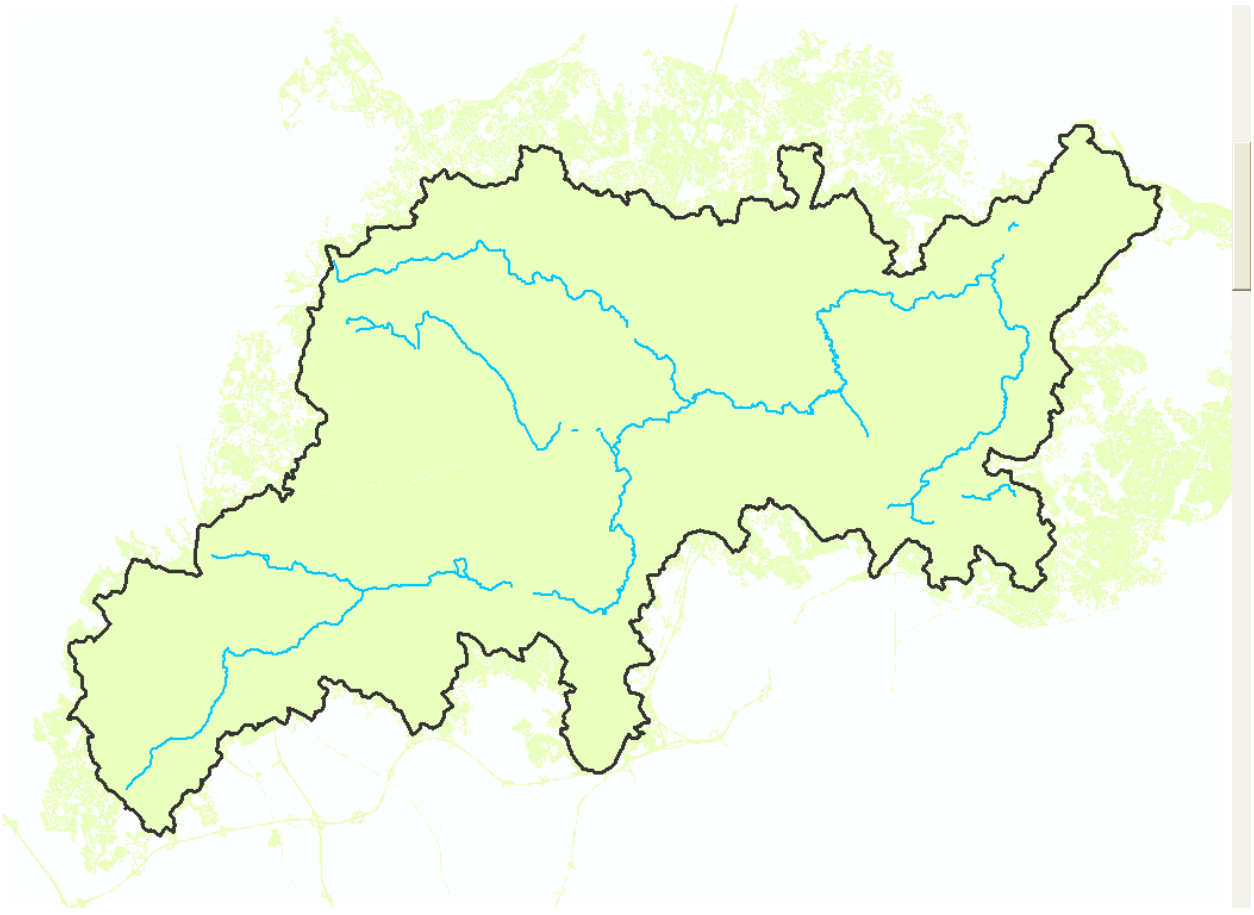
Querying Land Uses Statistics within the Ipswich Watershed

Objective

- Summarize areas of land uses likely to have a high proportion of impervious area and are located near major streams.

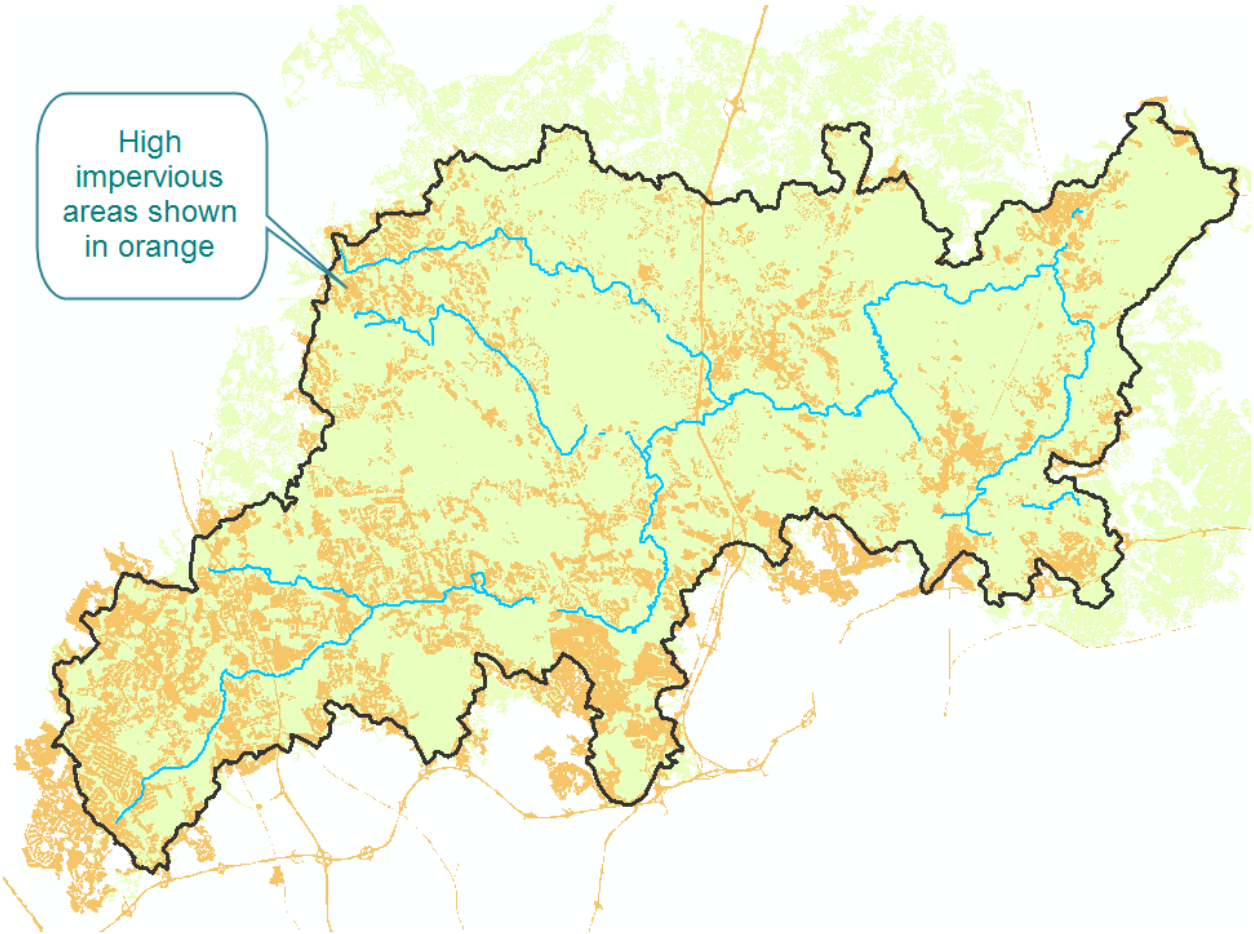
Methodology

- Ipswich Watershed loaded from WATERSHEDS_POLY
- Ipswich River and major tributaries loaded from MAJSTRM_ARC
- Data from MassGIS Land Use 2005 intersecting the Ipswich River watershed was selected and exported to a new layer for ease of use.

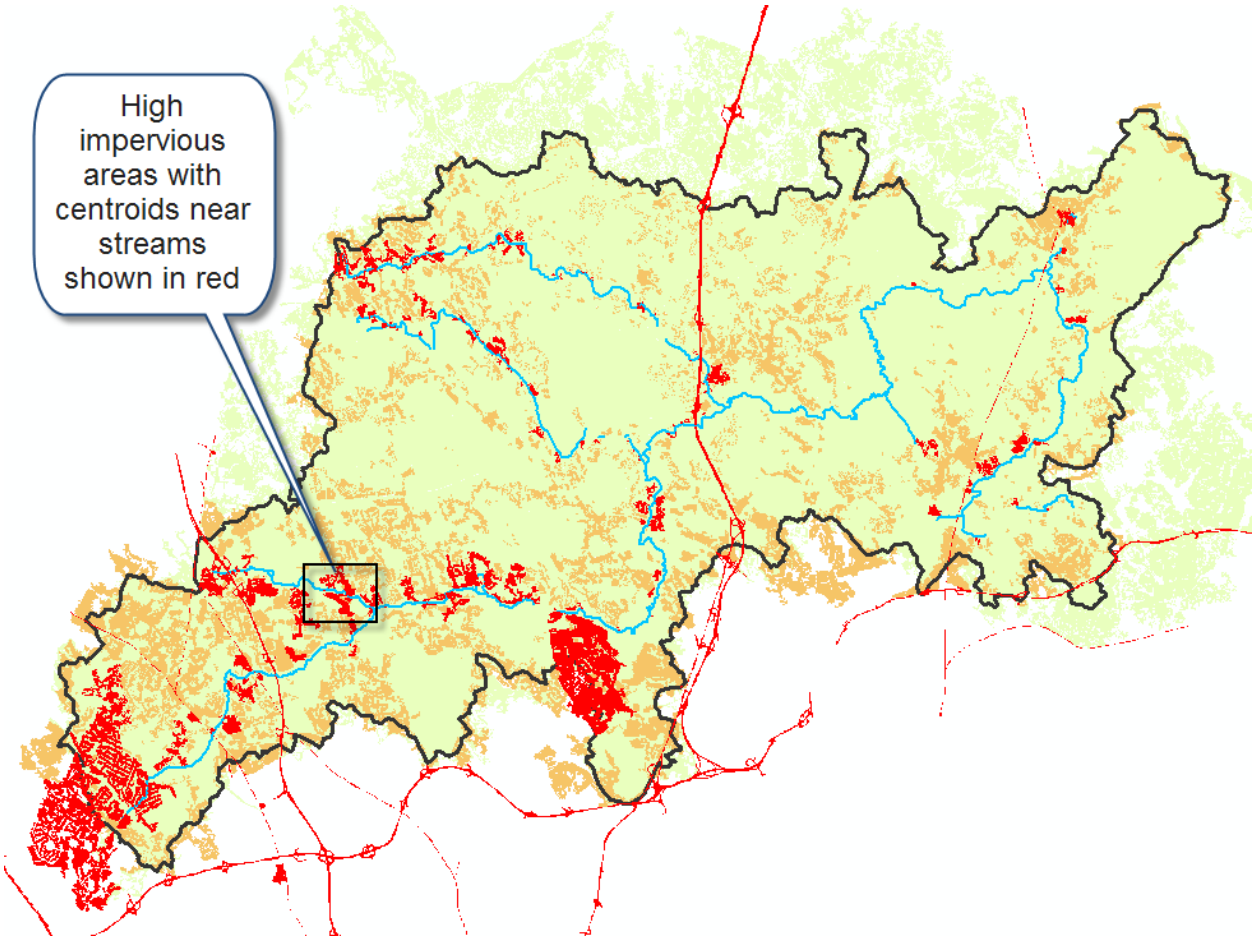


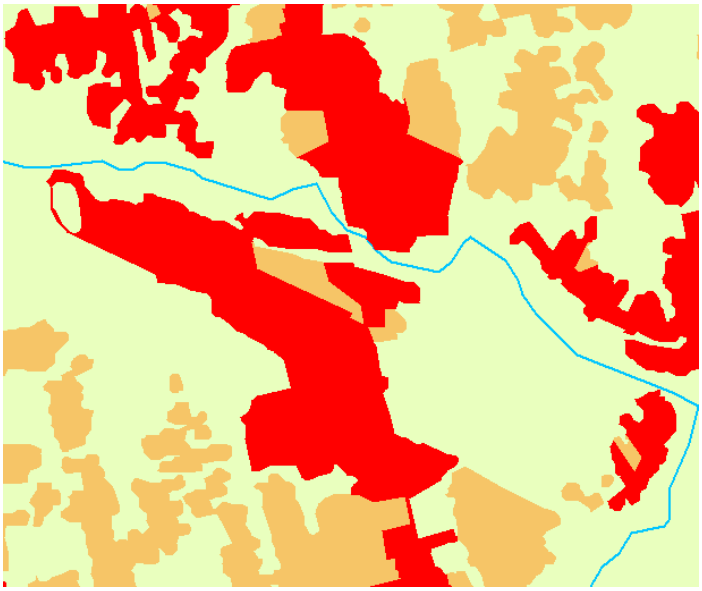
Note that some land use polygons are very large and extend far beyond the watershed boundary. Also note that there are gaps within the stream, especially at the downstream end.

- Land uses polygons with the following uses were selected by attribute:
    - 9 – Water Based Recreation
    - 10 – Multi-family Residential
    - 11 – High-density Residential
    - 12 – Medium Density Residential
    - 13 – Low Density Residential
    - 15 – Commercial
    - 16 – Industrial
    - 17 - Transitional
    - 18 – Transportation
    - 31 – Urban Public / Institutional



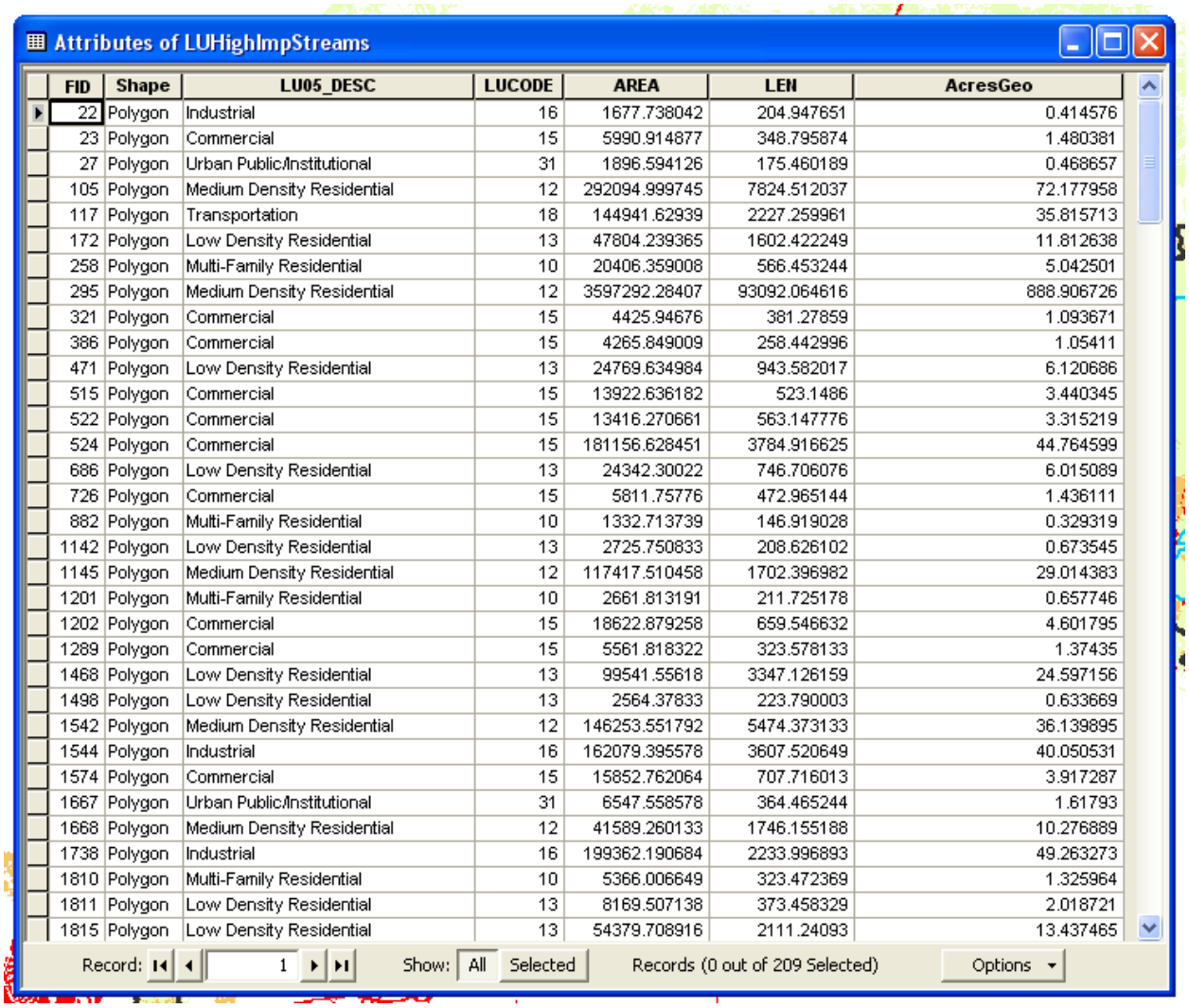
- Land use polygons located within 200 feet of the major streams were chosen.





Inset map. Note that due to irregular and large polygons, some located near the river are not chosen, while others further away are chosen.

The Calculate Geometry tool was used to calculate areas in acres.

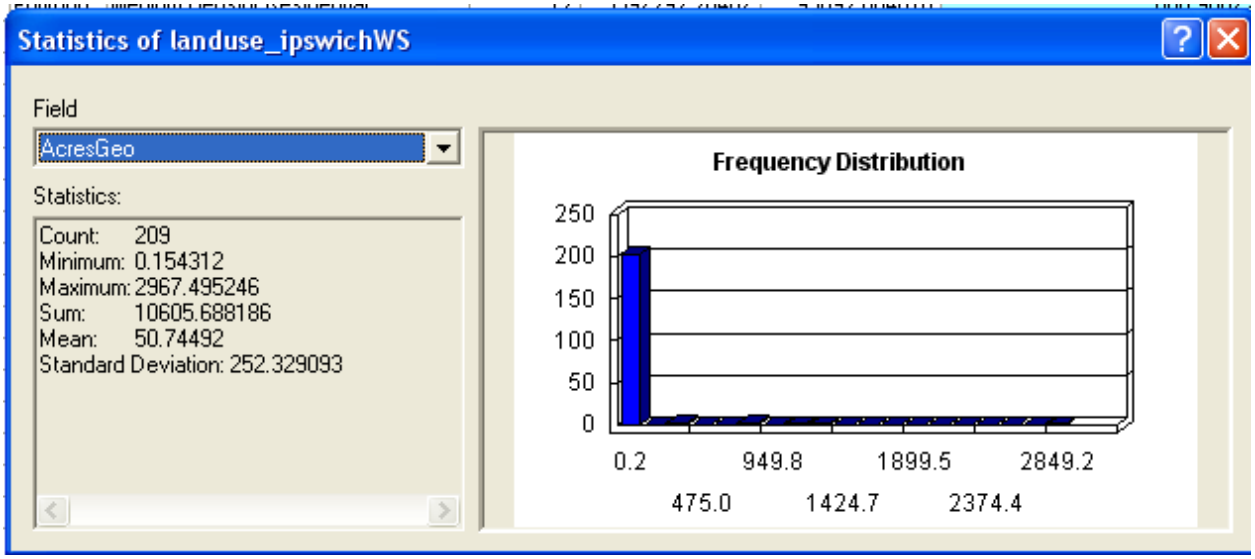


Attributes of LUHighImpStreams

FID	Shape	LU05_DESC	LUCODE	AREA	LEN	AcresGeo
22	Polygon	Industrial	16	1677.738042	204.947651	0.414576
23	Polygon	Commercial	15	5990.914877	348.795874	1.480381
27	Polygon	Urban Public/Institutional	31	1896.594126	175.460189	0.468657
105	Polygon	Medium Density Residential	12	292094.999745	7824.512037	72.177958
117	Polygon	Transportation	18	144941.62939	2227.259961	35.815713
172	Polygon	Low Density Residential	13	47804.239365	1602.422249	11.812638
258	Polygon	Multi-Family Residential	10	20406.359008	566.453244	5.042501
295	Polygon	Medium Density Residential	12	3597292.28407	93092.064616	888.906726
321	Polygon	Commercial	15	4425.94676	381.27859	1.093671
386	Polygon	Commercial	15	4265.849009	258.442996	1.05411
471	Polygon	Low Density Residential	13	24769.634984	943.582017	6.120686
515	Polygon	Commercial	15	13922.636182	523.1486	3.440345
522	Polygon	Commercial	15	13416.270661	563.147776	3.315219
524	Polygon	Commercial	15	181156.628451	3784.916625	44.764599
686	Polygon	Low Density Residential	13	24342.30022	746.706076	6.015089
726	Polygon	Commercial	15	5811.75776	472.965144	1.436111
882	Polygon	Multi-Family Residential	10	1332.713739	146.919028	0.329319
1142	Polygon	Low Density Residential	13	2725.750833	208.626102	0.673545
1145	Polygon	Medium Density Residential	12	117417.510458	1702.396982	29.014383
1201	Polygon	Multi-Family Residential	10	2661.813191	211.725178	0.657746
1202	Polygon	Commercial	15	18622.879258	659.546632	4.601795
1289	Polygon	Commercial	15	5561.818322	323.578133	1.37435
1468	Polygon	Low Density Residential	13	99541.55618	3347.126159	24.597156
1498	Polygon	Low Density Residential	13	2564.37833	223.790003	0.633669
1542	Polygon	Medium Density Residential	12	146253.551792	5474.373133	36.139895
1544	Polygon	Industrial	16	162079.395578	3607.520649	40.050531
1574	Polygon	Commercial	15	15852.762064	707.716013	3.917287
1667	Polygon	Urban Public/Institutional	31	6547.558578	364.465244	1.61793
1668	Polygon	Medium Density Residential	12	41589.260133	1746.155188	10.276889
1738	Polygon	Industrial	16	199362.190684	2233.996893	49.263273
1810	Polygon	Multi-Family Residential	10	5366.006649	323.472369	1.325964
1811	Polygon	Low Density Residential	13	8169.507138	373.458329	2.018721
1815	Polygon	Low Density Residential	13	54379.708916	2111.24093	13.437465

Record: 1 Show: All Selected Records (0 out of 209 Selected) Options

- Total acreage of selected land use types within 200 feet of major streams is calculated using Statistics of an Attribute Field.



- Acreages of selected land use types within 200 of major streams were summarized in a table.

OID	LU05_DESC	Count_LU05_DESC	Sum_AcresGeo
0	Commercial	22	172.0374
1	High Density Residential	3	1184.0596
2	Industrial	11	165.7438
3	Low Density Residential	113	1248.2346
4	Medium Density Residential	32	3156.648
5	Multi-Family Residential	10	19.2619
6	Transportation	8	4611.4618
7	Urban Public/Institutional	10	48.2409

Limitations of this Study

- Since the land use polygons are so large, the analysis of areas that are near the stream is going to be very inaccurate. It (likely) is possible to clip the polygons at the watershed boundary, which would resolve some of the problem – such as the highway parcels – but would still select some large parcels within the watershed where only the tip of which are near a river. It would be best if there was parcel data available with a land use attribute field. This would be expensive to compile since there are a dozen municipalities within the watershed, most of which probably do not have parcel with land use data available. Even if data was available, likely the classification systems would be different in each municipality. So we are stuck with the MassGIS layer which was created from remote sensing data.

- The major stream data only contains river reaches that are shown in 1:100,000 scale USGS maps. There are several impoundments or other "pond" areas within the river which are not shown in the major streams layer, but we would likely be interested in for this study. I could turn on the ponds layer to fill some of these gaps, but then other ponds, some of which are not

along main tributaries would also be shown, which we do not want. Also, the marshy area at the downstream end of the Ipswich River would have to be described using the HYDRO25K layer, and then the relevant polygons manually selected so that adjoining land uses can be added to the above tabulations. Another one of those cases where can get an approximation very easily (like I have done here), but an accurate assessment could take considerable effort!

Areas for Further Research

I had originally intended to include the following in this assignment, but performing the calculations within ArcGIS would be very laborious with my current skill set.

- We could calculate the estimated impervious areas located near major streams using the imperviousness coefficients developed by the Massachusetts Office of Coastal Zone Management:

Land Use Code	Description	Imperviousness Coefficient
1	Cropland	9.0
2	Pasture	8.0
3	Forest	7.8
4	Wetland	5.5
5	Mining	6.7
6	Open land	2.9
7	Participation recreation	6.0
8	Spectator recreation	5.0
9	Water based recreation	34.3
10	Residential – multifamily	45.4
11	Residential - < ¼ acre	54.3
12	Residential – ¼ - ½ acre	30.5
13	Residential - > ½ acre	30.4
14	Salt wetland	1.5
15	Commercial	64.0
16	Industrial	54.7
17	Urban open	31.1
18	Transportation	50.8
19	Waste disposal	21.8
20	Water	2.9
21	Woody perennial	15.4

- Obtained from final project of Chris Gerstner, 2007.
- I could also do this calculation within GIS, using a Select by Attribute query to choose the land use type and then performing a Field Calculation of that selection. This would be a little laborious, so perhaps a VBA script could be used to apply the correct coefficient using If, Then statements.