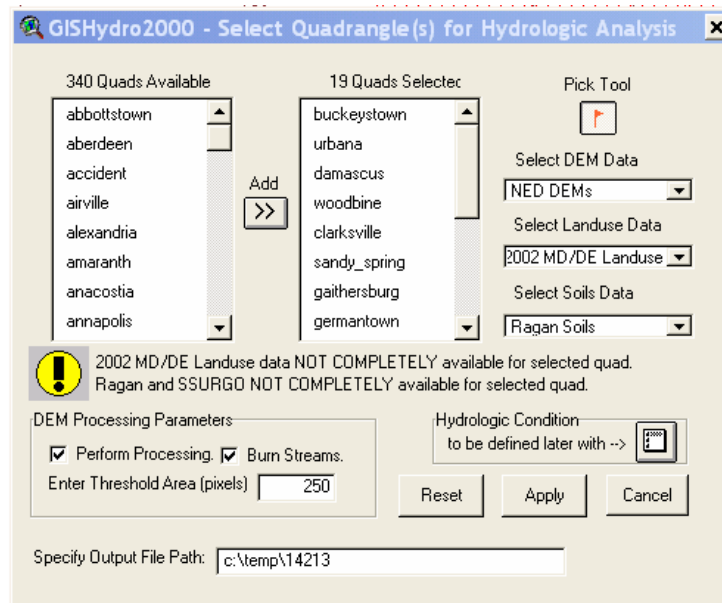


Manual for using Region-Style Models in GISHydro2000

-- using stream restoration sites in Montgomery County as an example

Please refer to GISHydro2000+ User's Manual (Moglen 2005) for details on how to use GISHydro2000. Here only the necessary steps are provided in order to use Region-style macroinvertebrate predictive models.

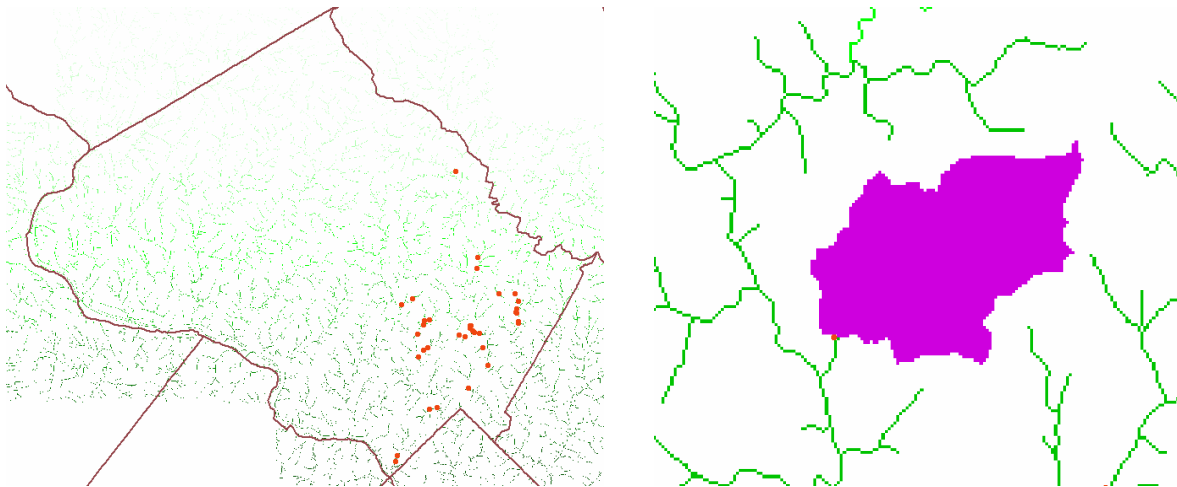
1. Select the quadrangles of interest and decide the Digital Elevation Model (DEM), landuse, and soil data sources.




In GISHydro2000, once you select the desired quadrangles, which includes all of Montgomery County in our case, “DEM”, “landuse”, and “soil data” are processed in the selected area. The default selections for all these data choices are applied in this example. They are NED DEMs, 2002 MD/DE landuse, and Ragan Soil. As mentioned earlier, GISHydro2000 processes STATSGO soil data automatically, and also the selected soil data, Ragan Soil, is applied here. Note that if you would like to use the Region-style

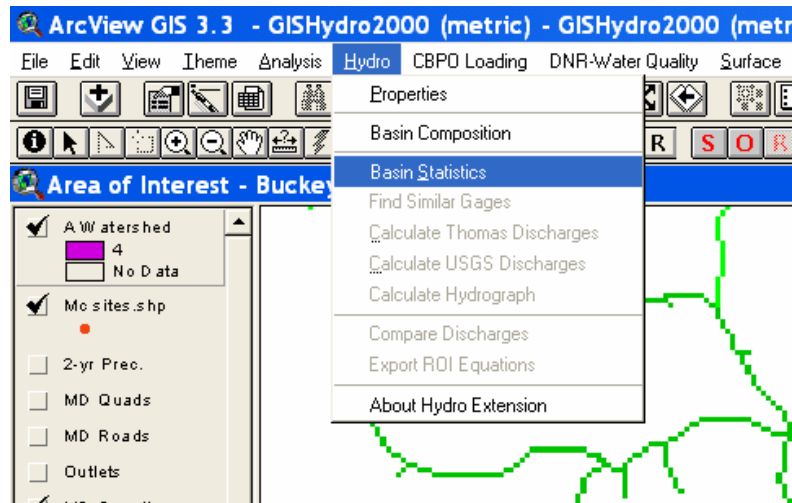
model built with Ragan Soil data, you need to select Ragan as the soil data source. Depending on the number of quadrangles selected, this primary hydrologic process can take a while. A new View named as “Area of Interest” will be generated in ArcView.

2. Locate the target stream site and delineate the watershed



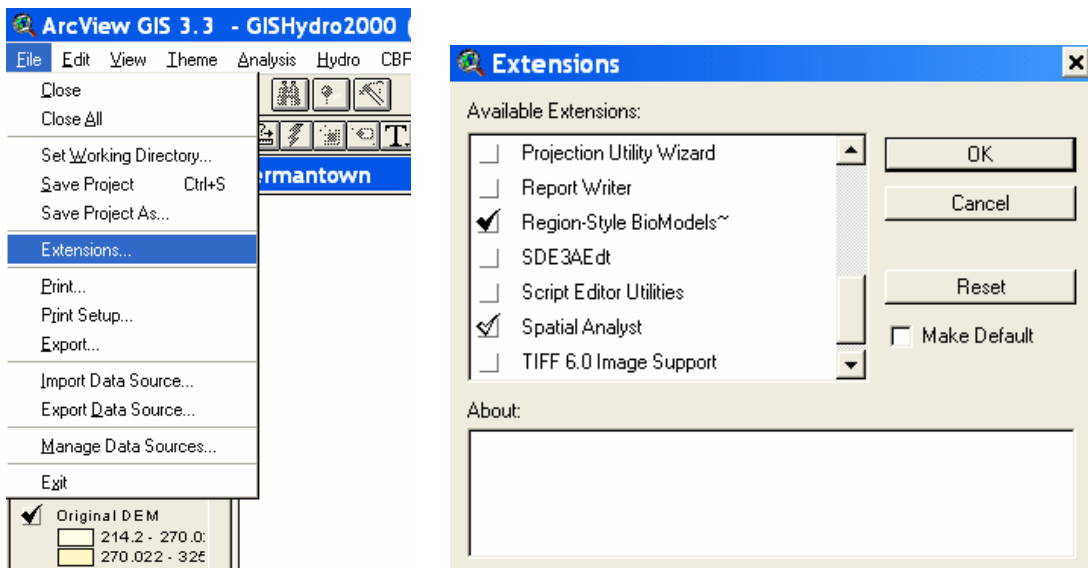
Once all the map data layers are ready for the area of interest, load the interested stream sites layer (“stream restoration sites of Montgomery County”) onto the map. If leaving only the “Stream Links” and the “stream restoration sites of Montgomery County” layers on the View window, the interested sites on “stream restoration sites of Montgomery County” layer falls approximately onto the stream channels on the “Stream Links” layer as above left figure. Then use the watershed tool, “”, on the tool bar to click the interested stream site. It will treat the stream site as a watershed outlet to delineate its watershed area. ArcView then creates the “A Watershed” theme for the delineated watershed as above right figure.

3. Calculate the GISHydro2000 built-in basin statistics





Click on the “Hydro” on the menu and choose “Basin Statistics” from the choices as above. GISHydro2000 then calculates all the basic basin statistics for the delineated watershed, including outlet location, drainage area, channel slope, land slope, and more. Some of these statistics are used as the predictors for the developed Region-style models. (A pop-up window will allow you to save these basin statistics for future reference.)

4. Run the Region-style models

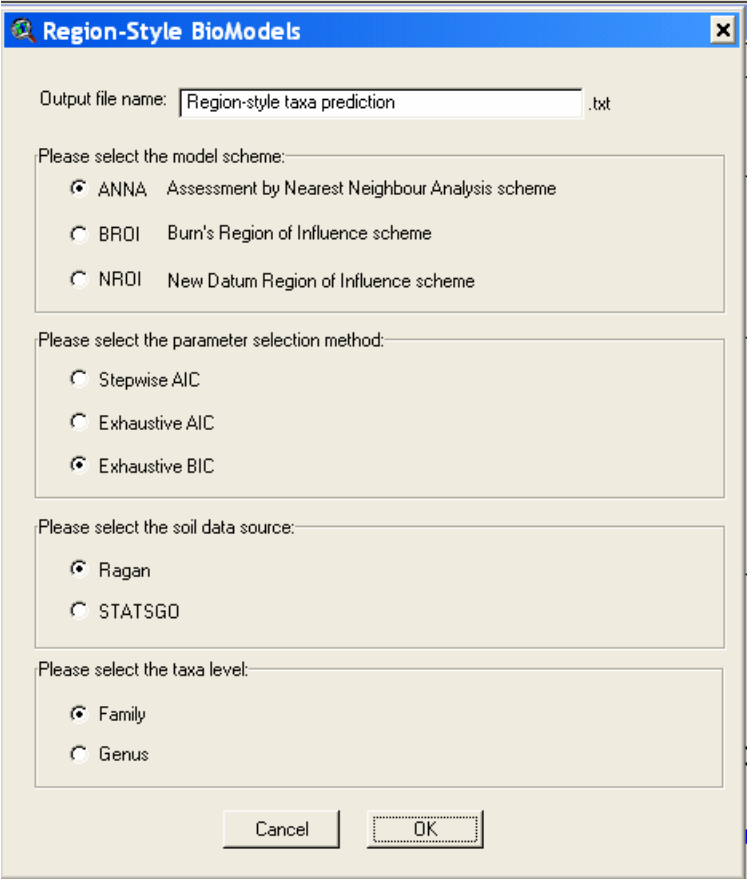


Click on the “File” on the menu and choose the “Extension” from the choice. A

extension list window will show up. Scroll down the menu and check the “Region-style Biomodels~”. One “dragonfly” icon  will show on the tool bar.

Run the Region-style model by clicking on the . A dialog windows will pop-up and ask you to :

- Input the name of the output file.
- Choose the region selection scheme (ANNA, BROI, NROI).
- Choose the parameter selection method (Stepwise AIC, Exhaustive AIC, Exhaustive BIC).
- Select the soil data sources (Ragan, STATSGO).
- Choose the desired prediction taxon level (Family, Genus).



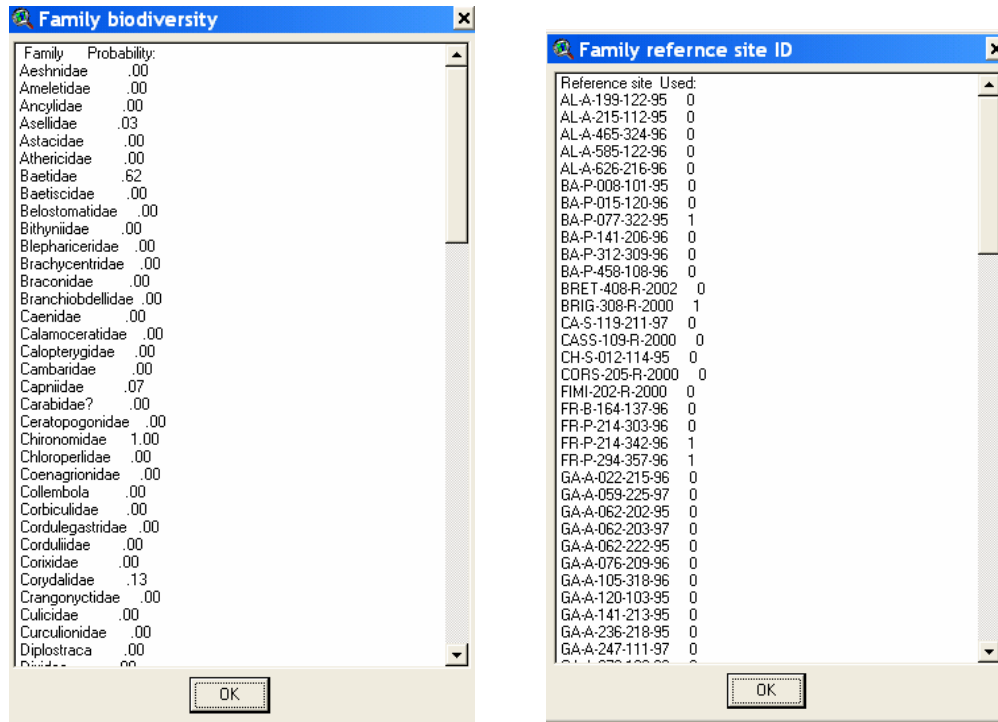
The image shows a dialog box titled "Region-Style BioModels". It contains several sections for user input:

- Output file name:** A text field containing "Region-style taxa prediction" followed by ".txt".
- Please select the model scheme:** Three radio button options:
 - ☒ ANNA Assessment by Nearest Neighbour Analysis scheme
 - ☐ BROI Burn's Region of Influence scheme
 - ☐ NROI New Datum Region of Influence scheme
- Please select the parameter selection method:** Three radio button options:
 - ☐ Stepwise AIC
 - ☐ Exhaustive AIC
 - ☒ Exhaustive BIC
- Please select the soil data source:** Two radio button options:
 - ☒ Ragan
 - ☐ STATSGO
- Please select the taxa level:** Two radio button options:
 - ☒ Family
 - ☐ Genus

At the bottom, there are "Cancel" and "OK" buttons.

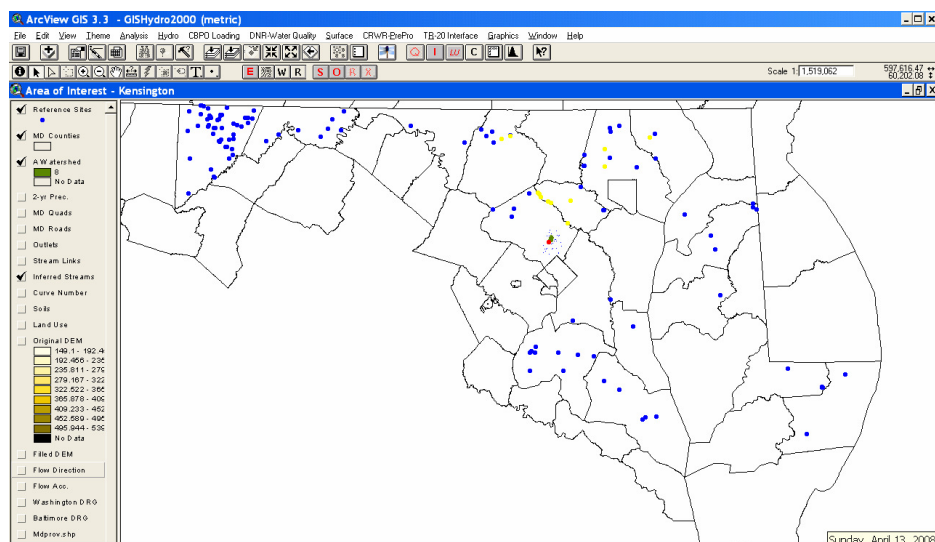
This extension script obtains and calculates all the parameters needed from GIS layers. The built-in FORTRAN executable file chooses the region of influence from

MBSS reference sites and calculates the predicted taxon appearance probabilities. The taxon prediction results will be shown in the window as well as the used reference sites.



All the results are saved in a text file (*.txt) under the name of the project that was assigned in the “Region-Style Biomodels” dialogue box.

5. Interpret and utilize the model output



One “Reference Sites” theme will also be added to the “Area of Interest” view. Setting the “Reference Sites” to visible by checking this theme and zooming out to view the entire state of Maryland, all the MBSS reference sites in the data set are shown as colored points. (The color will depend on the default color.) Some of the points are highlighted in yellow, these are the reference sites used in the Region-style models for predictions. If opening the attribute table of “Reference Site”, the rows of these used reference sites are also highlighted in yellow. Their physical parameters can also be provided as reference information.

Shape	Standard	Ref	Lat	Long	Area	W/Slope	C/Slope	RefID	Line	Huc1d	Huc2d	Point	Length	Sp	Sd	Sc	Sd	Elev	Sn	Twisting	P2	P100	Highflow	Slope	Existing	Nothing
Point	ALA-199-122-95	R	39.7038	-78.4127	0.30	0.16820	406.1854	161.90	0.00	100160	2070003	3.1	1.02	0.0	0.00	100.0	0.0	1154.9	1.310	0.410	2.63	5.93	0.0	0.38020	402503	694333
Point	ALA-215-112-95	R	39.6159	-78.5120	0.64	0.19260	243.9298	252.60	0.00	60133	2070003	5.0	1.41	0.0	0.00	100.0	0.0	840.3	1.220	0.940	2.60	5.95	0.0	0.44470	374010	652679
Point	ALA-465-324-95	R	39.6051	-78.7043	1.28	0.28040	276.6799	486.10	0.00	130256	2070002	8.8	3.28	81.7	9.70	8.50	0.0	944.4	1.110	2.450	2.50	5.72	0.0	0.61100	319782	649770
Point	ALA-585-122-95	R	39.5629	-78.8312	0.65	0.08160	117.8117	99.10	0.00	100207	2070002	5.1	1.42	26.0	2.30	69.60	0.0	728.5	3.150	1.110	2.43	5.63	0.0	0.50720	263856	642343
Point	ALA-625-216-95	R	39.5461	-78.9095	0.77	0.23280	1033.1914	737.40	0.00	100203	2070002	4.8	1.40	0.0	38.50	61.50	0.0	1234.9	1.170	0.910	2.44	6.05	47.7	0.50150	261066	629406
Point	BA-P-008-101-95	R	39.4943	-76.8626	3.18	0.08530	83.4794	166.20	0.00	150316	2060003	10.1	3.01	0.0	88.30	8.60	3.0	443.1	1.270	5.120	3.18	8.43	0.0	0.59500	836732	604952
Point	BA-P-015-120-95	R	39.4805	-76.6983	0.00	0.11480	358.6549	10.10	0.00	120226	2060003	0.3	0.13	0.0	100.0	0.00	0.0	596.3	1.190	0.000	3.29	8.70	0.0	0.58930	885167	600032
Point	BA-P-077-322-95	R	39.4348	-76.7256	4.84	0.06660	72.7075	108.70	0.00	140251	2060003	12.2	3.23	1.1	73.20	14.40	11.2	452.9	1.380	7.110	3.27	8.65	0.0	0.45600	876371	583362
Point	BA-P-141-206-95	R	39.6086	-76.6907	3.36	0.08040	76.8191	109.30	0.00	120180	2060003	11.7	3.49	14.2	73.40	9.30	3.0	508.1	1.280	4.010	3.24	8.55	0.0	0.53110	887151	646706
Point	BA-P-212-309-95	R	39.5386	-76.6372	6.85	0.10930	54.0088	165.00	0.00	120129	2060003	19.6	6.05	1.5	63.40	9.90	5.1	443.0	1.350	8.940	3.21	8.46	0.0	0.56190	902185	657677
Point	BA-P-458-108-95	R	39.5277	-76.6987	0.22	0.10120	226.9169	86.50	0.00	120180	2060003	2.4	0.68	1.7	84.30	13.90	0.0	635.6	1.330	0.000	3.23	8.52	0.0	0.63750	884873	653646
Point	BRET-408-R-2002	R	38.3254	-76.6421	22.74	0.04720	13.2951	85.40	0.00	210178	2070011	35.0	6.84	17.7	24.90	38.40	19.0	24.1	1.290	31.850	3.43	9.14	0.0	0.58160	431298	73184
Point	BRIS-308-R-2003	R	39.3999	-77.1515	8.17	0.10910	67.3811	199.30	0.00	20001	2060006	21.0	4.96	0.0	46.60	11.40	41.9	538.4	1.150	12.230	3.11	8.25	0.0	0.59530	386935	181306
Point	CAS-119-R-197	R	38.6379	-76.5548	1.04	0.08350	39.5332	28.60	0.00	10032	2060004	7.3	1.67	0.0	38.50	23.90	45.6	81.3	1.220	1.170	3.26	8.74	0.0	0.53650	827159	283334
Point	CAS-109-R-2000	R	39.5786	-79.2505	4.98	0.07800	79.3488	149.50	0.00	50151	5020006	13.8	3.77	4.0	12.20	48.80	35.0	2567.0	2.030	1.600	2.59	6.29	100	0.35410	206854	214403
Point	CH-S-012-114-95	R	38.4994	-76.9035	0.59	0.05330	59.3102	29.70	0.00	100110	2070011	5.1	1.43	9.7	43.90	39.10	7.3	132.8	1.230	0.890	3.30	8.87	0.0	0.65070	827623	242565
Point	CDRS-205-R-2000	R	39.0184	-76.0260	2.86	0.00450	5.5406	10.70	0.00	180302	2060002	9.6	2.67	0.0	52.70	29.70	17.4	52.7	1.690	2.780	3.25	8.75	0.0	0.43290	484349	150496
Point	FIM-202-R-2000	R	39.6620	-76.4860	2.14	0.19310	175.6699	347.20	0.00	100156	2070003	10.3	3.67	0.0	8.10	91.90	0.0	837.0	1.240	4.200	2.57	5.82	0.0	0.37370	272480	222541
Point	FR-B-164-137-95	R	39.6207	-77.5280	1.70	0.10460	149.9102	251.80	0.00	10026	2070008	7.7	2.53	0.0	25.70	57.50	16.7	138.8	1.160	1.950	3.24	8.05	0.0	0.56240	851253	651365
Point	FR-P-214-303-95	R	39.5911	-77.3371	36.47	0.10880	72.3639	518.20	6.00	60177	2070009	48.7	16.35	2.9	28.20	59.30	9.5	339.5	1.530	46.230	3.20	8.09	0.0	0.34900	704999	640335
Point	FR-P-214-342-95	R	39.5887	-77.3392	38.57	0.10870	70.8430	526.80	6.00	60177	2070009	48.6	16.70	2.9	28.30	59.20	9.5	329.6	1.570	46.580	3.20	8.09	0.0	0.34900	704385	639461
Point	FR-P-234-357-95	R	39.5745	-77.3332	22.83	0.11085	122.4022	643.45	7.55	60227	2070009	32.9	24.69	2.9	33.25	56.65	6.7	325.4	1.615	28.145	3.21	8.10	0.0	0.40845	689154	634365
Point	GAA-022-215-95	R	39.6616	-79.0286	2.47	0.10890	86.7019	215.10	0.00	50127	5020002	8.0	3.29	0.0	9.40	81.50	9.1	2249.3	1.350	2.320	2.52	6.31	100	0.59580	228884	672196
Point	GAA-029-225-97	R	39.6096	-79.1963	0.00	0.10190	911.5596	111.50	0.00	50152	5020006	0.9	0.21	0.0	30.80	69.20	0.0	2443.1	1.180	0.000	2.95	6.25	100	0.59600	181205	654255
Point	GAA-062-202-95	R	39.7193	-79.3302	7.11	0.15310	104.4690	596.90	0.00	10122	5020006	17.8	6.04	0.0	30.40	64.00	0.0	1955.8	1.240	7.130	2.53	5.86	99.7	0.57910	144606	695242
Point	GAA-062-203-97	R	39.7189	-79.3372	7.32	0.15320	111.6336	692.10	0.00	10122	5020006	18.8	6.46	0.0	30.00	63.90	0.6	1847.5	1.240	7.540	2.53	5.95	98.2	0.60500	142544	695157
Point	GAA-062-222-95	R	39.7190	-79.3160	6.43	0.14860	83.8873	403.70	0.00	10122	5020006	15.5	5.13	0.0	29.00	64.70	0.0	2172.8	1.270	6.260	2.53	5.88	100	0.50040	148474	693954
Point	GAA-076-209-95	R	39.8170	-79.0688	6.17	0.22130	130.6760	525.80	0.00	50129	2070002	15.8	4.94	0.0	19.70	80.30	0.0	1996.5	1.290	7.240	2.53	6.27	99.5	0.63980	217185	696487
Point	GAA-105-219-95	R	39.5385	-79.0295	14.20	0.13890	57.8596	324.80	0.00	50129	2070002	31.5	9.87	0.4	14.70	76.90	8.0	2246.0	1.310	14.780	2.51	6.32	100	0.48410	238427	683045
Point	GAA-120-103-95	R	39.6996	-79.9931	1.63	0.10690	84.8227	153.80	0.00	50157	5020006	6.8	2.44	0.0	7.50	92.40	0.0	2417.9	2.040	1.910	2.50	6.32	100	0.51410	239165	688917
Point	GAA-141-213-95	R	39.6216	-79.2815	6.92	0.11670	40.7736	236.00	0.00	10116	5020006	21.3	7.38	0.0	57.00	35.20	7.7	2437.0	1.510	6.780	2.54	5.84	100	0.49190	157313	695912
Point	GAA-236-219-95	R	39.7093	-79.1632	0.00	0.24500	1166.9065	7.80	0.00	50195	5020006	0.3	0.13	0.0	0.00	100.0	0.0	2420.5	1.390	0.000	2.54	6.34	100	0.56160	189710	690465
Point	GAA-247-111-97	R	39.6723	-79.3348	1.27	0.17780	167.1961	314.70	0.00	10120	5020006	6.5	2.25	0.0	42.00	58.00	0.0	2185.0	1.390	1.410	2.54	5.69	100	0.53690	142785	678142
Point	GAA-276-106-95	R	39.5395	-79.2086	0.82	0.15440	349.1250	327.70	0.00	50134	2070002	5.0	1.29	0.0	45.10	48.00	2.9	2188.3	1.560	7.800	2.57	6.34	100	0.62620	177137	628962
Point	GAA-304-316-97	R	39.6160	-79.3514	6.76	0.12930	68.3536	275.60	0.00	10115	5020006	16.4	4.22	0.0	41.70	57.90	0.4	2242.4	1.380	7.580	2.52	5.72	100	0.41770	137880	657781
Point	GAA-310-319-97	R	39.6687	-79.2059	22.27	0.06280	27.2735	341.70	0.00	50153	5020006	37.8	13.35	1.0	30.80	47.80	20.4	2319.6	1.480	18.800	2.56	6.20	100	0.48750	179037	679593
Point	GAA-315-101-96	R	38.6254	-79.1007	0.00	0.21950	777.9292	12.00	0.00	50130	2070002	0.5	0.19	0.0	90.90	9.10	0.0	2449.4	1.690	0.000	2.53	6.22	100	0.66410	208269	659456

Reference:

Moglen, G.E., 2005. GISHydro2000+ User's Manual.

Tsang, Y.-P., 2008. Use of Macroinvertebrate Predictive Models to Evaluate the Stream Restoration Effect, University of Maryland, College Park, 393 pp.