Watershed Management in the Chipuxet River Watershed

Background:

The Chipuxet Watershed is located in Southern Rhode Island. The Chipuxet River has been experiencing low-flows or complete dewatering on an increasingly regular basis.

Goals:

The goals of this project are to develop a foundation for the development of a watershed management plan. This foundation includes the following:

. Determine the Natural Hydrologic Budget
. Determine the Current Hydrologic Budget
. Determine Future Sources of Impervious Cover

Components of a Hydrologic Budget:*

. Precipitation
. Evapotranspiration rates
. Geologic features

**(Additional factors that could be, but were not included in this analysis would be slope, out-of-Basin Transfers, groundwater pumping, and irrigation, in addition to any other source of water entering of leaving the watershed.)*

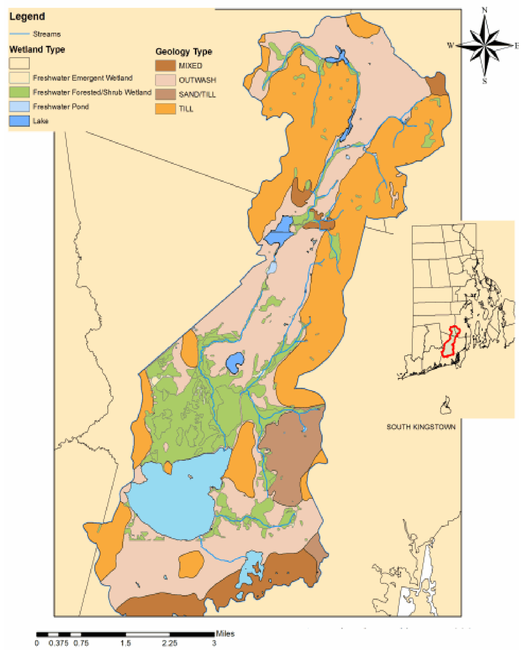
Methodology:

A spatial analysis of the watershed was preformed using Geographic Information System (GIS) software to determine the hydrologic budget, of the watershed under past and current conditions, as well as to indentify land in the town of South Kingstown available for future development.

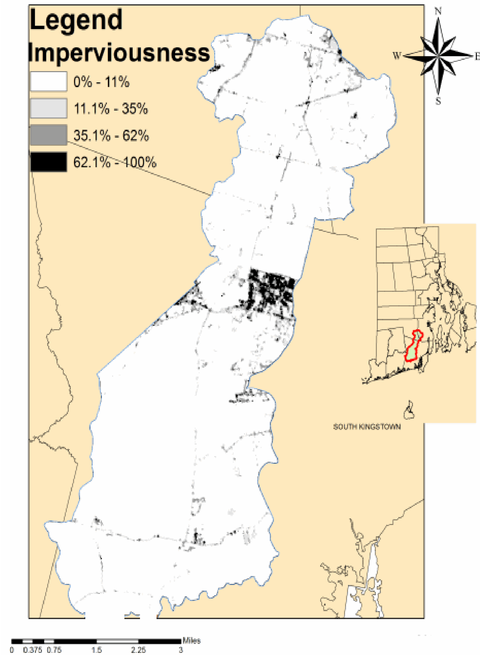
Past and Current Hydrologic Budget:

Surficial geology, watershed boundary, and surface land feature data was obtained using GIS. Calculations to determine groundwater recharge were completed using data obtained from the GIS analysis as well as precipitation and evapotranspiration rates for the region obtained from US Geologic Survey. Impervious cover analysis was preformed to determine percent of imperviousness for each type of soil group and calculations were completed again.

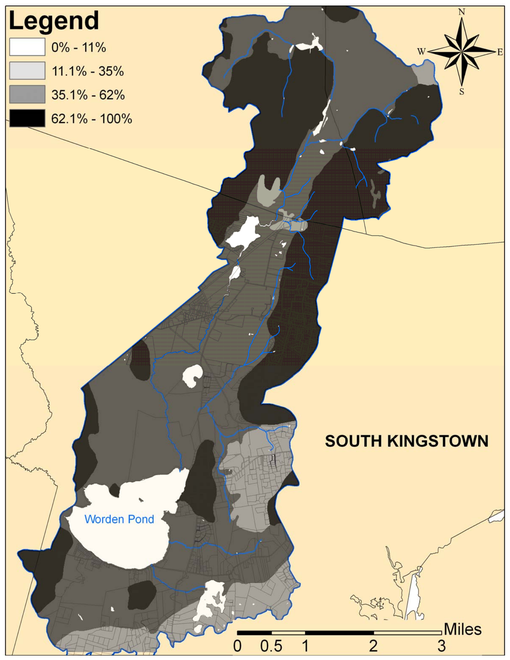
Chipuxet River Watershed Natural Hydrologic Conditions



Chipuxet River Watershed Imperviousness

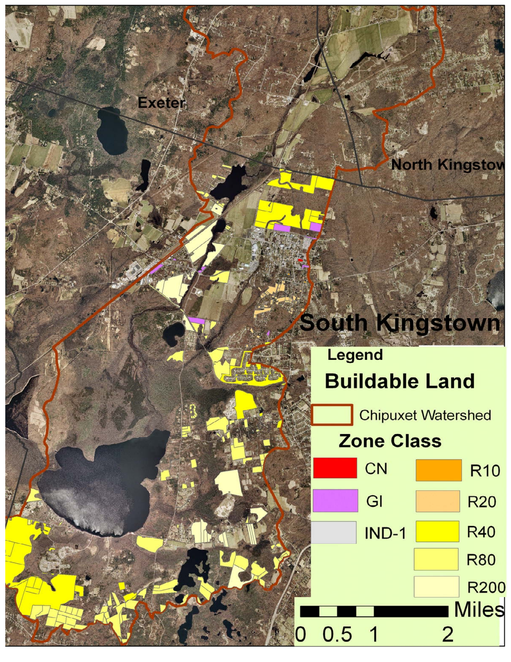


Percent Imperviousness by Soil Type



Future Development:

A buildable lands analysis was completed for the town of South Kingstown. The analysis focused on South Kingstown for two main reasons; of the four towns associated with the watershed, it occupies the greatest area, due to time and data limitations it was only feasible to conduct a buildable analysis of one town. In order to determine future land available for development GIS data was utilized to determine vacant land located in area zoned for development and not constrained by natural or regulatory features.



Data/Mapping:

Cartography: Jayme Hamann,2008

Projection for all Maps: Rhode Island State Plane NAD 83 Feet

Data: 3/2008
RIGIS www.edc.uri.edu/RIGIS
Multi-Resolution Land Characteristic Consortium www.mrlc.gov/
South Kingston GIS
www.gis.cdm.com/SouthKingstownRI
Calculations: UEP Water Resource Policy/Watershed Management Handbook

Results:

Natural Recharge					
Type	sq feet	Recharge	P ft/yr	Total Recharge (ft3/yr)	MGY
mixed	53,805,312.00	0.5	1.9	51,115,046.4	382.3
outwasl	102,592,512.00	1	1.9	194,925,772.8	1,458.0
sand/till	34,290,432.00	0.9	1.9	58,636,638.7	438.6
till	226,372,608.0	0.1	1.9	43,010,795.5	321.7
total					2,600.7

Built Recharge				
Type	Pervious sq ft	Impervious Sq Ft	Total Recharge (ft3/yr)	MGY
mixed	53,526,528.00	278,784.00	264,844.80	2.0
outwash	98,968,320.00	3,624,192.00	6,885,964.80	51.5
sand/till	33,732,864.00	557,568.00	953,441.28	7.1
till	215,500,032.00	10,872,576.00	2,065,789.44	15.5
				76.1

Natural Recharge	Built Recharge	Lost Recharge
2600.7 MGY	76.1 MGY	2524.6 MGY

Zone	Buildable Acres
CN	1.38
GI	46.66
IND-1	3.92
R10	0.83
R20	52.33
R40	786.8
R80	656.4
R200	377.7
total	1926

Discussion:

Based on this analysis it is clear that the impervious cover associated with development has lead to a significant decrease in groundwater recharge. Groundwater is a major source of streamflow in summer months. It is recommended that steps to reduce imperviousness be taken.