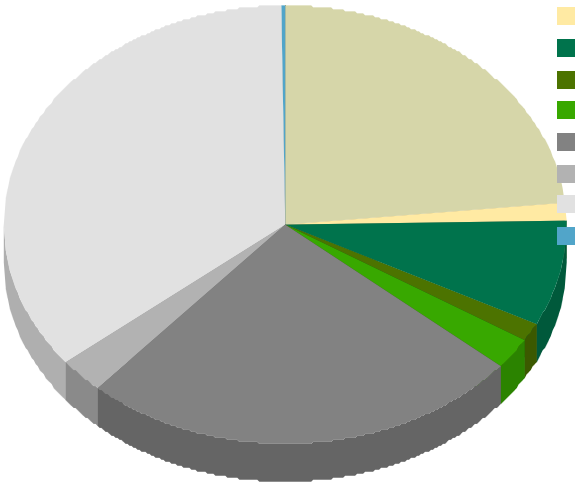
The Town of Haymarket, VA
Rapid Ecosystem Analysis for 1992



Cropland : Pasture/Hay	71.3	23.3%
Cropland : Row Crops	4.5	1.5%
Forest : Deciduous Forest	23.9	7.8%
Forest : Evergreen Forest	3.8	1.2%
Forest : Mixed Forest	7.4	2.4%
Urban : Commercial/Industrial/Transportation	77.8	25.4%
Urban : High Intensity	7.4	2.4%
Urban : Low Intensity	109.3	35.7%
Wetlands : Emergent Herbaceous Wetland	0.7	0.2%
Total :	306.0	100.0%

Land cover areas are in acres

Data Source: See attached map.

Total Tree Canopy: 35 acres (11.5%)
Total Urbanized Area: 194 acres (63.6%)

Air Pollution Removal

By absorbing and filtering out atmospheric nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), carbon monoxide (CO), and particulate matter less than 10 microns (PM10) in their leaves, urban trees perform a vital air cleaning service that directly affects the well-being of urban dwellers. CITYgreen estimates the annual air pollution removal rate of trees within a defined study area for the pollutants listed below. To calculate the dollar value of these pollutants, economists use “externality” costs, or indirect costs borne by society due to air pollution, such as increased health care expenditures and reduced tourism revenue. The actual externality costs of each air pollutant used in CITYgreen is set by the

Nearest Air Quality Reference City: ,

	LBS Removed	Dollar Value
Carbon Monoxide:	156	$67
Ozone:	1,220	$3,745
Nitrogen Dioxide:	626	$1,920
Particulate Matter:	1,032	$2,114
Sulfur Dioxide:	501	$375
Totals:	**3,535**	**$8,227**

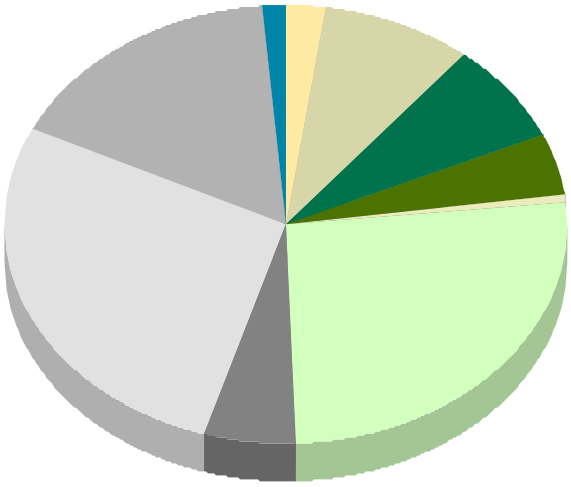
Carbon Storage and Sequestration

Trees remove carbon dioxide from the air through their leaves and store carbon in their biomass. Approximately half of a tree’s dry weight, in fact, is carbon. For this reason, large-scale tree planting projects are recognized as a legitimate tool in many national carbon-reduction programs. CITYgreen estimates the carbon storage capacity and carbon sequestration rates of trees within a defined study area.

Total Tons Stored: 1,509

Total Tons Sequestered (Annually): 12

The Town of Haymarket, VA
Rapid Ecosystem Analysis for 2001



Cropland : Cultivated Crops	7.2	2.3%
Cropland : Pasture/Hay	26.4	8.6%
Forest: Deciduous Forest	22.8	7.5%
Forest: Evergreen Forest	13.4	4.4%
Naturally Bare Rock, Sand or Clay	1.8	0.6%
Urban: Developed Open Space	79.6	26.0%
Urban: High Intensity	16.8	5.5%
Urban: Low Intensity	84.1	27.5%
Urban: Medium Intensity	49.6	16.2%
Wetlands : Woody Wetland	4.5	1.5%
Total:	306.0	100.0%

Land cover areas are in acres

Data Source: See attached map.

Total Tree Canopy: 36 acres (11.8%)
Total Urbanized Area: 230 acres (75.2%)

Air Pollution Removal

By absorbing and filtering out atmospheric nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), carbon monoxide (CO), and particulate matter less than 10 microns (PM10) in their leaves, urban trees perform a vital air cleaning service that directly affects the well-being of urban dwellers. CITYgreen estimates the annual air pollution removal rate of trees within a defined study area for the pollutants listed below. To calculate the dollar value of these pollutants, economists use "externality" costs, or indirect costs borne by society due to air pollution, such as increased health care expenditures and reduced tourism revenue. The actual externality costs of each air pollutant used in CITYgreen is set by the

Nearest Air Quality Reference City: ,

	LBS Removed	Dollar Value
Carbon Monoxide:	161	$69
Ozone:	1,259	$3,864
Nitrogen Dioxide:	646	$1,981
Particulate Matter:	1,065	$2,181
Sulfur Dioxide:	517	$387
Totals:	**3,648**	**$8,489**

Carbon Storage and Sequestration

Trees remove carbon dioxide from the air through their leaves and store carbon in their biomass. Approximately half of a tree's dry weight, in fact, is carbon. For this reason, large-scale tree planting projects are recognized as a legitimate tool in many national carbon-reduction programs. CITYgreen estimates the carbon storage capacity and carbon sequestration rates of trees within a defined study area.

Total Tons Stored: 1,557

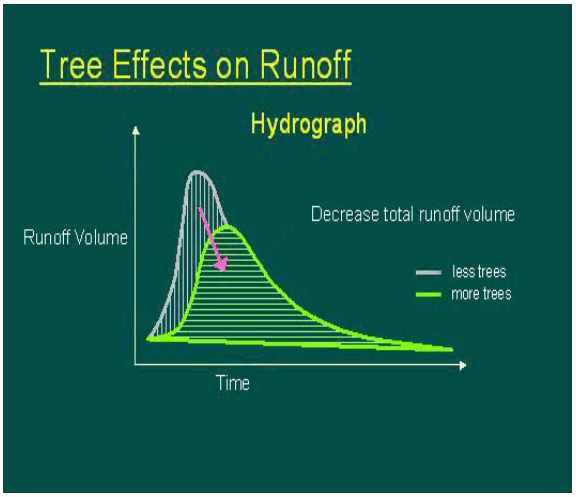
Total Tons Sequestered (Annually): 12

Trees and Water - Town of Haymarket, VA: 1992 to 2001

Trees decrease total stormwater volume and slow peak flow; both help cities to manage their stormwater and decrease detention costs. CITYgreen assesses how land cover, soil type, slope, and precipitation affect stormwater runoff volume, time of runoff concentration, and runoff peak flows. It calculates the change in volume of runoff for a 2-year 24-hour storm event in 2001 that would need to be contained by stormwater facilities in comparison to 1992 conditions. The larger the curve number the greater the amount of stormwater runoff. This volume multiplied by local construction costs calculate the dollars saved by the tree canopy. CITYgreen uses the TR-55 model developed by the Natural Resource Conservation Service (NRCS) which is very effective in evaluating the effects of land cover/land use changes and conservation practices on stormwater runoff. The infiltation percentage in the report estimates the change in ground water recharge given the change in landcover from 1992 to 2001 in this analysis.

Water Quantity (Runoff)

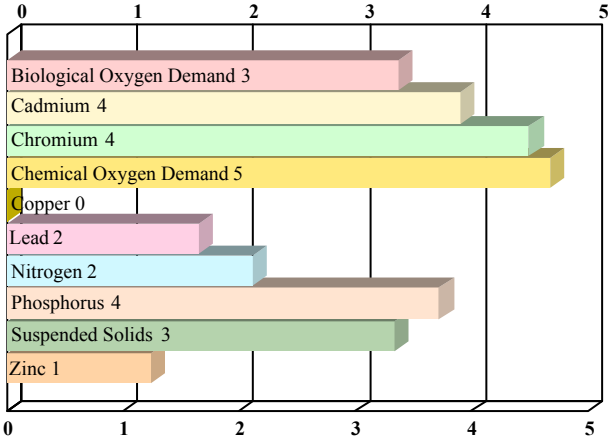
2-yr, 24-hr Rainfall:	3.75 in.	
Rainfall Distribution Type:	II	
Curve Number 1992:	**86**	
Curve Number 2001:	**87**	% change
Runoff :		4
Time of Concentration:		-4
Peak Flow:		7
Potential for Infiltration:		-5
Additional Storage volume needed (to mitigate the change in peak flow):		287,339 cu. ft.
Construction cost per cu. ft.:		$2.00
Total Stormwater Value Lost:		**$574,677**
Annual Loss based on payments over 20 years at 6% interest:		**$50,103** **per year**



Water Quality (Contaminant Loading)

Cities must comply with Federal clean water regulations and develop plans to improve the quality of their streams and rivers. Trees filter surface water and prevent erosion, both of which maintain or improve water quality. Using values from the U.S. Environmental Protection Agency (EPA) and Purdue University's L-THIA spreadsheet water quality model, The Natural Resources Conservation Service (NRCS) developed the CITYgreen water quality model. This model estimates the change in th concentration of the pollutants in runoff during a typical storm event given the change in the land cover from 1992 to 2001. Thi model estimates the Event Mean Concentrations of Nitrogen, Phosphorus, Suspended Solids, Zinc, Lead, Copper, Cadmium, Chromium, Chemical Oxygen Demand(COD), and Biological Oxygen Demand (BOD). Pollutant values are shown as a percent of change.

Percent Change in Contaminant Loadings



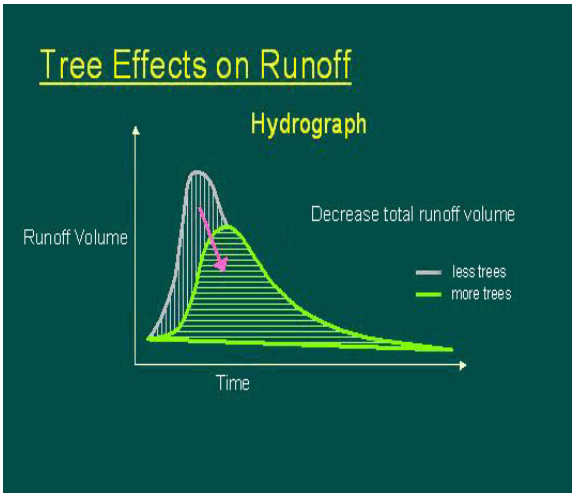
Trees and Water - Town of Haymarket, VA: 2001 to 2010 (Projected)

If the tree cover change trend indentified between 1992 and 2001 continues, both stormwater runoff and water quality will be affected. This modeling scenario uses CITYgreen to project this trend into the future. The greater the difference in the curve number between 2001 and 2010, the greater the impact on stormwater and water quality.

Water Quantity (Runoff)

2-yr, 24-hr Rainfall: 3.75 in.

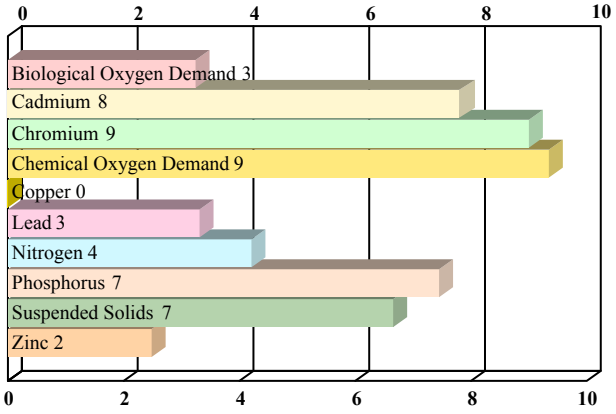
Rainfall Distribution Type: II



		% change
Curve Number 2001:	**87**	
Curve Number 2010:	**88**	
Runoff :		8
Time of Concentration:		-7
Peak Flow:		16
Potential for Infiltration:		-11
Additional Storage volume needed (to mitigate the change in peak flow):		344,551 cu. ft.
Construction cost per cu. ft.:		$2.00
Total Stormwater Value Lost		**$689,103**
Annual Loss based on payments over 20 years at 6% interest:		**$60,079** **per year**

Water Quality (Contaminant Loading)

Percent Change in Contaminant Loadings



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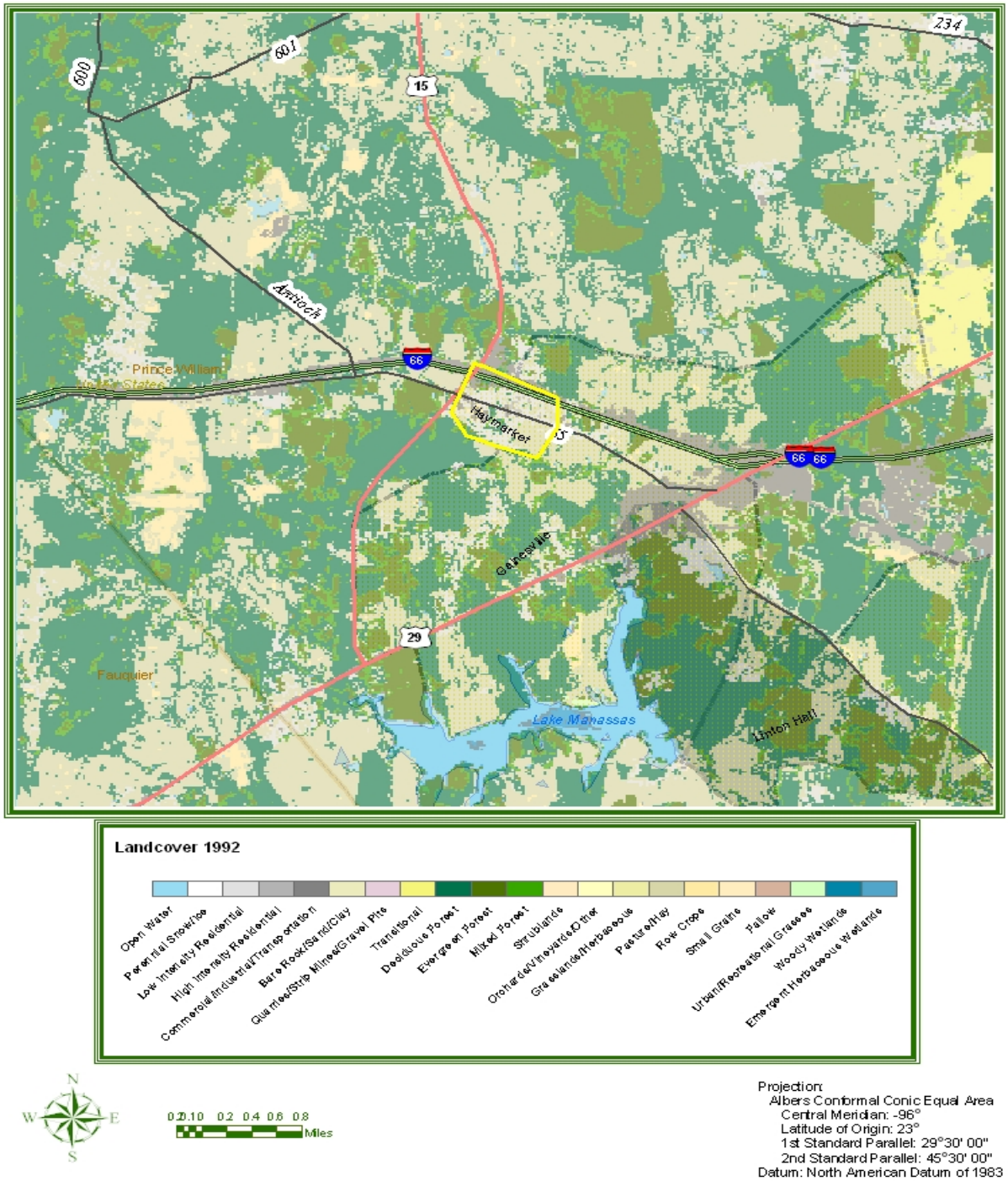
CITYgreen
calculating the value of nature

The Town of Haymarket, VA
Rapid Ecosystem Analysis



Land cover data source: National Land Cover Dataset, United States Geological Service (USGS), US Dept of the Interior