

The Institute of Water Research

Michigan State University **S**



Institute of Water Research Highlights

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About the Institute

The Institute of Water Research at Michigan State University is responsible for coordinating research and educational programs on surface water and groundwater quality and quantity. Established in 1961, the Institute addresses

multi-disciplinary issues arising from the dynamic interaction of land and water resources, and strengthens MSU's commitment to finding effective solutions to contemporary water resource problems.



Director, Dr. Jon F. Bartholic

Our Goal

The Institute's goal is to provide the most accurate and complete information on contemporary land and water issues to citizens, stakeholders, government agencies, and resource managers. To achieve this goal, the Institute

consistently collaborates and forges partnerships with other research and resource conservation organizations. The result of these collaborations is the development of science-based information for use by decision-makers faced with com-

plex land and water issues. The increasing use of information technologies and geographical information systems (GIS) for better decision-making is a fundamental part of the Institute's mission in the 21st century.

Restoring Great Lakes Basin Waters Through the Use of Conservation Credits and Integrated Water Balance Analysis System

A two-year, \$540,000 project funded by the Great Lakes Protection Fund has been concluded this year by the Institute of Water Research, Michigan State University (MSU). This innovative market-based approach to groundwater management, using an integrated model with a

system of conservation credits trading was developed through the collaborative efforts Michigan State University, the University of Michigan, the World Resource Institute, the U.S. Geological Survey, and Public Sector Consultants. The Integrated Watershed Balance Analysis model is

the first-of-its-kind in assessing the impacts of groundwater withdrawals.

The Project Team designed a groundwater permitting system that could be hypothetically used for ecologically-sensitive watersheds in which connections between groundwater and

Restoring Great Lakes Basin Waters Through the Use of Conservation Credits and Integrated Water Balance Analysis System cont.

stream flow exist and large withdrawals might cause adverse impacts on trout populations and related habitats. Stream flows in Michigan streams depend on groundwater supply for over half of their volume, on average, 60%. The model is used to determine the rates of groundwater recharge and the ecological impacts of groundwater withdrawals.

The innovative Integrated Watershed Balance Analysis model uses the health of a cold-water trout stream and fish populations as an indicator and measure of the ecological impact of proposed groundwater withdrawals. The model integrates three major components.

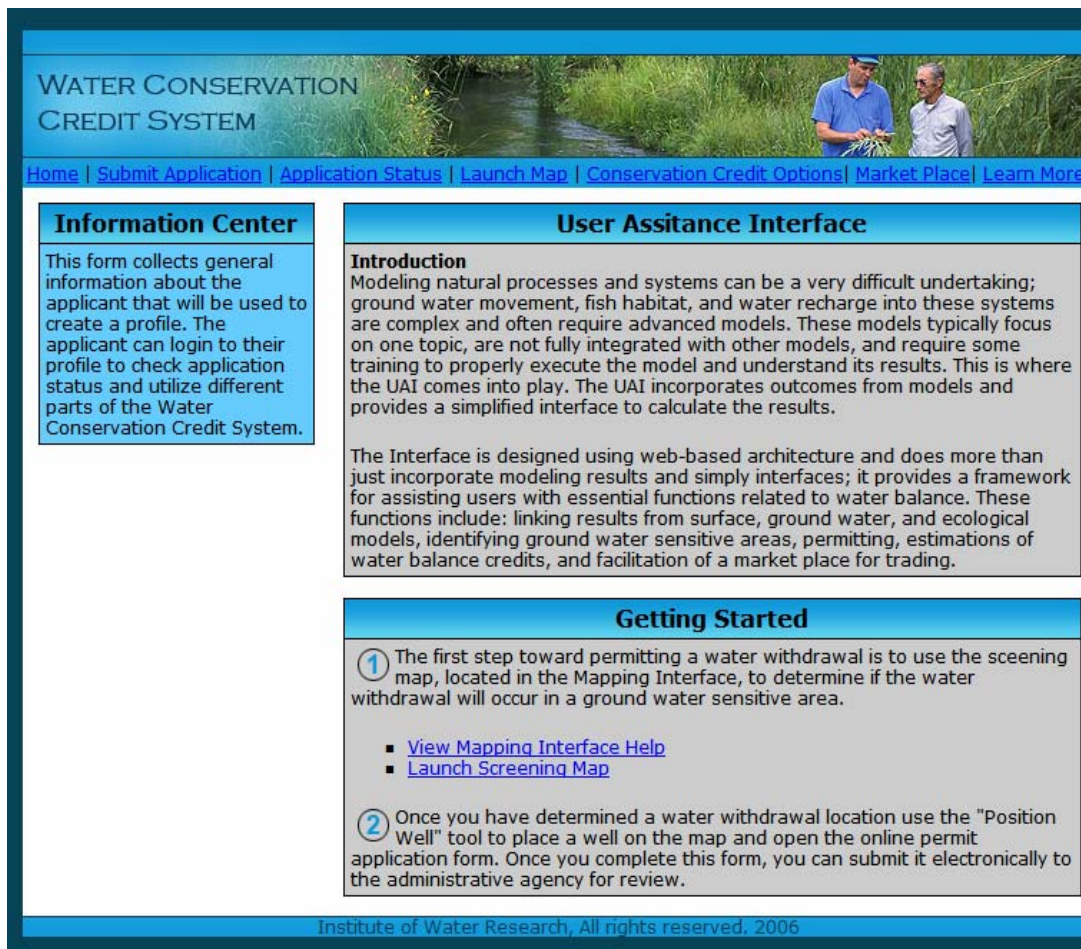
First, the Soil and Water Assessment Tool (SWAT) estimates stream recharge rates and

the long-term water balance. Second, a groundwater aquifer model provides data connecting the impacts of changes in local groundwater resources on ecological values associated with water resources in that area as evidenced by trout populations. Third, an aquatic ecosystem model measures the changes in trout populations resulting from the changes in the groundwater resources.

To provide water users with convenient access to the system, the team designed a User Assisted Interface (UAI) with a Web portal linked to the hypothetical groundwater withdrawal permit

and conservation credit system. The portal linked the modeling results from an integrated model consisting of surface, ground water, and ecological models to assist users in identifying groundwater-sensitive areas and estimates of associated conservation credits within the case study area.

The final project report was submitted to the Great Lakes Protection Fund in early May 2007, and can be found at <http://www.iwr.msu.edu/research/projects.html>



The screenshot shows the 'WATER CONSERVATION CREDIT SYSTEM' website. At the top, there is a navigation bar with links: Home, Submit Application, Application Status, Launch Map, Conservation Credit Options, Market Place, and Learn More. Below the navigation bar, the page is divided into three main sections:

- Information Center:** This section contains a text box stating: "This form collects general information about the applicant that will be used to create a profile. The applicant can login to their profile to check application status and utilize different parts of the Water Conservation Credit System."
- User Assistance Interface:** This section has an 'Introduction' sub-section. It explains that modeling natural processes is difficult and that the UAI provides a simplified interface. It also states: "The Interface is designed using web-based architecture and does more than just incorporate modeling results and simply interfaces; it provides a framework for assisting users with essential functions related to water balance. These functions include: linking results from surface, ground water, and ecological models, identifying ground water sensitive areas, permitting, estimations of water balance credits, and facilitation of a market place for trading."
- Getting Started:** This section contains two numbered steps:
 1. The first step toward permitting a water withdrawal is to use the screening map, located in the Mapping Interface, to determine if the water withdrawal will occur in a ground water sensitive area. It includes links for "View Mapping Interface Help" and "Launch Screening Map".
 2. Once you have determined a water withdrawal location use the "Position Well" tool to place a well on the map and open the online permit application form. Once you complete this form, you can submit it electronically to the administrative agency for review.

At the bottom of the screenshot, it says "Institute of Water Research, All rights reserved. 2006".

Water Conservation Credit System DEMO

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