# WATER QUANTITY AND EROSION CHARACTERIZATION IN THE BIG CREEK WATERSHED, ESSEX REGION

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## BACKGROUND

The Big Creek watershed is located in the southwest corner of Essex County, adjacent to the outlet of the Detroit River to Lake Erie. Big Creek drains to Lake Erie.

A number of recent land and resource use activities and proposals in the Big Creek watershed have revealed a need for a watershed plan that can be used to inform decision-making. Initiated in 2008, plan completion is expected later in 2010. The plan will provide guidance to land and resource use decisions taken over time, and target voluntary landowner stewardship.

Three related technical studies are nearing completion including natural heritage (wetlands and woodlands), surface water quality, and water quantity. The water quantity study is the subject of this poster presentation.

## OBJECTIVE

A major objective of the water quantity study is to complete a water budget assessment, and drainage and erosion characterization studies for the Big Creek watershed plan through the use of watershed modeling tools, such as Annualized Agricultural Non-Point Source pollution modeling (AnnAgNPS) and Soil and Water Assessment Tool (SWAT). By characterizing drainage and erosion, targeting of non-point source load reductions can be undertaken through targeted beneficial management practices projects.

## CANADA-ONTARIO AGREEMENT

This project addresses a number of Canada-Ontario Agreement (Annex 3: Lake and Basin Sustainability) priorities:

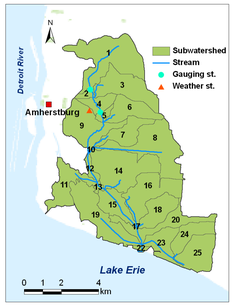
Result 1.2 – Increased stewardship actions that work towards a balance between human well-being and prosperity, and healthy aquatic ecosystems.
Result 1.3 – Sustainable use of land, water and other natural resources to provide benefits from the Great Lakes now and in the future.
Result 1.3 – Enhanced knowledge about beneficial and harmful impacts of human activities on Great Lakes aquatic ecosystems and resources.

## PARTNERSHIP

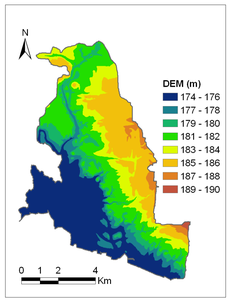
This project is a partnership between ERCA, the Town of Amherstburg, OMAFRA, MOE, MNR, Environment Canada and watershed residents. A Steering Committee of 11 individuals, including four selected from the community-at-large, guide the watershed planning process. The University of Windsor has taken the technical lead in the completion of the water quantity study using OMAFRA COA funding.

## MATERIALS AND METHODS

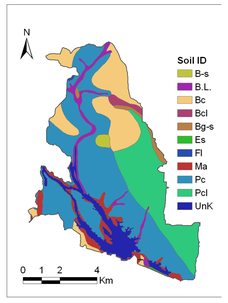
The study used complex hydrological and non-point source pollution simulation models such as Annualized Agricultural Non-Point Source pollution modeling (AnnAgNPS) and Soil and Water Assessment Tool (SWAT). This poster summarizes the results from SWAT simulation.
Various data including spatial data on drainage, topography, land use, soils and tile drains in the form of Geographical information layers (shown above) were utilized. Other data such as climate data, streamflow data, tile drain data, soil parameters were obtained from limited field investigations.



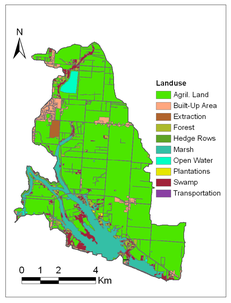

Subwatersheds




Digital Elevation Model




Soils



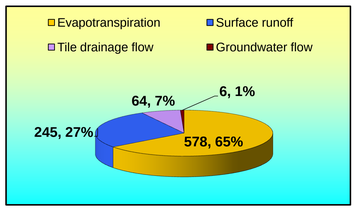

Land use

## HOW DOES PRECIPITATION GET DISTRIBUTED?

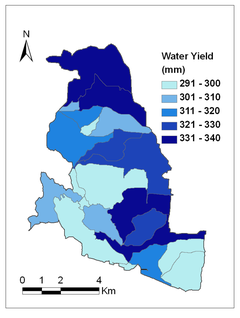
The following charts depict the how the precipitation flows through the watershed. The study has confirmed that evapotranspiration consumes almost two thirds (67%) of precipitation while 27% drains through surface runoff.

The spatial distribution of the water yields from different subwatersheds show that the upstream subwatersheds and some of the eastern sub-watersheds contribute to higher levels of water yields.

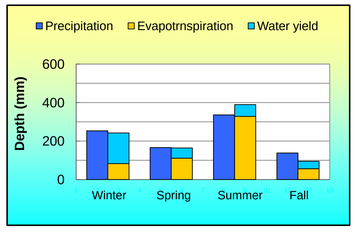
Even though the summer precipitation is high, the higher evapotranspiration leads to reduced water yields in the Big Creek Watershed.




Annual water balance




Water yield

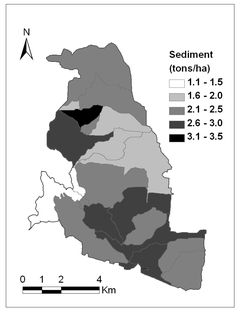



Seasonal water balance

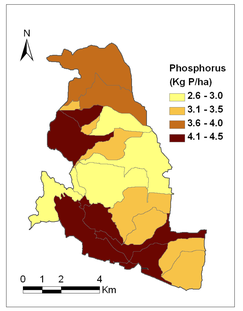
## PRIORITIZATION OF AREAS FOR SEDIMENT AND NUTRIENT REDUCTION

The following maps show the spatial distribution of sediment and nutrient loading from the Big Creek watershed to Lake Erie.

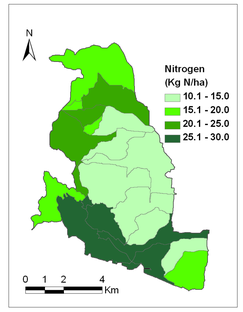
These findings are useful in helping to identify priority areas for targeting of beneficial management practices (BMP) projects. Targeted landowner outreach will be undertaken to promote the implementation of buffer strips, conservation tillage, soil erosion control structures and other BMPs through ERCA's Clean Water~Green Spaces technical and financial assistance program. Targeting will maximize BMP effectiveness at reducing sediment and nutrient loadings.




Sediment Loading




Phosphorous Loading




Nitrogen Loading

## CONCLUSIONS

SWAT Model was implemented for the Big Creek watershed to develop an understanding on the hydrology, sediment, and nutrient loadings from the watershed to the Lake Erie.

The study has confirmed that evapotranspiration consumes almost two thirds (67%) of precipitation while 27% drains through surface runoff.

Seasonal variations indicate that the late winter streamflows are the highest as a percentage of the precipitation and that the higher evapotranspiration in the summer leads to reduced streamflows/water yields from the watershed.

Sediment and nutrient loadings from different sub-watersheds are mapped and the areas contributing higher proportions of these loadings are identified as priority areas for implementing BMPs.

## ACKNOWLEDGEMENTS

Partial funding for this project was provided by the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem through the Ontario Ministry of Food, Agriculture and Rural Areas.