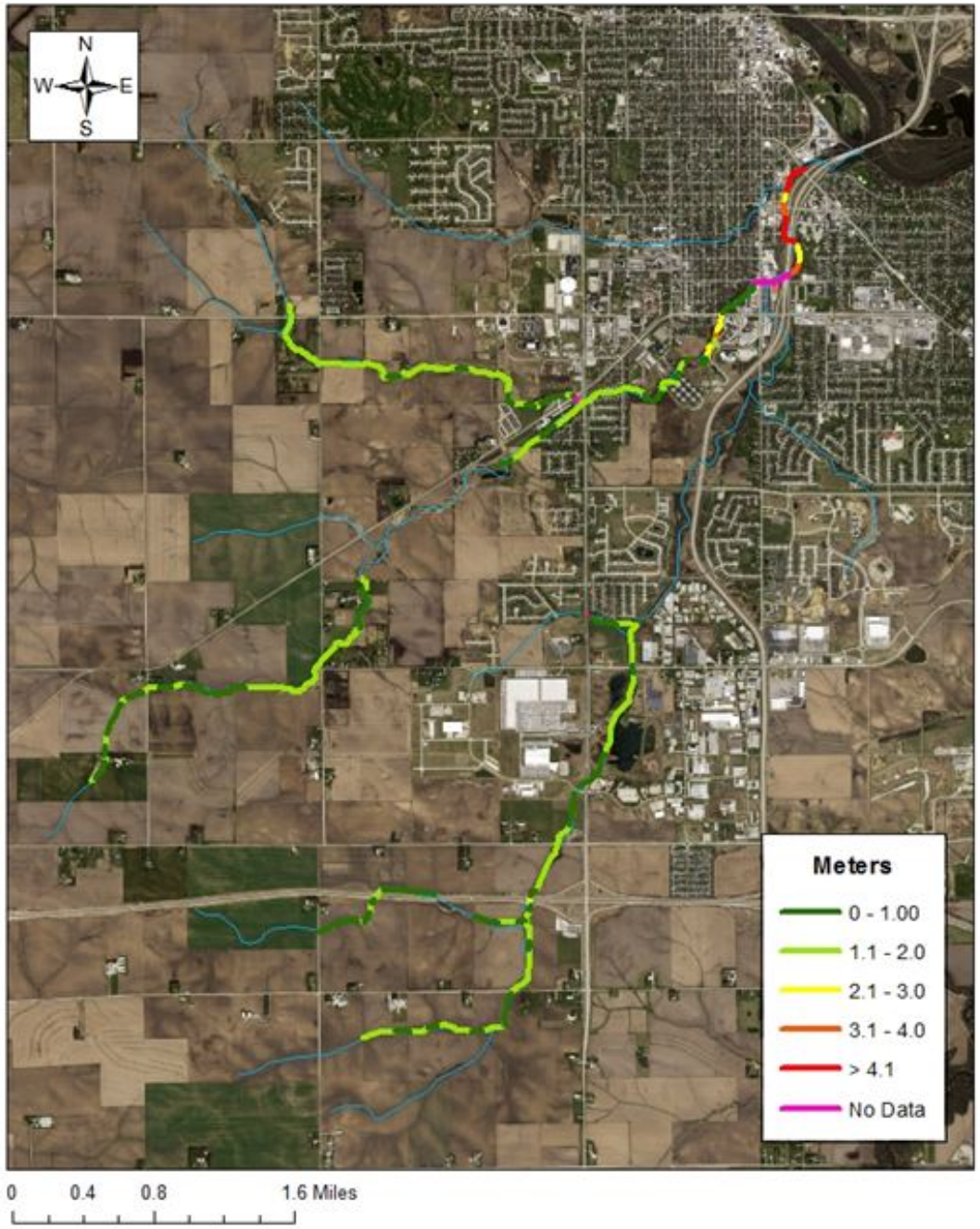
Canopy Cover

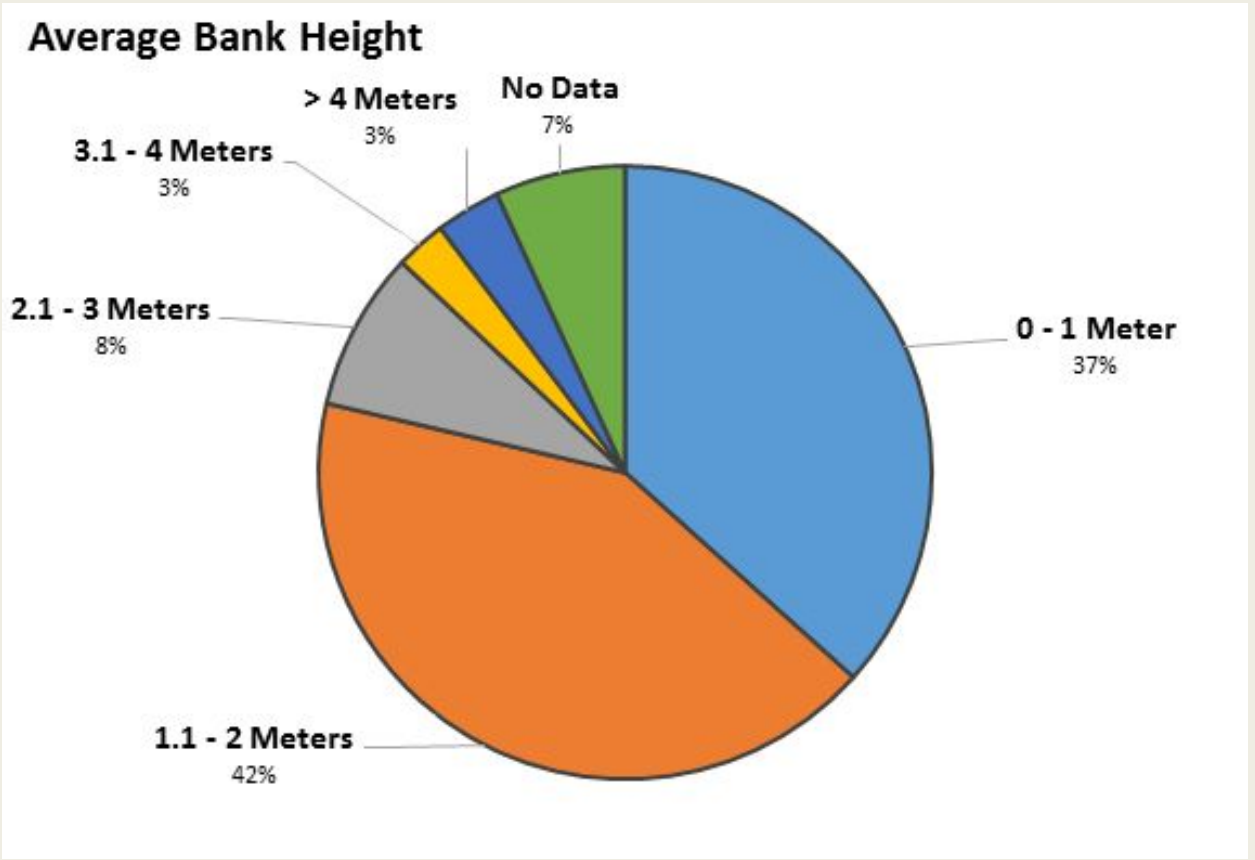


Canopy Cover

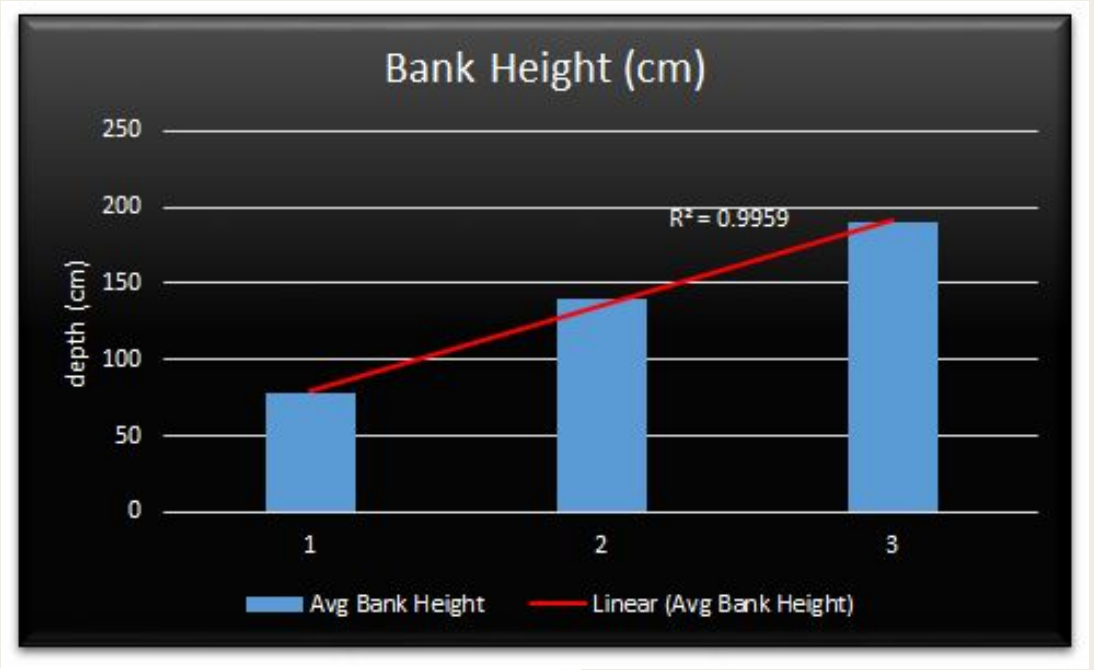


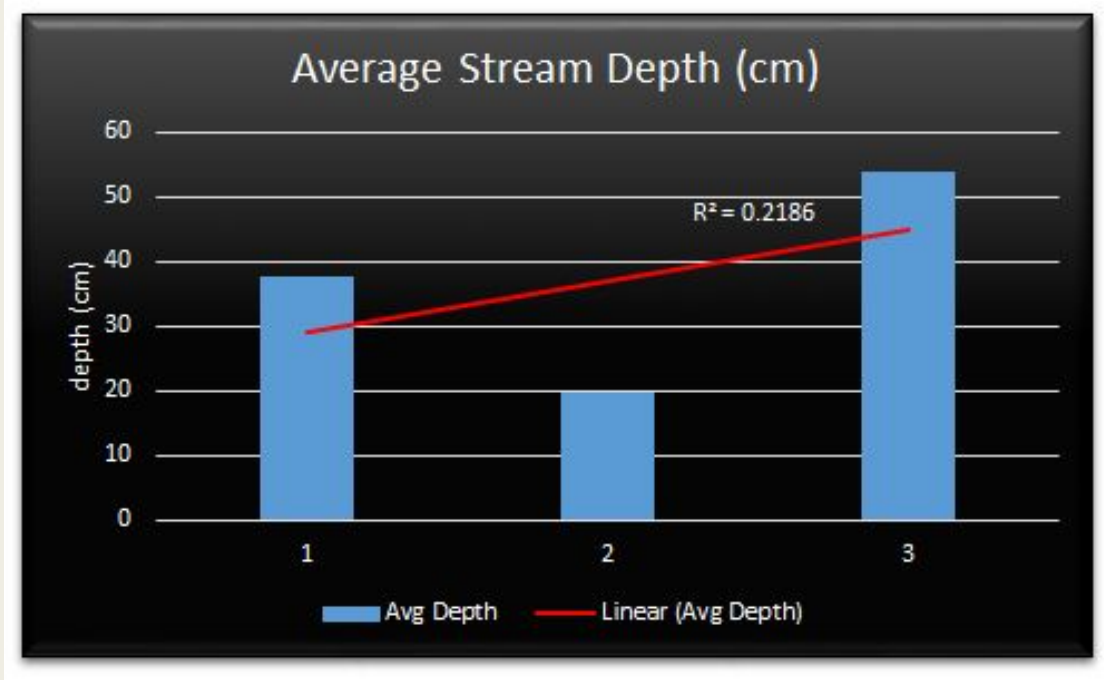
Average Bank Height

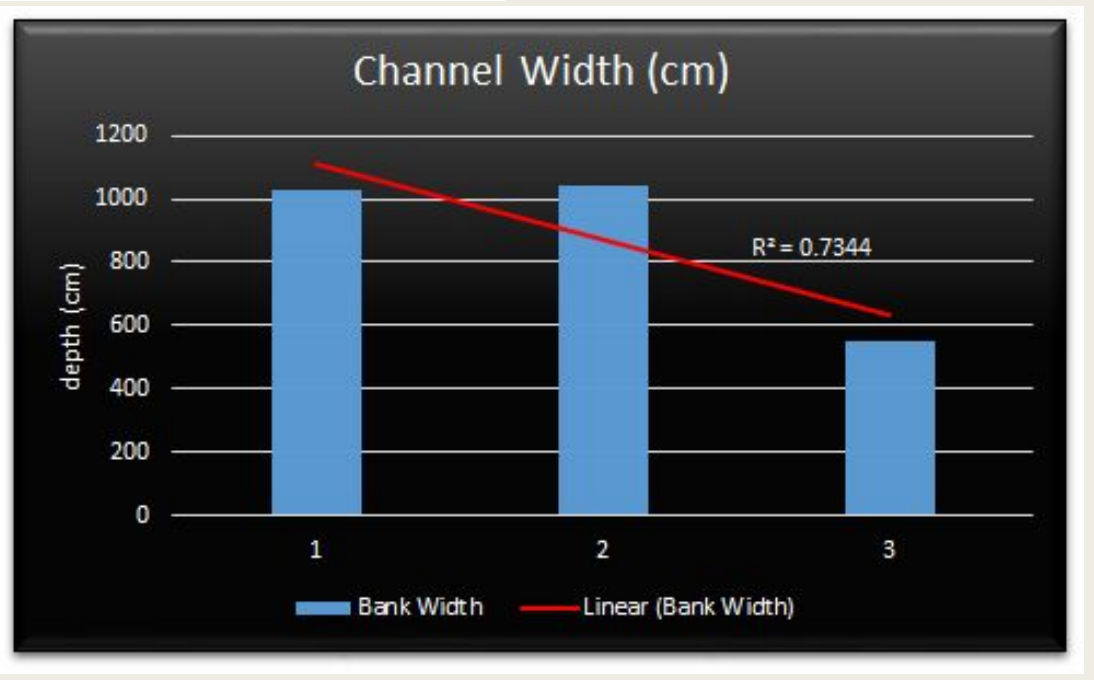


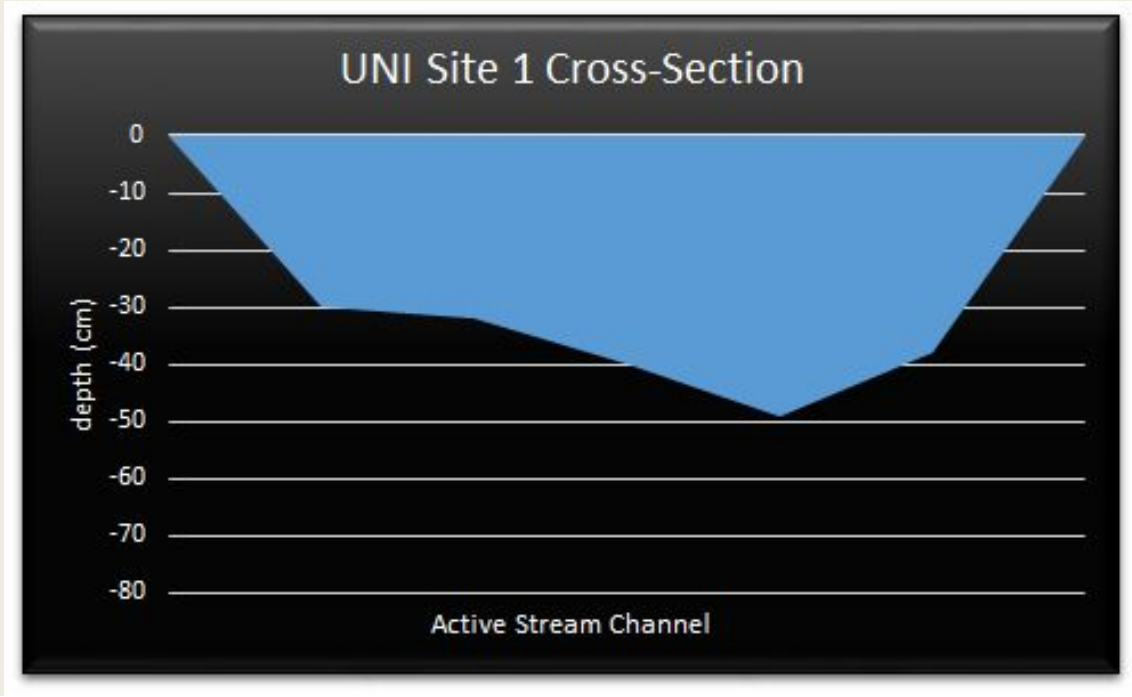


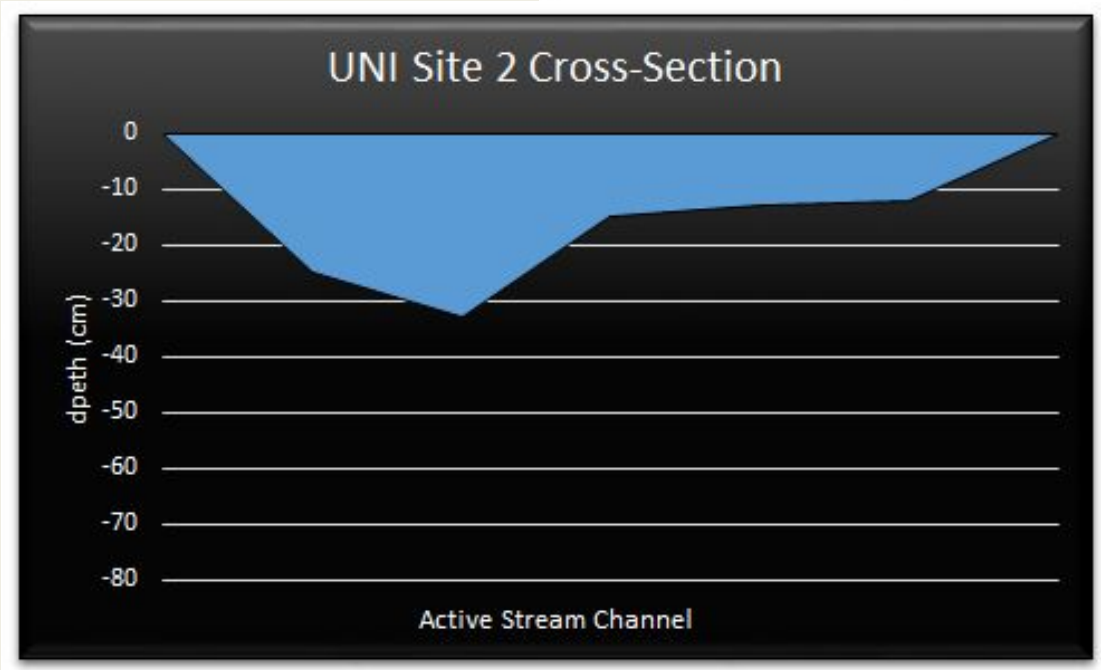
UNI CAMPUS

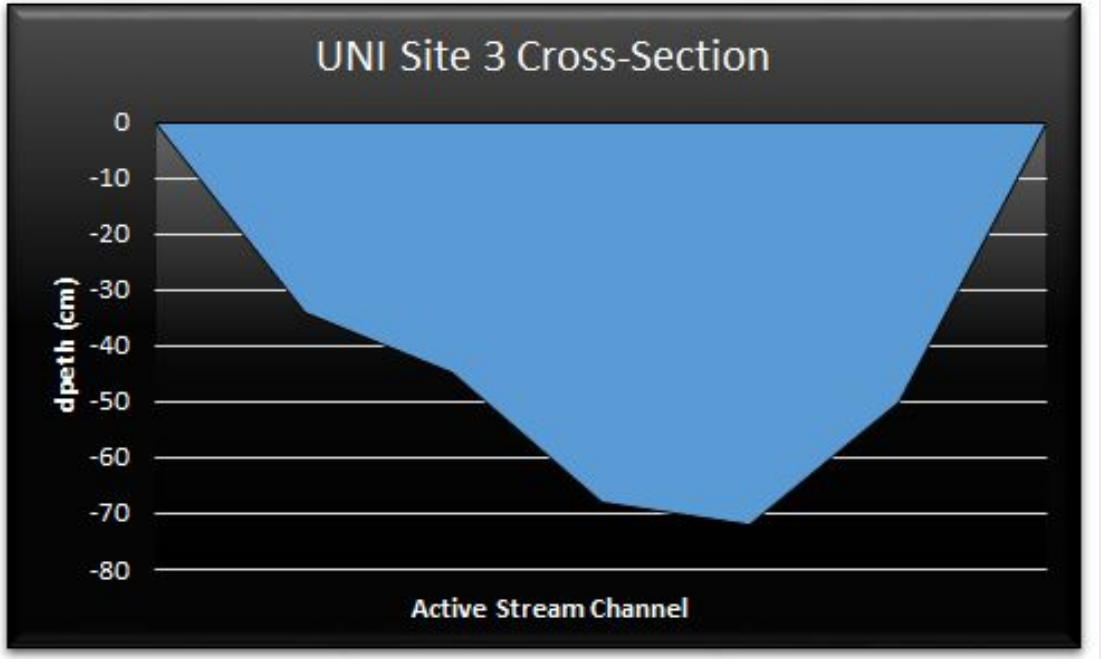

Bank Height (cm)
250
200
150
100
50
0
depth (cm)
R² = 0.9959
1
2
3
Avg Bank Height
Linear (Avg Bank Height)


Average Stream Depth (cm)
60
50
40
30
20
10
0
depth (cm)
R² = 0.2186
1
2
3
Avg Depth
Linear (Avg Depth)


Channel Width (cm)
1200
1000
800
600
400
200
0
depth (cm)
R² = 0.7344
1
2
3
Bank Width
Linear (Bank Width)


UNI Site 1 Cross-Section
0
-10
-20
-30
-40
-50
-60
-70
-80
depth (cm)
Active Stream Channel


UNI Site 2 Cross-Section
0
-10
-20
-30
-40
-50
-60
-70
-80
dpeth (cm)
Active Stream Channel


UNI Site 3 Cross-Section
0
-10
-20
-30
-40
-50
-60
-70
-80
dpeth (cm)
Active Stream Channel

	Wentworth Geometric Progression															USDA		
	Sand (mm)						Silt (μm)								Clay	Sand	Silt	Clay
Sample ID	VCS	CS	MS	FS	VFS	TS	VCSi a	VCSi b	VCSi	CSi	MSi	FSi	VFSi	TSi	TC	TS	TSi	TC
	2-1	1-0.5	0.5-0.25	0.25-0.125	0.125-0.063	2-0.063	63-53	53-32	63-32	32-16	16-8	8-4	4-2	63-2	< 2 lm	2-0.053	53-2 m	< 2 m
008L	2.5	2.0	24.7	30.5	5.6	65.3	0.7	1.5	2.2	13.8	5.5	3.1	2.6	27.2	7.4	66.1	26.5	7.4
008R	9.9	7.7	20.7	25.4	6.0	69.6	0.9	2.3	3.2	7.5	3.9	2.0	3.7	20.4	10.0	70.5	19.5	10.0
008B	35.7	31.3	29.2	4.2	0.2	100.6	-0.1	0.0	-0.1	-1.4	-0.1	0.7	-0.5	-1.4	0.8	100.5	-1.3	0.8
003L	9.0	4.4	15.9	20.2	1.8	51.3	0.9	2.4	3.3	18.1	8.9	6.2	3.5	40.0	8.7	52.2	39.1	8.7
003R	4.1	6.7	26.5	25.2	5.4	68.0	0.9	2.9	3.8	6.8	5.5	3.8	3.4	23.3	8.7	68.9	22.4	8.7
003B	23.6	41.0	33.2	1.4	0.2	99.5	0.0	0.1	0.1	-0.8	0.9	-0.6	-0.6	-1.0	1.5	99.5	-1.0	1.5
026L	17.9	10.2	14.0	13.3	4.3	59.8	0.8	2.6	3.4	10.5	7.8	5.0	3.3	30.0	10.2	60.6	29.2	10.2
026R	3.9	1.8	20.2	32.4	6.0	64.3	0.9	2.4	3.3	9.5	5.9	3.3	4.3	26.3	9.4	65.2	25.4	9.4
026B	13.9	32.6	40.5	11.8	0.5	99.3	0.0	0.0	0.0	-0.3	-0.2	0.8	-0.6	-0.3	1.0	99.3	-0.3	1.0
120L	3.1	13.0	41.9	19.9	3.9	81.8	0.7	1.8	2.5	3.6	2.4	2.3	0.8	11.6	6.6	82.5	10.9	6.6
120R	4.8	4.8	30.2	30.2	6.3	76.4	0.8	2.1	2.9	5.7	3.8	2.1	1.1	15.5	8.1	77.2	14.7	8.1
~~120B~~	~~62.8~~	~~21.3~~	~~57.6~~	~~1.6~~	~~0.6~~	~~143.8~~	~~0.1~~	~~0.6~~	~~0.7~~	~~-48.6~~	~~-0.4~~	~~1.4~~	~~0.2~~	~~-46.7~~	~~2.9~~	~~143.9~~	~~-46.8~~	~~2.9~~
131L	1.0	1.6	19.3	30.9	7.1	59.9	1.2	4.1	5.4	11.3	7.0	3.9	3.3	30.8	9.3	61.1	29.6	9.3
131R	0.7	3.8	19.9	12.8	3.9	41.2	1.0	3.8	4.8	15.4	10.1	5.5	4.8	40.7	18.1	42.2	39.7	18.1
131B	2.4	11.8	25.9	15.7	2.8	58.6	0.7	2.8	3.5	18.5	4.3	3.0	1.6	30.9	10.5	59.3	30.2	10.5
125L	3.2	11.8	22.6	14.2	4.1	56.0	0.9	2.9	3.8	12.6	8.0	4.5	3.8	32.7	11.3	56.9	31.8	11.3
125R	0.9	3.1	10.8	9.8	8.1	32.8	1.2	4.3	5.6	22.9	15.4	8.5	4.6	57.0	10.2	34.0	55.8	10.2
125B	0.6	6.1	45.0	25.9	3.0	80.6	0.5	2.2	2.7	3.8	3.9	0.9	1.3	12.6	6.7	81.1	12.1	6.7
STD	0.7	0.7	1.1	1.9	15.9	20.3	6.0	9.9	15.9	39.2	13.5	5.3	2.1	76.0	3.7	26.3	70.0	3.7
SALT											0.0009	0.0004	0.0009		0.0009			

Conclusion

- The data from this study will provide an accurate estimation of the present geomorphic setting of DRC, and will be utilized to help identify problem areas within the watershed that are highly susceptible to degradation
- Urbanization continues to have the largest impact on stream channel morphology - with a growing urban population, continued monitoring and community outreach and education are imperative for the future health of DRC.

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