Assignment 3

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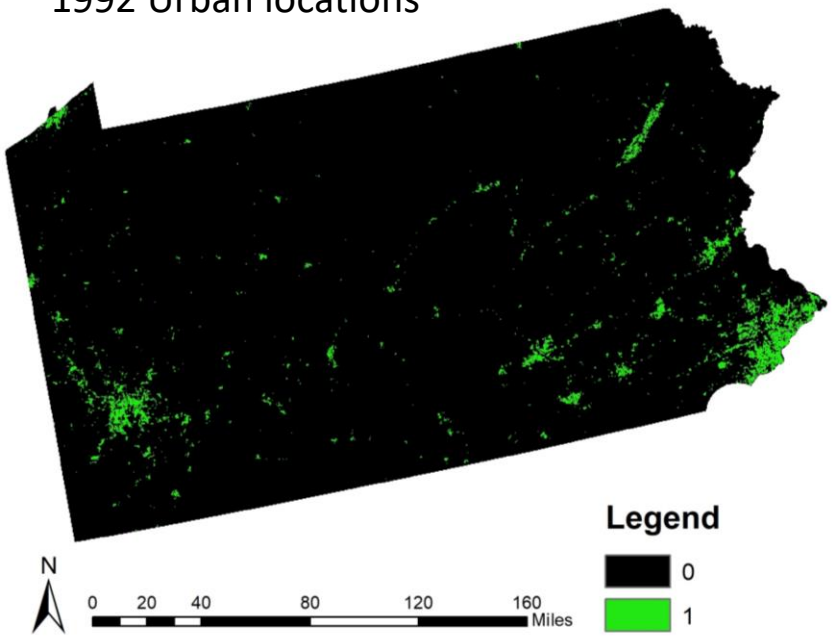
Urban Growth vs. Development Suitability Using Raster Overlay

The Pennsylvania Department of Environmental Protection (DEP) is considering establishing a special fund to provide funds to local land conservancies to acquire important resources lands threatened by likely urban development. Before looking at actual funding amounts, they ask you to assess the threat and opportunity with respect to future development. Your analysis will attempt to address two important and interrelated questions.

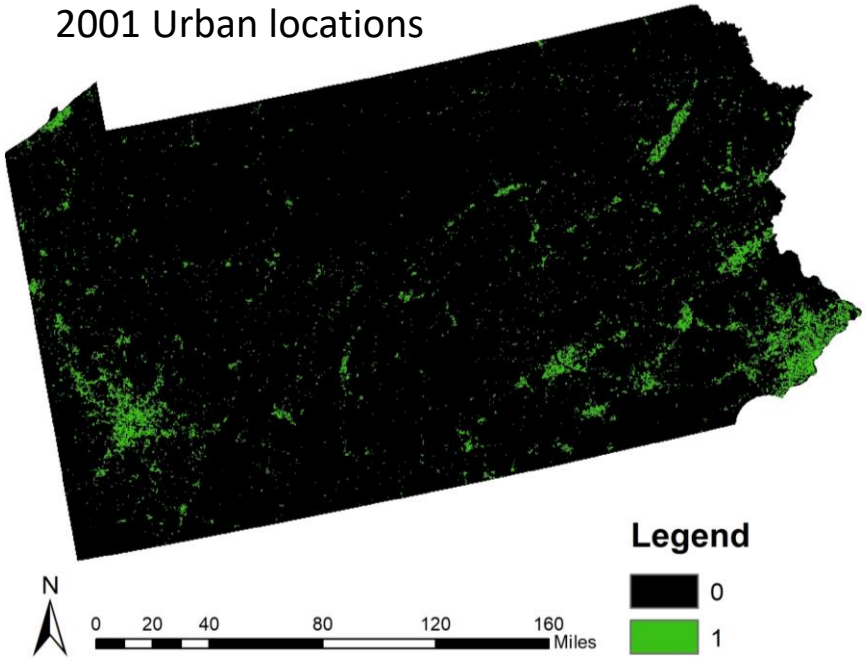
1. What are the areas that may be environmentally 'sensitive' to development but where development may be infringing in the coming years? (Supply-side)

2. What are the areas that are not environmentally sensitive to development where we would like to encourage development in the coming years? (Demand-side)

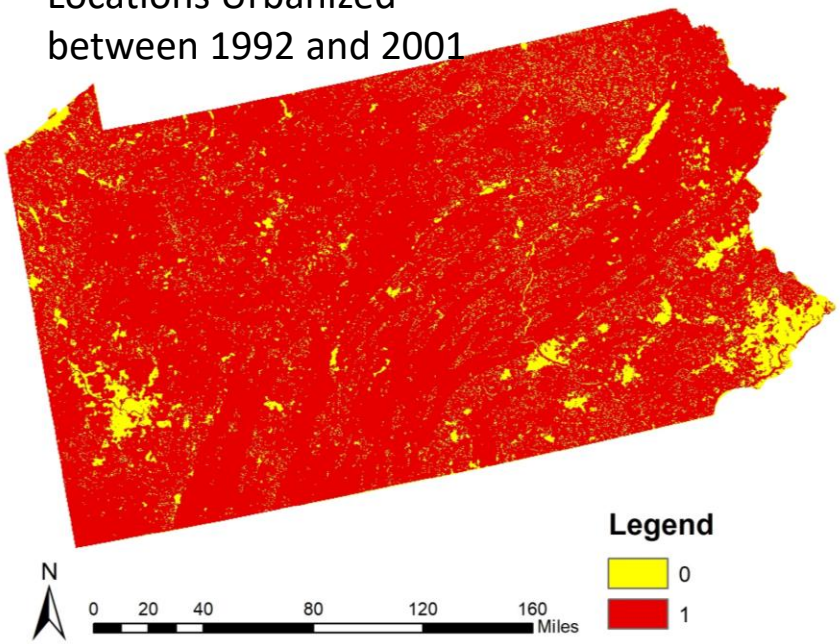
1992 Urban locations



2001 Urban locations



Locations Urbanized between 1992 and 2001



	Rowid	VALUE	COUNT
▶	0	0	401783
	1	1	12408

Value 1 represents the locations which have been urbanized between 1992 and 2001

PA County	Urban Land Change	Population Change	Urban Land Conversion per New Resident
York	259	58042	-0.022694701
Chester	329	53626	-0.015267176
Lancaster	398	52055	0.002591707
Monroe	415	50063	0.016739634
Bucks	462	38793	0.004840484
Berks	339	36913	0.007223581
Pike	132	30740	0.037804878
Lehigh	345	27850	0.009425878
Cumberland	267	26529	0.003363664
Butler	311	26479	0.015819897
Northampton	288	26018	0.011745157
Montgomery	707	24762	0.003936616
Adams	78	23189	-0.082428629
Wayne	79	20068	0.062409289
Centre	202	19168	0.016774309
Clearfield	191	11549	0.019175455
Lycoming	187	11148	0.037240119
Carbon	117	10812	0.011986301
Franklin	212	10485	0.000412655
Huntingdon	44	9090	0.009183756
Dauphin	326	8754	0.006135084
Union	62	8583	0.012387792
Somerset	86	7903	-0.003118654
Cameron	3	7270	0.038530067
Susquehanna	66	7002	0.059972106
Bradford	90	6691	0.340028694
Columbia	104	6574	0.020219361
Erie	292	5964	3.796610169
Wyoming	48	5434	0.053369272
Warren	63	5256	0.072549852
Forest	13	5016	0.040952779
Juniata	25	4797	0.007656066
Crawford	196	4786	0.053545052
Fayette	173	4490	-0.031413613
Montour	27	4257	0.014472123
Snyder	61	4215	0.01082131
Sullivan	12	4180	0.031554791
Mercer	258	4134	0.028710247
Armstrong	97	4132	0.013450904
Clinton	65	3883	0.028551813
Lawrence	215	3585	0.011909365
Schuylkill	124	3280	0.01106926
Lebanon	145	2708	0.004462286
Blair	171	2357	0.008833272
Mifflin	59	2307	0.010064458
Bedford	65	2264	0.002870813
Elk	40	2086	0.041800643
Greene	54	1902	-0.783783784
Venango	99	1855	0.040337146
Perry	55	1743	0.005211591
Potter	13	1698	0.150141643
Tioga	67	1661	0.337792642
Fulton	39	933	-0.026446915
Jefferson	91	918	0.023475315
Delaware	237	697	-0.197435897
McKean	53	353	0.09912854
Northumberland	101	299	0.016538228
Lackawanna	224	59	0.048960429
Indiana	87	-111	0.010881944
Clarion	77	-390	0.028391167
Westmoreland	410	-4974	0.007645759
Beaver	331	-5504	0.010538397
Luzerne	294	-9359	0.025574339
Washington	276	-10436	0.004294079
Cambria	186	-12183	0.008289224
Allegheny	1251	-55123	0.006342495
Philadelphia	215	-68940	-0.060138081

The table shows Urban land change, population change and the ratio of two by county. The highlighted counties have the negative population grow within these years. It seems like Erie County has the most efficient land conversion because of its high ratio.

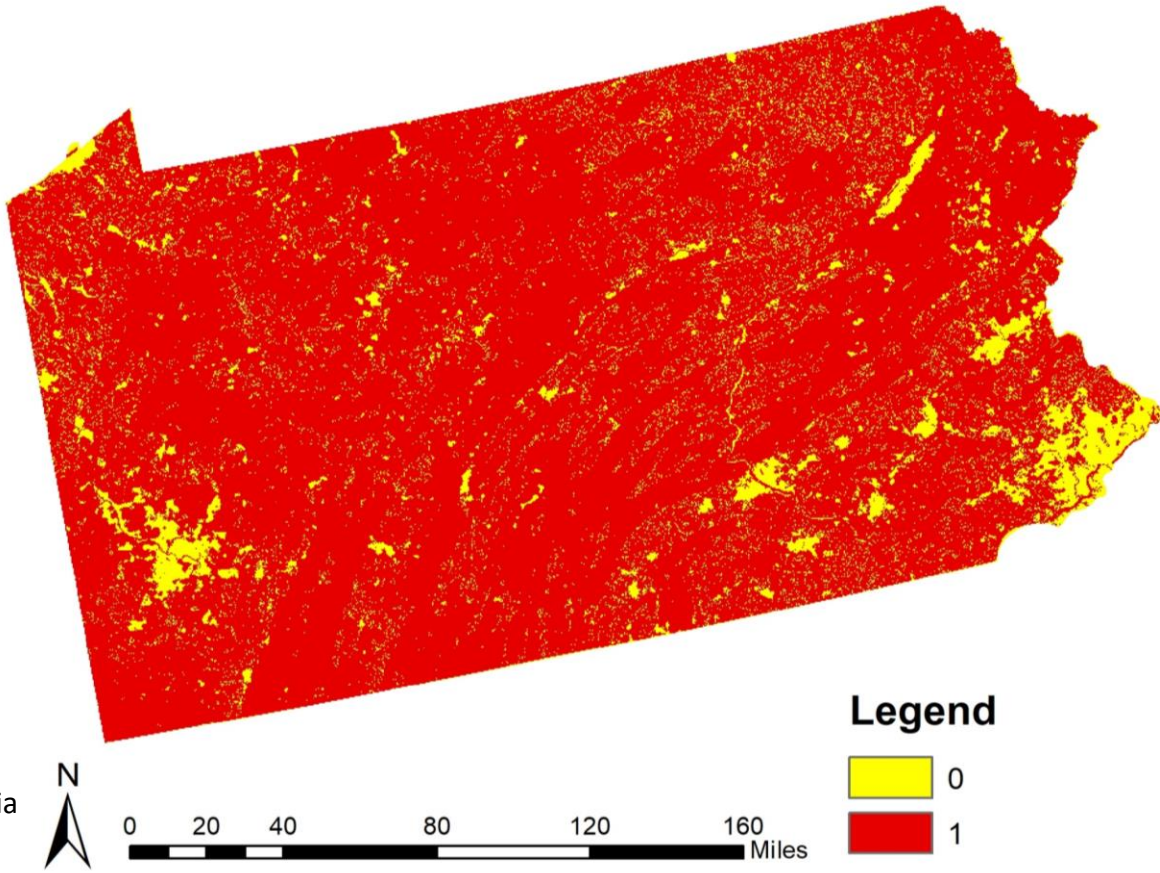
1992 Sensitive Lands table by county

NAME	Amount of Sensitive Land
Erie	5949
Bradford	9263
Tioga	9585
Potter	9583
McKean	8560
Warren	7443
Wayne	6412
Susquehanna	6726
Crawford	8124
Wyoming	3215
Lackawanna	3566
Elk	6931
Forest	3742
Venango	6085
Cameron	3538
Pike	4889
Lycoming	10261
Sullivan	3795
Mercer	5301
Clinton	7863
Clarion	5055
Luzerne	7266
Jefferson	5655
Columbia	3887
Clearfield	9720
Centre	9525
Monroe	4872
Northumberland	3862
Butler	6636
Montour	1067
Armstrong	5864
Union	2668
Carbon	3315
Lawrence	2816
Northampton	2709
Schuylkill	6798
Indiana	7303
Snyder	2698
Beaver	3532
Mifflin	3577
Lehigh	2256
Huntingdon	7828
Blair	4464
Cambria	5814
Juniata	3391
Westmoreland	8523
Berks	6760
Allegheny	4104
Dauphin	4146
Perry	4831
Bucks	3788
Lebanon	2901
Washington	7210
Montgomery	2393
Cumberland	4139
Bedford	8926
Lancaster	7905
Franklin	6259
Somerset	9405
Chester	5659
York	7020
Fulton	3818
Fayette	6877
Philadelphia	286
Adams	4333
Delaware	870
Greene	5200

The table above shows the sensitive lands by county. Lycoming has the most sensitive lands while Philadelphia has the least.

1992 Sensitive Lands

The value 1 represents the sensitive lands in 1992.

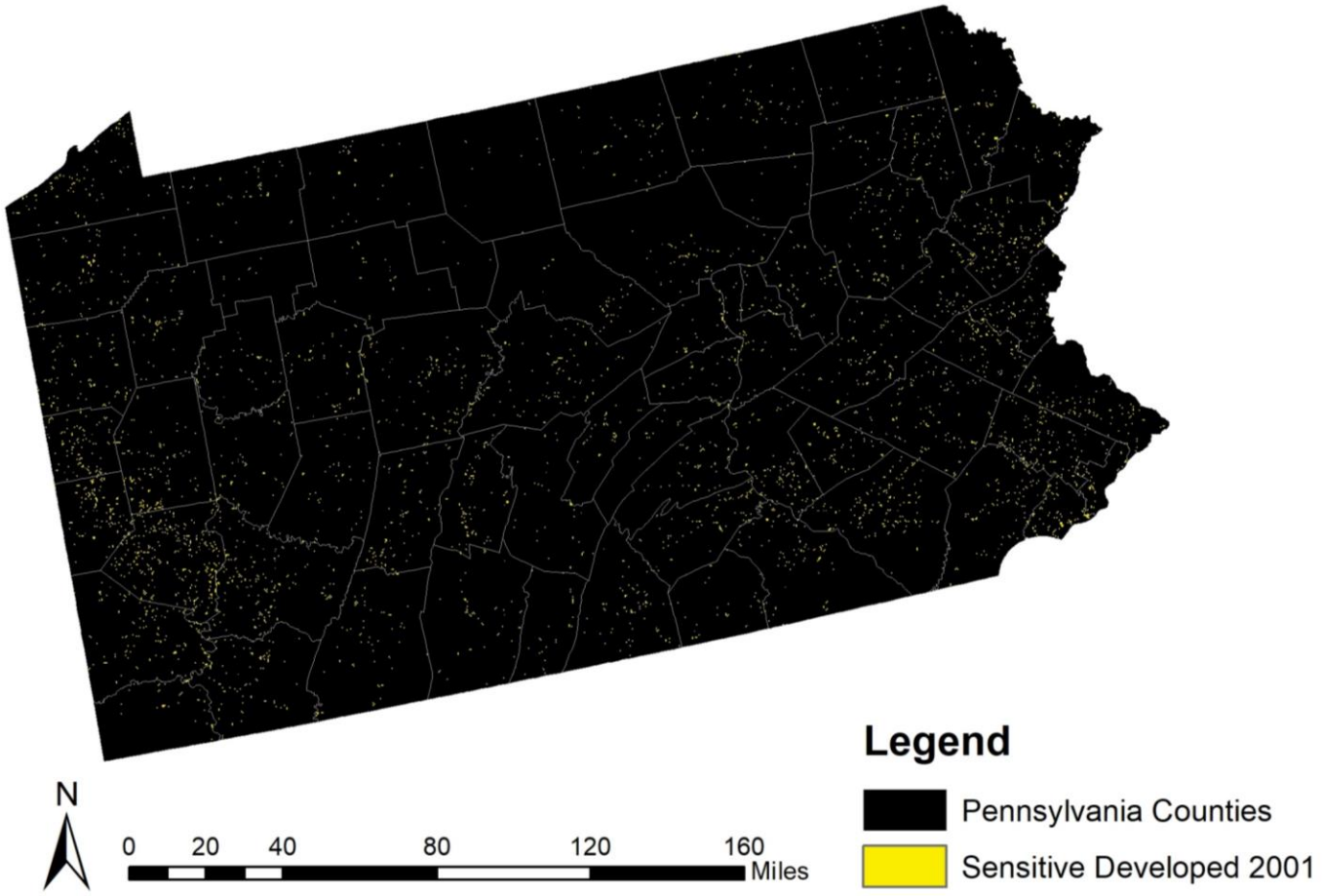


Sensitive Lands urbanized by county

NAME	Sensitive Lands (Urbanized)
Erie	92
Bradford	57
Tioga	46
Potter	12
McKean	34
Warren	44
Wayne	51
Susquehanna	37
Crawford	90
Wyoming	23
Lackawanna	63
Elk	23
Forest	8
Venango	62
Cameron	3
Pike	62
Lycoming	58
Sullivan	9
Mercer	94
Clinton	36
Clarion	46
Luzerne	97
Jefferson	62
Columbia	46
Clearfield	123
Centre	99
Monroe	142
Northumberland	41
Butler	125
Montour	18
Armstrong	56
Union	27
Carbon	61
Lawrence	101
Northampton	65
Schuylkill	90
Indiana	51
Snyder	35
Beaver	118
Mifflin	33
Lehigh	75
Huntingdon	37
Blair	81
Cambria	87
Juniata	15
Westmoreland	173
Berks	113
Allegheny	286
Dauphin	95
Perry	50
Bucks	93
Lebanon	59
Washington	134
Montgomery	131
Cumberland	72
Bedford	52
Lancaster	149
Franklin	71
Somerset	67
Chester	93
York	91
Fulton	28
Fayette	88
Philadelphia	41
Adams	32
Delaware	81
Greene	35

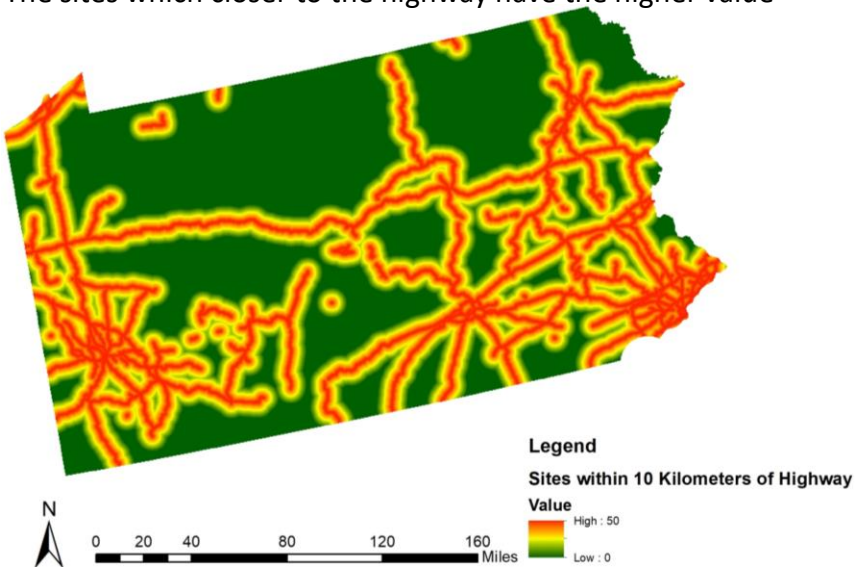
The table elaborates the 1992 sensitive lands which have been urbanized in 2001. Allegheny county has the highest amount of sensitive land transformation, which threats the original environmental conditions

Sensitive Lands developed in 2001



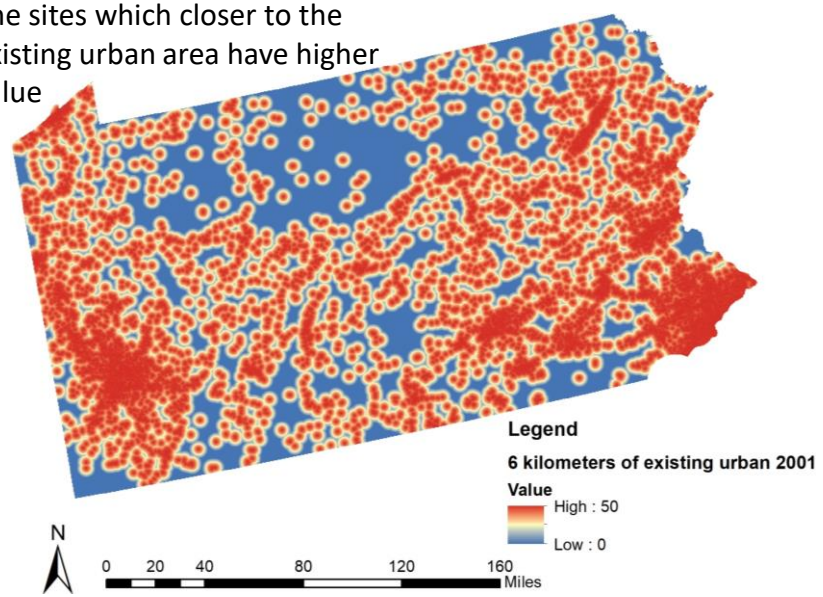
Sites within 10 kilometers of 4-Lane highways

The sites which closer to the highway have the higher value



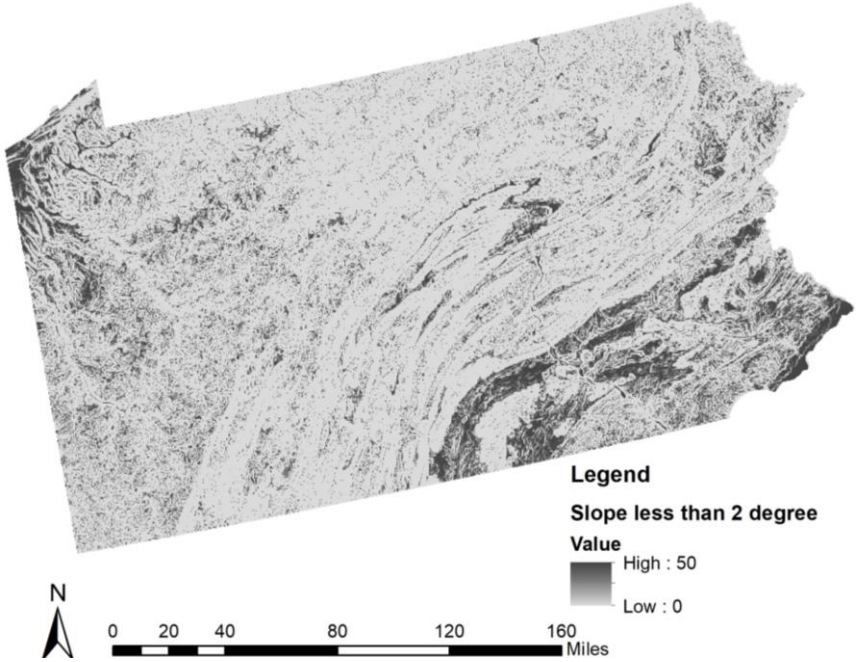
Sites within 6 Kilometers of existing urban development in 2001

The sites which closer to the existing urban area have higher value



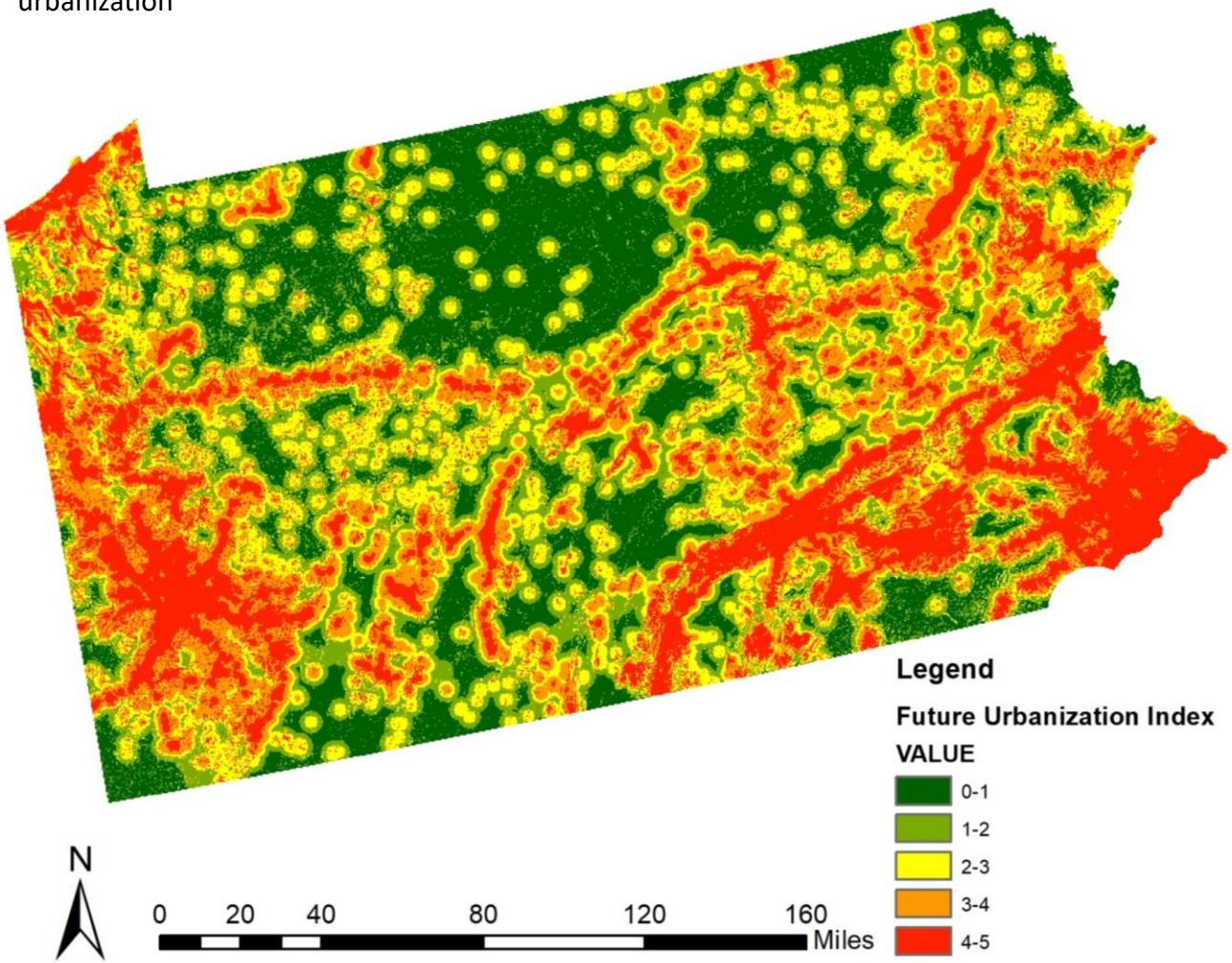
Sites having slopes of less than 2 degrees grade

The less slope have higher value



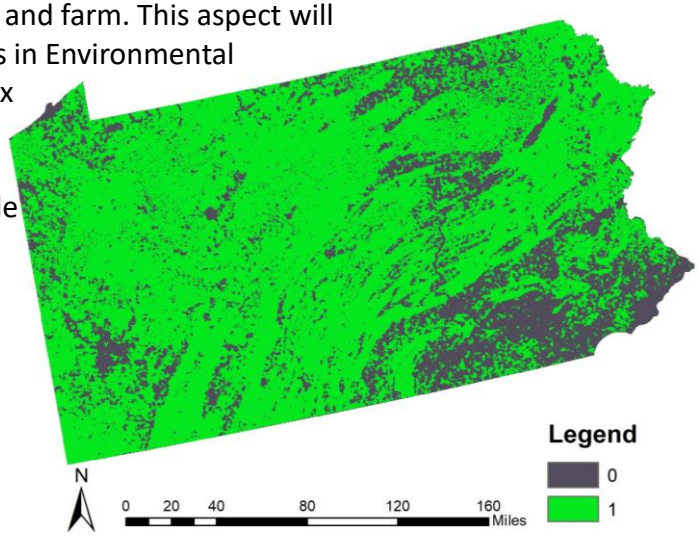
Future Urbanization Index Map

The higher value represents the higher likelihood of future urbanization



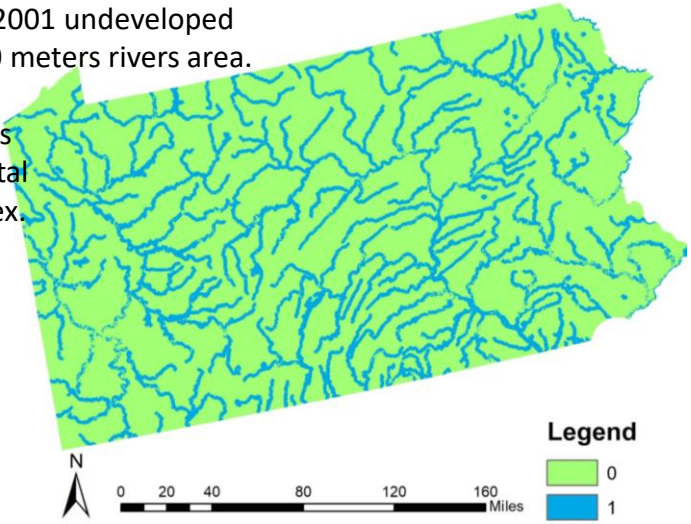
Active Farm and Forest Use

Value 1 represents the active farm and forest use. The value includes the layers of both the forest and farm. This aspect will occupy 4 points in Environmental Sensitivity Index because these area are existing valuable space which would like to be preserved



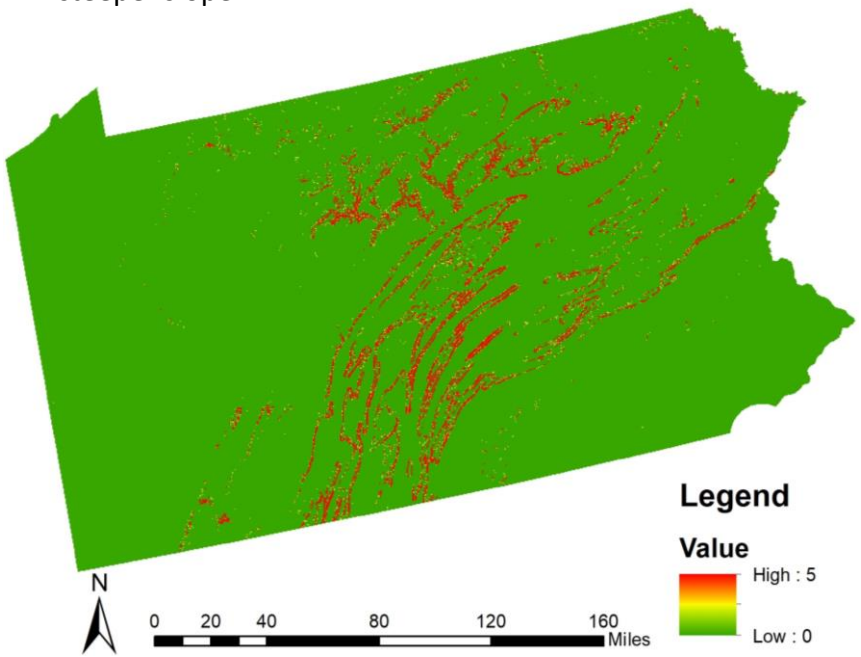
Undeveloped sites within 1000 meters of rivers

Value 1 represents the sites within 1000 meters of river. The value combines the 2001 undeveloped area with 1000 meters rivers area. This aspect occupy 3 points in Environmental Sensitivity Index.



Hillside with slopes of 15 degree or more

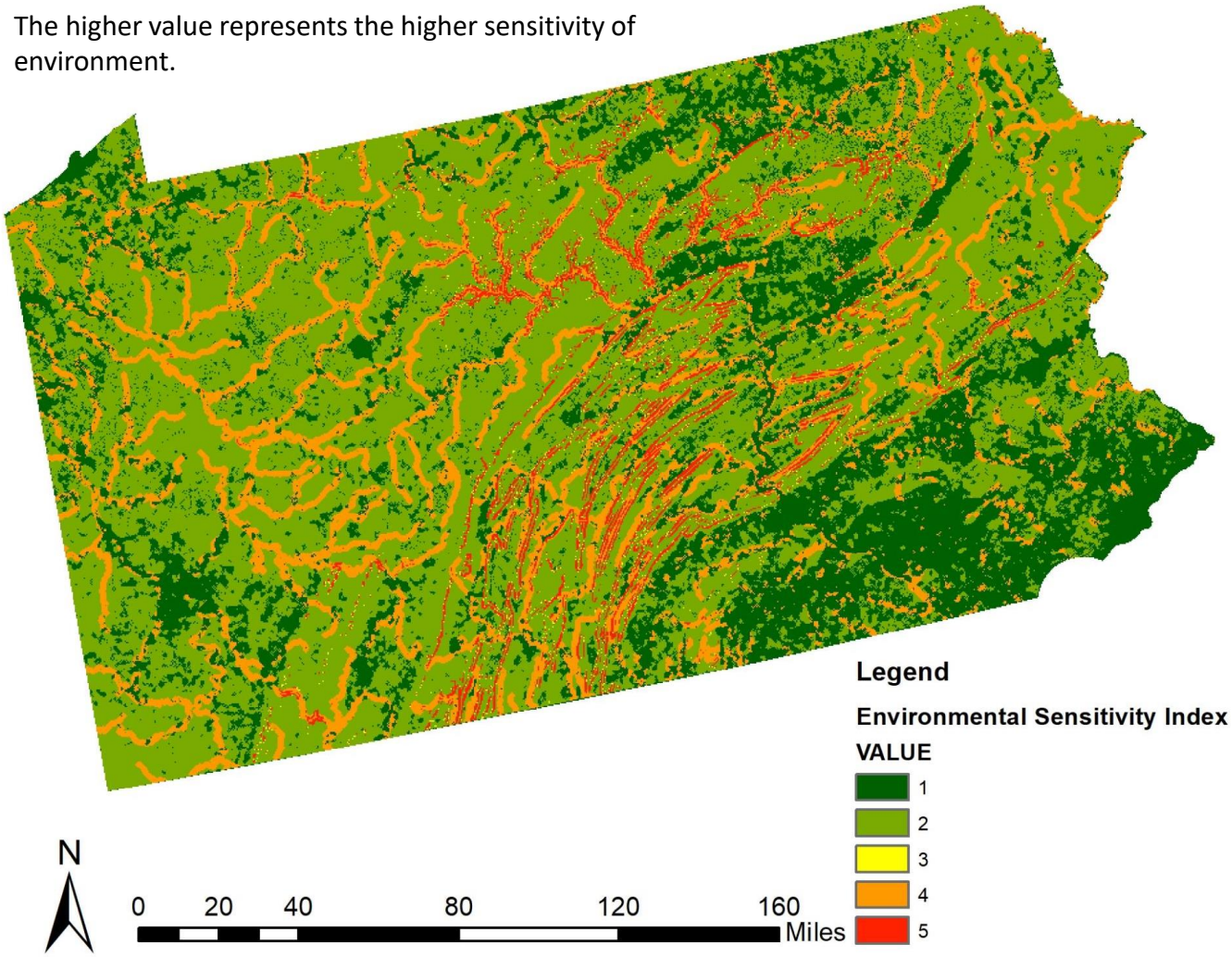
The higher value represents steeper slope



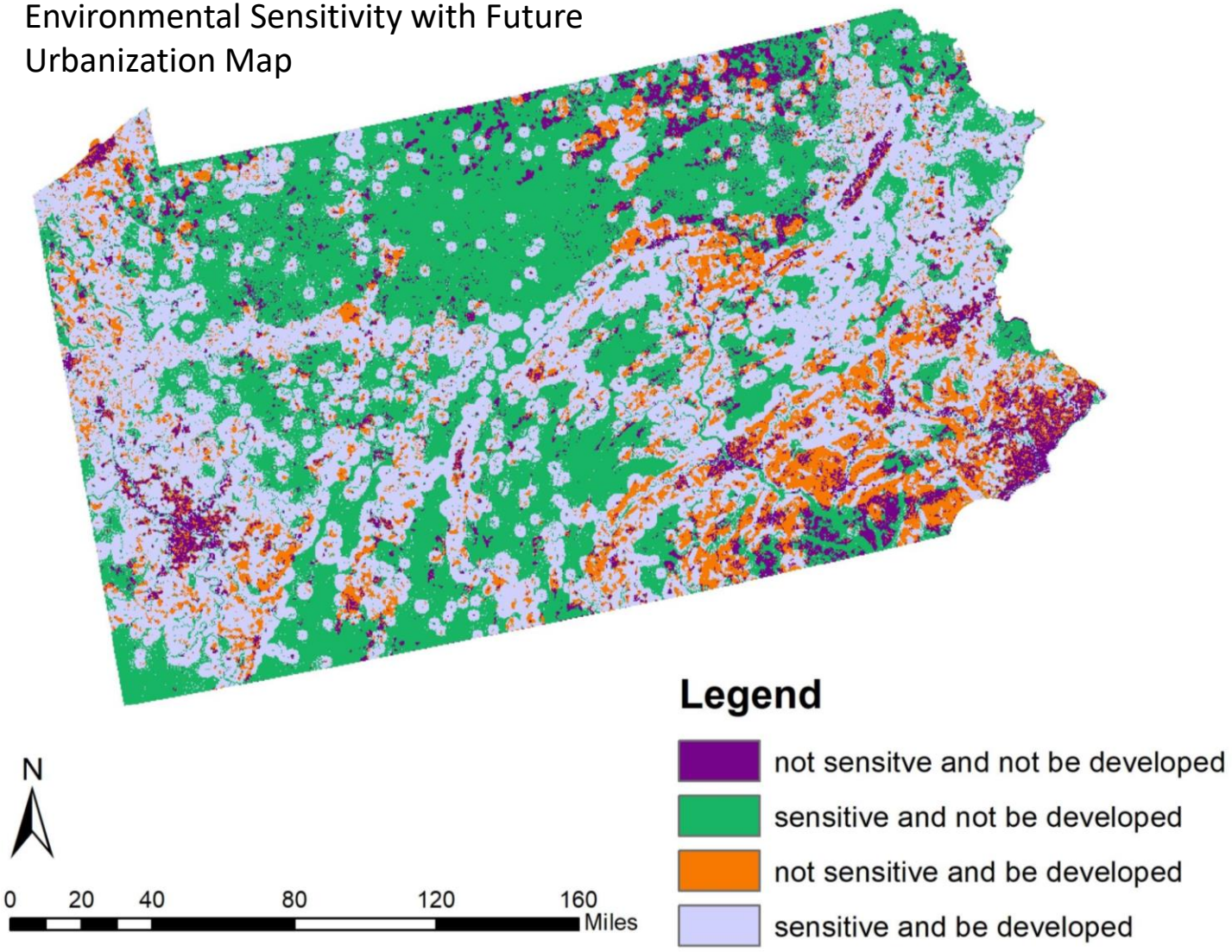
Value from 1-5 represents the slope of 15 degree or more. The higher value means the higher slope. The layer comes from the slope raster file. This field counts 2 points because it is sort of easier to transform the slope compared with forest and riverside.

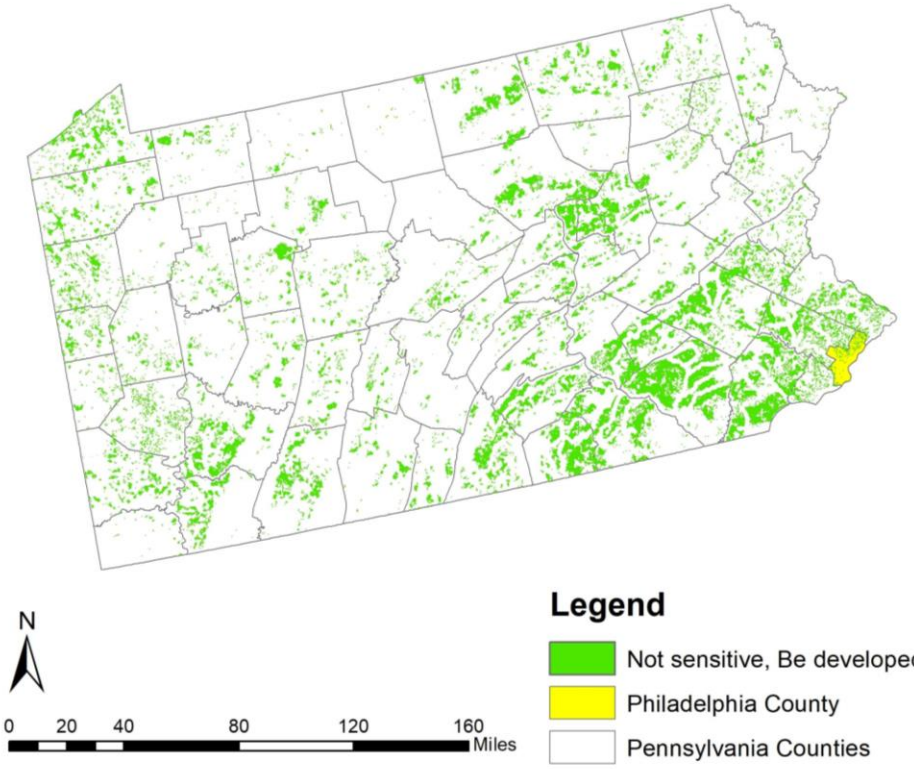
Environmental Sensitivity Index

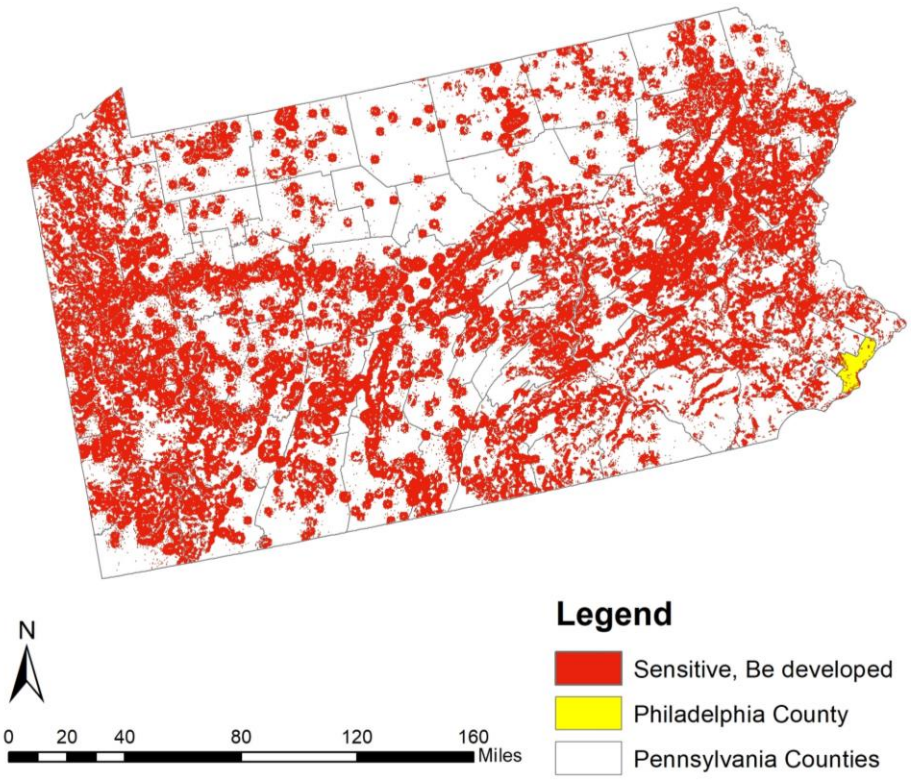
The higher value represents the higher sensitivity of environment.



Environmental Sensitivity with Future Urbanization Map







In terms of Philadelphia County, it has more not sensitive open area than sensitive area. Most non-sensitive develop opportunities are located in the northern county. These two graphics provides us some information whether these area could be developed sustainably in the future.