

1. PHOTO ESSAY

THE GREENING OF DETROIT, 1975-1992: PHYSICAL EFFECTS OF DECLINE

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Figure 1. Landsat change image of Detroit showing changes in urban greenness from 1975 to 1992. Imagery and analysis are joint ventures between Environmental Research Institute of Michigan (ERIM) and The University of Michigan, College of Architecture and Urban Planning. Green areas show tracts with greenness increase; red areas with greenness decrease; black areas, no change. Change data derived from TM 1992 and MSS 1975 images of vegetation reflectance.



Figure 2. Ground truth, green area (reference to Figure 1). Areas of increased greenness are places where the social system is stressed. Houses are abandoned or destroyed. Much of the territory is vacant land. Sidewalks and alley surfaces are broken and overgrown with weeds. The overall effect is increased greenness over the time period. Indeed, we observed pheasants in overgrown parts of the central city. Much of the green part of the image in Figure 1, in the inner city of Detroit, are territories of this sort.



Figure 3. Ground truth, no change area--black (reference to Figure 1). In some neighborhoods in the central part of Detroit, the social structure is intact. The physical properties of these neighborhoods reflect this sustained social organization. This neighborhood has not changed much and shows as mostly black in the image (Figure 1). This is also true of cemeteries and parks where the vegetation cover has not changed over the time period.



Figure 4. Ground truth, red area (reference to Figure 1). In much of the outer edge of the city of Detroit, shown by the overlay of census tracts in Figure 1, the social structure of the neighborhoods remains intact but the physical changes indicate decline in vegetation cover. By field investigation, we noted open streets with an occasional single elm tree as shown in this figure. We attribute the decrease in greenness to the effects of the Dutch elm disease which in the decade of the 70s destroyed virtually the entire elm tree population. In 1975, at the time of the image, this process was in progress. By 1992, very few elm trees remained. In the early period, much of the street surface was shaded by these trees, whereas currently that is not the case, despite replanting of small trees.



Figure 5. Figure 5 shows a recently completed automobile plant in the City of Detroit. This location shows in Figure 1 as a red and black region with no green. The red resulted from conversion of low income neighborhoods, once green, to factory roof and parking lot surface. The black areas were pre-existing industrial areas that lacked vegetation and still have no vegetation.

Increase in Vegetation and High Social Stress Areas 1990 Census Tracts, Detroit, Michigan

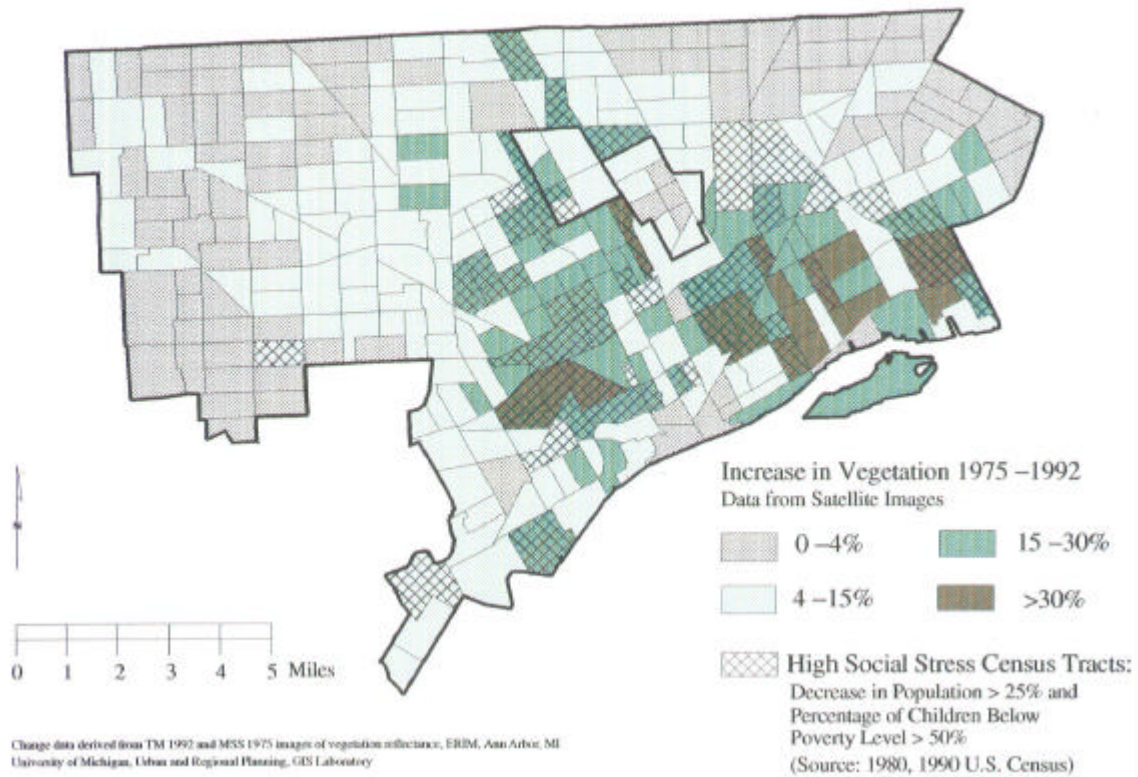


Figure 6. In Figure 6, census tracts with the largest increase in greenness are shown with the darkest green and brown tones. Superimposed on this colored pattern are census tracts of high social stress (cross-hatched). High social stress census tracts are defined as those tracts with decrease in population greater than 25% between 1980 and 1990 and with more than 50% of children below the poverty level. There is substantial correspondence between the two patterns.

Landsat Data Analysis by ERIM

Two Landsat data sets: MSS data from May 10, 1975 and TM data from May 16, 1992 were employed in the analysis. A restoration resampling algorithm rectified the images to the same spatial reference frame (the State Plane Coordinate system). A principal component procedure was employed to create a "greenness" vector from signals returned by several spectral bands available from the satellites' instruments. The "greenness" vector has been identified with intensity of vegetation. The resampling and rectification allows for the creation of a change image measuring the difference in "greenness" per pixel (at 25 meter change image was then divided into three classes: increased greenness (colored green), no change in greenness (colored black), and decrease in greenness (colored red) to create the image shown here. Detroit census tracts (1990) were superimposed on this image and counts of pixels by each class by census tracts could then be compared with census data on socioeconomic variables. A map of percent increase in vegetation was created by classifying census tracts by the proportion of green pixels to total pixels contained in each. The remote sensing analysis was carried out by the Environmental Research Laboratory of Michigan (ERIM), Ann Arbor, Michigan. Comparisons to socioeconomic data were done by the Urban and Regional Planning GIS Laboratory, University of Michigan.
