

A Spatial Analysis of Impervious Surfaces at Colby College in 1965 and 2005

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Introduction

Much of the Colby campus is currently covered by impervious surfaces, which greatly increase run-off. When rainwater lands on buildings or pavement, it can not be absorbed into the ground, and instead washes away into nearby bodies of water, carrying with it any pollutants present from motor oil or pesticides applied to the bordering grassy areas. My goal was to use GIS to determine the percent of campus covered by impervious surfaces, and also to show how much of this area has been added over the past 40 years.



Colby Campus, 2005

Methods

ArcGIS was used to create a map of all current impervious surfaces at Colby, which was then compared to an aerial photograph taken in 1965 to determine which buildings and paved areas had been added since then.



Original Polyline Layer

I started with a CAD layer from the Colby PPD that had been converted to a shapefile. After editing the layer to close any gaps in the lines outlining all of the features on the Colby campus, I created a new layer with polygons using the "feature to polygon" tool.



Polygon Layer

Once all of the features had been converted to polygons, I created a new attribute called surface type and labeled each polygon as Building, Pavement, Other Impervious Surface, or Other. To help with this process, I used an ortho photo tile of Waterville underneath my partially transparent polygon layer.

I then compared the resulting product to an aerial photo taken in 1965, and re-labeled all buildings and pavement on my map that were not present in the photo. To do this I had to edit many of the old polygons to show where additions had been added to buildings or paths.



Colby Campus, 1965



Semi-transparent polygon layer overlaying the ortho photo tile

I calculated the area of every polygon by surface type to obtain my final estimates of the area covered by impervious surfaces.

Map of Colby by Surface Cover



Results

224,280m² of the Colby campus is covered by impervious surfaces (7.8% of the land owned by Colby).

Of the total:

68.8% is pavement

25.9% is buildings

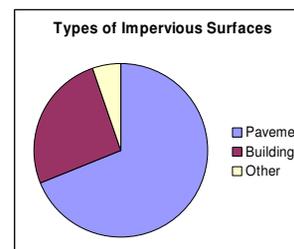
5.3% is other

An estimated 76,546m² (34%) has been added since 1965.

Of the total area of impervious surfaces that have been added:

64% is new pavement

36% is new buildings



Discussion

The majority of new impervious surfaces that have been added in the past 40 years consist of pavement, which now represents over 2/3 of the total area covered by impervious surfaces. Because data is lacking on pavement that have disappeared since 1965, it is difficult to estimate how much the total area has really changed, but this analysis does show that a large extent of the area currently covered by impervious surfaces is the result of new development. The substantial increase in impervious surfaces on the Colby campus since 1965 suggests that runoff may also have increased, and with it the volume of pollutants entering nearby bodies of water.