

# The Potential Impacts of Increased Corn Production for Ethanol in the Great Lakes – St. Lawrence River Region

*Prepared by the Great Lakes Commission for the  
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## Executive Summary

Rising energy costs and policies to reduce dependence on foreign energy supplies have dramatically increased the domestic production of bioethanol (ethanol produced from plants) as an alternative fuel. With available technology, virtually all bioethanol is derived from corn, though there is significant effort to expedite development of technologies that use cellulose-based materials. As a result of the demand for corn for ethanol production, prices of corn have risen sharply and farmers across the nation are making rapid changes to meet this demand. This paper provides an overview of the increased production of corn-based ethanol and resulting changes in agricultural practices, with emphasis on known and potential environmental and socio-economic impacts within the Great Lakes-St. Lawrence River region.

Ethanol production and use accounted for approximately 3.5 percent of the total U.S. fuel consumption in 2006 and is expected to reach 7 percent by the end of this decade. Ethanol is produced by fermenting and distilling starch feedstock crops (e.g., corn, barley and wheat) that have been converted to simple sugars or sugar-containing crops (e.g., sugar beets and sugar cane). Ethanol can also be produced from cellulosic biomass (e.g., fast-growing trees, corn stover, grain straw, switchgrass, forest products, waste and construction waste) that has been converted to sugar. However, technologies for ethanol production using cellulosic feedstocks are not yet economically viable for commercial production within the United States. At the present time, corn grain provides the most immediate and economic way to mass-produce raw materials for ethanol production. Roughly 98 percent of all U.S. ethanol is currently produced from corn grain.<sup>1</sup>

Manufacturing of ethanol fuel is now the second largest U.S. market for corn behind livestock feed/residual. As of December 2007, there were 134 operating ethanol production facilities in the U.S., with a total annual capacity of nearly 7.3 billion gallons of ethanol.<sup>2</sup> Another 66 facilities were under construction and 10 undergoing expansion, which will nearly double current U.S. ethanol production capacity. In the U.S. portion of the Great Lakes-St. Lawrence River region,<sup>3</sup> there are 39 ethanol production facilities with an annual capacity of 2.66 billion gallons and an additional 28 facilities and/or facility expansions underway. It is projected that the percentage of U.S. corn utilization for ethanol production will level out at around 30 percent of total U.S. corn yield by 2009-2010.

The increased demand associated with ethanol production has caused corn prices to rise from \$2.00 per bushel in 2005 to \$3.20-3.75 in 2007, with average prices projected to peak at \$3.75 per bushel by 2010. The U.S. Department of Agriculture estimates 90.5 million acres of corn were planted in 2007, an

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<sup>1</sup> Personal communication: M. Hartwig, Renewable Fuels Association, September 5, 2007.

<sup>2</sup> Production facilities include both corn and cellulose-based ethanol (Renewable Fuels Association, 2007).

<sup>3</sup> The Great Lakes-St. Lawrence River region includes the entire area of the eight U.S. states and two Canadian provinces. Alternatively, the Great Lakes-St. Lawrence River Basin contains the land area in those states and provinces that drains to the Great Lakes and St. Lawrence River, their tributaries, and connecting channels.

increase of 12.3 million acres from 2006. Total U.S. corn production is estimated to rise 15.5 percent to an all-time record high of more than 12.2 billion bushels in 2007.<sup>4</sup>

The near-term increase in corn production has been largely accomplished by the conversion of existing croplands from soybeans to corn. The National Agriculture Statistics Services estimates a nationwide decrease of 11.1 percent in soybean acreage from 2006 levels. Within the Great Lakes states and provinces, corn acreage is projected to increase by 13.1 percent over 2006 figures with soybean acreage decreasing by 9.9 percent.

With a continued demand for ethanol as a fuel source and elevated price levels for corn, additional acres are expected to go into production. One source of this acreage is land that is currently fallow, in pasture or in conservation. Of the lands currently enrolled in the Conservation Reserve Program (CRP), the USDA has projected that approximately 4.6 million acres, or roughly 12.5 percent, will be exiting the program without re-enrollment by 2010, as high crop prices encourage their return to production.

Potential economic issues and impacts that may result from increased corn and corn-based ethanol production include changes in fuel and food costs; decreased federal farm commodity payments due to higher corn and other crop prices; changes in waterborne, truck, and rail transportation; creation of jobs and increased farm income; rural economic development; and increasing real estate values. Some of the impacts are already evident to the consumer, such as higher grain and food costs resulting from corn price increases. Other impacts may take more time to realize, such as increased sediment accumulation in commercial and recreational harbors and channels which impacts navigation and contributes to an increased need for dredging.

Known and potential environmental impacts of increased ethanol production from corn and the resulting changes in the agricultural landscape include increased soil erosion and sedimentation occurring from tillage practices often used in corn production, increased water consumption for the production of both corn and ethanol, and increased loadings of nutrients and persistent contaminants from agricultural applications. These stressors may cause changes to the quality of surface and groundwater, aquatic habitat and fisheries, and recreational opportunities. The impacts on the Great Lakes ecosystem are likely to be most pronounced in regions where lands that are more highly erosive or environmentally sensitive – such as those currently in conservation – are brought into production. It is possible that increased loadings of sediments, nutrients and pesticides/herbicides may reverse some of the environmental gains made through previous nonpoint source control efforts.

While the increased use and production of ethanol has been a positive step toward decreasing North America's dependency on fossil fuel imports and a positive influence on rural economies, renewable energy production in the form of corn-based ethanol may have a variety of environmental and socio-economic impacts that deserve the attention and consideration of the region's leaders and stakeholders.

This paper does not present answers to these issues and potential problems but is intended to stimulate this discussion. Stakeholders around the Great Lakes-St. Lawrence River region and beyond are encouraged to use these data to inform additional studies and management strategies.

**The full report is available online at [www.glc.org/tributary/](http://www.glc.org/tributary/).**

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<sup>4</sup> USDA data reported on a marketing-year basis (September-August) and may vary depending on survey methods and estimating procedures.