An Accuracy Assessment of Multiple Mid-Atlantic Sub-Pixel Impervious Surface Maps

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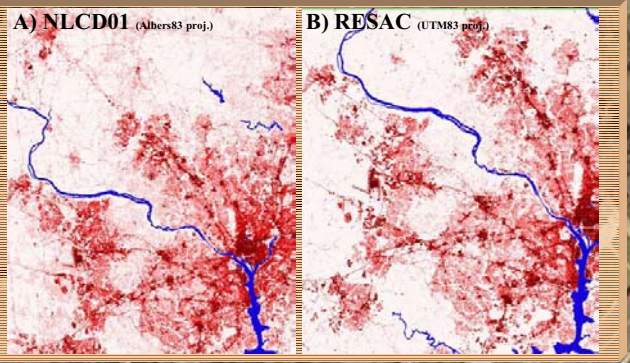
- Anthropogenic impervious surfaces (IS), such as roads, rooftops, etc., are a key environmental indicator integrating a number of concurrent interactions that effect a streams physical ecology.
- Several recent remote sensing efforts have been undertaken to map IS at the mid- Atlantic regional scale using Landsat 7 multi-spectral data and advanced sub-pixel processing algorithms. Work accomplished under the **1A)** National Land Cover Data 2001 (NLCD01) by the USGS EROS data center and the work accomplished by **1B)** the University of Maryland Regional Science Applications Center (RESAC) are noted on this poster.
- However, there are fundamental questions with respect to a) the accuracy of these IS maps, and b) the scales at which these maps may be appropriately utilized.
- As per Jones et al., (2003), the USGS, USEPA and the Chesapeake Bay program have partnered on an accuracy assessment protocol that will test the statistical rigor of both the NLCD01 and the RESAC IS sub-pixel maps.
- The data will be assessed at various scales (pixel, catchment, subwatershed, 8-unit HUC, etc.) and with various statistical routines (Pearson R, mean error, whole area assessment). The various assessment methods are outlined below.

1) **A) NLCD01** (Albers83 proj.) **B) RESAC** (UTM83 proj.)



2) Accuracy Assessment design, after *Jones et al., 2003.*

A) The assessment design employs a simple stratified random sampling strategy based on an urban gradient design (Table 1), per physiographic region.

B) Prototype sample development (Table 2) is ongoing in those areas currently mapped with IS sub-pixel data.

C) Example of a subset of "truth chips" in the prototype development area.

D) Example of "truth" chip mapping of IS from high resolution ortho-rectified digital aerial photographs. See section 3 below.

Gradient Assessment Design: number of "truth" sample chips per gradient and physio-graphic region.

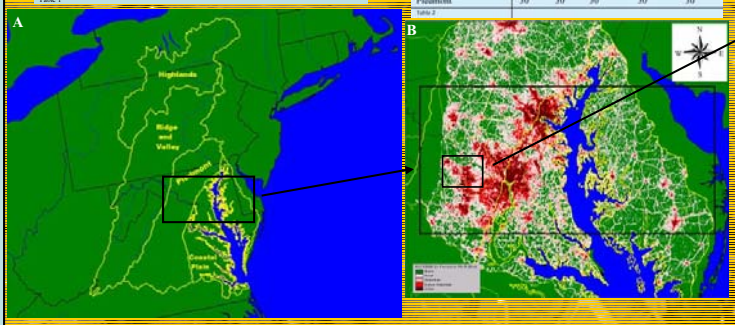
Physiographic Region	None	Rural	Suburban	Dense Suburban	Urban
Coastal Plain	30	30	30	30	30
Piedmont	30	30	30	30	30
Ridge and Valley	30	30	30	30	30
Highlands	30	30	30	30	30

Table 1

Prototype Development: Based on area of coastal plain and Piedmont region bounded by the box below.

Physiographic Region	None	Rural	Suburban	Dense Suburban	Urban
Coastal Plain	30	30	30	30	30
Piedmont	30	30	30	30	30

Table 2

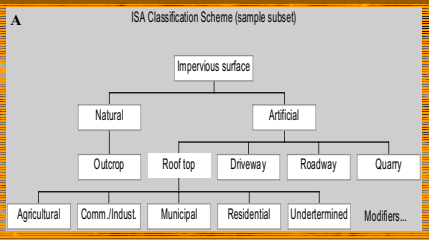


"Truth" chip IS data (outlined in yellow) will be compared with the sub-pixel IS predictions from NLCD01 and RESAC.

3) Impervious Surface "Truth Chip" mapping, after *Jones, 2003.*

A) IS mapping classification scheme for "truth" chip mapping.

B) Example of the "truth" chip mapping process.

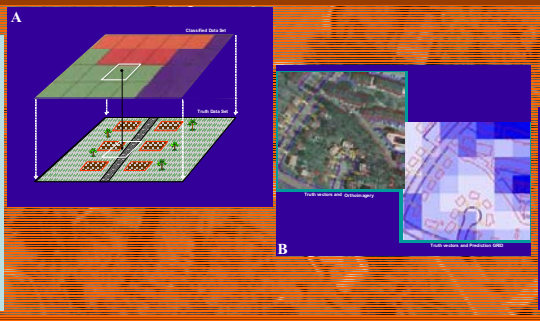


4) Sub-Pixel Extraction Framework, after *Jarnagin et al., 2004.*

A) Overlay of sub-pixel prediction data and "truth".

B) Comparison of "truth" vectors and prediction GRID.

C) Comparison of "truth" and prediction GRID.



POINTID	CLASS_IS_VALUE	TRUTH_IS_VALUE
18	4	1
23	26	27
54	40	66
60	32	73
69	58	53
72	27	10
73	7	16
86	78	83
88	43	22
90	1	1
92	0	0
105	70	66
111	0	17
126	54	49
129	27	37
157	10	26
161	52	47
177	1	0
188	0	4
192	28	54
229	1	0
243	11	14
247	13	41
261	6	9
274	12	0
295	14	2
304	35	47
310	0	60
325	0	0
341	7	9

REFERENCES:

Jarnagin, S.T., D.B. Jennings, and D.W. Ebert, 2004. A note on a technique for assessing the accuracy of sub-pixel estimates extracted from Landsat TM imagery. Ch. 19 in Remote Sensing and GIS Accuracy Assessment (R.S. Lunetta and J.G. Lyon, editors), CRC Press, Boca Raton, FL (in press).

Jones, J.W., P. Claggett, S. T. Jarnagin, and D.B. Jennings. 2003. Shared assessment of USGS and NGO impervious surface datasets for the Chesapeake Bay Watershed. USGS funded PROSPECTUS PROPOSAL. 32p.

Jones, J. W. (2003). Procedures for standardized collection of high-resolution, high accuracy calibration/validation data for impervious surface and land use mapping. USGS Open File Report: in review.

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