



# Environmental Health

*The physical environment has a very important impact on a person's health. Encompassing both the natural and built environment, the physical environment includes (but is not limited to) water, soil and air quality, climate, land use, population density, physical infrastructure and design.*

For the purposes of this report, only select features of the physical environment unique to Huron County will be explored - the bordering of Huron County on Lake Huron and the predominance of recreational beaches; the rurality of the county; and air quality issues.

as safe or unsafe for swimming. The health unit posts a beach as unsafe to swim for the season if the five year geometric mean E.coli concentrations are 81/100mL or higher. Also, blue signs are posted at all times as a notice that water may be polluted with high levels of bacteria for up to two days following heavy rainfall and/or high winds – both of which can make the water cloudy and possibly unsafe for swimming.

## Water in Huron County

Huron County is privileged to border Lake Huron, providing 14 lakeshore public beaches for residents and visitors, as well as eight inland public dams (Figure 1).

The five year geometric means, along with three year and one year means, of the public beaches is shown in Table 1. All 14 lakeshore public beaches

While this close proximity to water provides the community with enjoyment and a sense of well-being, it can also create potential health risks if water is contaminated. Beach water is subject to contamination by agricultural or urban run-off, storm sewers, sewer overflows, shoreline development, human waste (i.e. boats), swimmers, waterfowl, and wildlife wastes. Bacterial levels in beach water are influenced by adverse weather such as heavy rainfall and high winds, as well as water current and wind direction. High levels of bacteria can cause mild gastrointestinal infections, skin rashes, and throat and ear infections.

Huron County uses a predictive model, based on a five year geometric mean of E.coli concentrations, to monitor beaches



**Figure 1.** A map of the beaches and inland public dams of Huron County, 2007.

Lakeshore Public Beach Locations	5 Year 2003 to 2007 E. coli GM	3 Year 2005 to 2007 E. coli GM	1 Year 2007 E. coli GM
Amberley Beach	48	42	19
Ashfield Township Park Beach	51*	44	36
Bayfield Main Beach	34	33	24
Bayfield South Beach	30	29	21
Black's Point Beach	49	51	49
Goderich - Main Beach	66	70	54
Goderich - Rotary Cove Beach	42	46	20
Goderich - St. Christopher's Beach	44	48	38
Hay Township Park Beach	47	48	37
Houston Heights Beach	38	33	25
Port Albert Beach	47	50	53
Port Blake Beach	37	40	27
St. Joseph's Beach	45	47	44
Sunset Beach	21	20	15

5 Year E. coli Geometric Mean of 81 or greater  
5 Year E. coli Geometric Mean between 61 and 80  
5 Year E. coli Geometric Mean of 60 or lower



**Table 1.** Five, three and one year geometric mean E.coli concentrations for the 14 lakeshore public beaches in Huron County. *Source: Protecting the Environment Quad, Huron County Health Unit 2008.*

in Huron County have a five year geometric mean E.coli levels below 81/100mL and are safe to swim in (except within 48 hours after a heavy rainfall or winds). Goderich Main Beach has a tendency to have higher E.coli levels compared to other beaches in Goderich, as it is subject to multiple sources of pollution, such as the break wall and freighter traffic. All inland public dams in Huron, with the exception of Morrison Dam, have been posted as being unsafe for the 2008 swimming season based on high five year geometric means (data not shown).

## Huron County Is Predominantly Rural

According to the 2006 Census, 60% of Huron County is predominantly rural.<sup>1</sup> While little research exists on the physical environment as a determinant of health in rural settings<sup>2</sup> several physical attributes unique to rural environments are known to impact health.

## Private Drinking Water Wells

Because Huron County is predominantly rural, there are a higher proportion of households whose water supply comes from a private well instead of a municipal supply when compared to other regions in Ontario. In Huron County, there are an estimated 8,934 private wells.<sup>3</sup> In 2006, roughly a third (36.1%, 95% CI 32.6-39.6) of households reported that they received their tap water from a private well (n=711).<sup>4</sup>

Households receiving their tap water from a private well may be at increased risk for water-borne illness than those on municipal systems, especially if the well water is not tested on a regular basis for bacteria. Owners of unregulated or private water systems serving five or fewer residences can have water samples processed free of charge by the Public Health Lab in London, Ontario via the Huron County Health Unit, among other locations. Water results are compiled and analyzed daily to reveal trends in water quality and identify areas for concern. Of

households who use a private well, 28.7% (95% CI 23.2-34.2) had not had their water tested for bacteria in the past 12 months, while only 30.6% (95% CI 27.2-35.7) reported testing their water once over the past 12 months (**Figure 2**). Only 15.9% (95% CI 11.4-20.4) of households reported testing their tap water at least three times in the past 12 months, as recommended by the health unit.

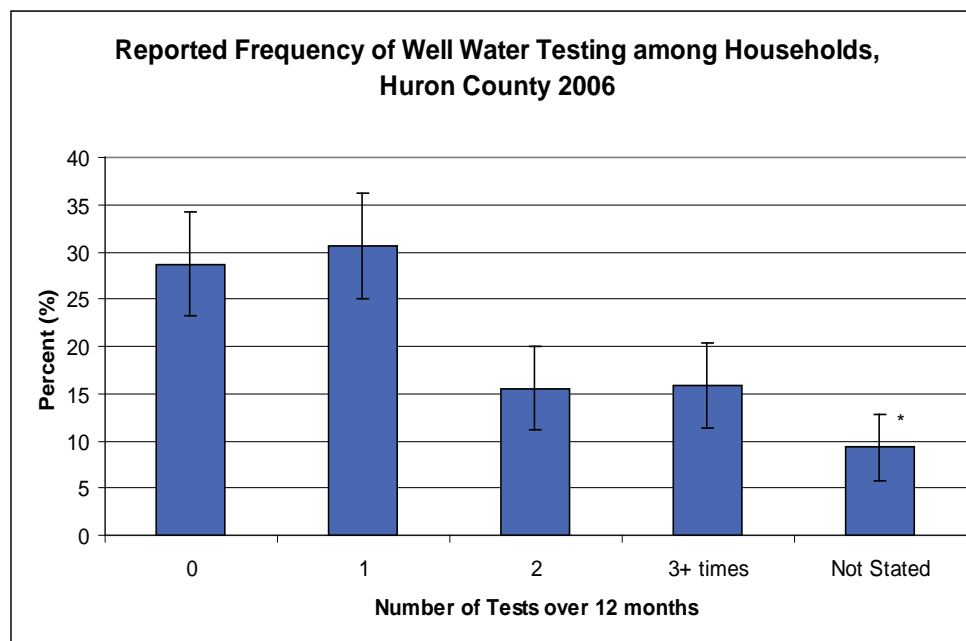
The proportion of households who have their well water tested on a regular basis increased after the municipal water contamination in Walkerton, Ontario; however, these percentages have slowly declined over the past few years. Private well sample results for 2005 to 2007 are shown in **Table 2**. The total number of samples submitted to the health unit decreased from 3,237 samples in 2005 to 2,761 samples in 2007. Despite this, the percentage of safe water samples increased from 73.9% to 77.1%. As multiple samples can be

submitted from single wells and participation is voluntary, these sample results are not meant to be indicative of the groundwater quality in Huron County.

Although the results are not described here, a quality assessment of the groundwater of Huron County has occurred and research has been undertaken to understand regional aquifer characteristics, identify potential threats to groundwater and develop protection strategies.<sup>5</sup>

## Private Septic Systems

Rural Huron County residents not connected to municipal water and sewage systems require a private septic system to process wastewater from the household. Wastewater is water that contains



**Figure 2.** Frequency of well water testing among Huron County households who report receiving their tap water from a private well. \* indicates that the estimate should be interpreted with caution due to high sampling variability. Source: Rapid Risk Factor Surveillance System (RRFSS), January - December 2006 (n=258).

**Table 2.** Percentage of private well water samples submitted within Huron County that tested safe, not safe, adverse or other in 2005-2007. 'Other' indicates that the samples were not properly submitted. Note: Source: Protecting the Environment Quad, Huron County Health Unit 2008, made available by the Public Health Lab, London, Ontario.

Private Well Water Sample Result	2007 (n=2761) %	2006 (n=2,863) %	2005 (n=3,237) %
Safe	77.1	78.1	73.9
Adverse	12.1	11.8	14.1
Not Safe	2.8	2.8	3.5
Other	8.0	7.3	8.5

waste materials or pollutants and includes the water flushed down the toilet and the water drained from the sink, shower, washing machine, etc. In Huron County, 64% of households are on private septic systems.<sup>6</sup> Health hazards of septic systems which are not properly maintained include: potential contamination of well or surface water, impacting beach water quality, and also wastewater ponding can act as breeding grounds for mosquitos.

## Population Density and the Built Environment

Population density measures the number of persons living in a defined area. Compared to urban areas, Huron County has a relatively low population density of 17.5 people per square kilometre.

Population density impacts health in a variety of ways. Firstly, density affects the distance residents need to travel between destinations and the number of destinations that can be reached through active transportation, such as walking or cycling. Communities with a lower population density, such as Huron County, often have to travel further distances to reach their destinations. For example, only 11.2% of Huron County residents report walking or cycling to work, while 87.3% travel to work in a car, van or truck (either as a driver or passenger).<sup>2</sup> When motorized transport becomes necessary for everything from work to shopping to school, there are fewer opportunities to be physically active. Reduction in physical activity levels is an important risk factor for obesity. As shown in the “Behavioural Risk Factors” chapter, almost half of adults in Huron County are classified as inactive and a significantly higher proportion is classified as obese when compared to Ontario.

Having farther distances to travel also increases the risk of motor vehicle collisions. In Canada, the overall injury-related mortality has been shown to increase with increasing rurality.<sup>2</sup> This is likely a consequence of the predominance of rural roads, with higher speed limits and poorer road conditions, combined with increased time spent on the roads.<sup>2</sup> In Huron County, land transport

occurrences are the 10<sup>th</sup> leading cause of death in Huron County and the leading cause of death in adults 20-44 years (Mortality chapter).

Low population density also influences the availability of public transit. In Huron County, no public transportation is currently available. Given the longer travel distances between destinations, taxi cabs are not always a financially viable transportation solution for individuals and families without access to a vehicle. Lack of affordable transportation creates barriers for Huron County residents to access health services and other resources necessary for good health.

Lastly, the physical environment also influences accessibility to healthy food. As noted in Health Canada’s report Nutrition for Health: An Agenda for Action, food is a part of the physical environment and the types of food available is a powerful influence on food choices.<sup>8</sup> Several studies have demonstrated a positive association between proximity to supermarkets/health food stores and dietary patterns, as well as weight status.<sup>9 10 11</sup> Recently, healthy food sources\* were mapped in Huron County to describe how household access to these food sources varied across the county.<sup>12</sup> In total, 60% of Huron County households were farther than two kilometres from the nearest healthy food source. Proximity to these healthy food sources varied across the county, with over 77% of households in northern municipalities farther than two kilometres from the nearest healthy food source compared to 53% of households in southern municipalities. Northern municipalities in Huron County may, therefore, be disadvantaged when it comes to accessibility of healthy foods. There may be healthy food choices just outside of the boundaries of Huron County, but those were not mapped.

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\* Healthy food sources were defined as equal in performance of grocery stores in terms of the number of Nutritious Food Basket (NFB) items carried.

## Agricultural Land Use and Practices

Another aspect of the physical environment which dominates rural landscapes such as Huron County is the predominance of farmland. Southwest Ontario is a farming region; farmlands cover the largest proportion of land surface of any other health regions in Ontario.<sup>13</sup> In 2006, 86% of the total land area in Huron County was designated for agricultural use (2,928 square kilometres).<sup>14</sup> This has important impacts on the economy and community of Huron County. Huron County leads all counties and regions in Ontario in total value of production.<sup>15</sup> In addition, farmers and agricultural workers (along with those employed in resource-based industries) make up an important part of Huron County's workforce; almost 1 in 5 persons (16.8%) persons in the labour force aged 15 years and older is employed in this sector.<sup>16</sup> Agriculture/farming is also one of the most hazardous professions.

## Outdoor Air Quality

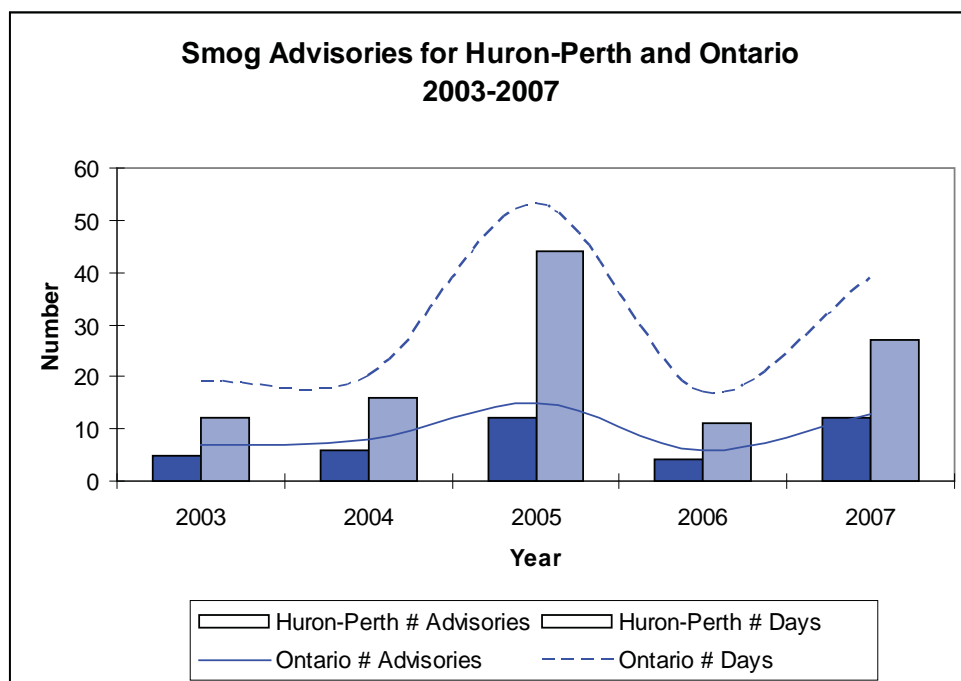
Free of high traffic volume and congestion, rural areas are often perceived as having pristine air quality given their lower population density and subsequent reduced energy consumption and emission of green house gases. Like other communities in Southwestern Ontario, however,

Huron County's air quality is impacted by the long range transport of air pollution from sources within the United States.

The Ministry of the Environment monitors the quality of the air on an hourly basis at 38 sites across Ontario. Six key air pollutants known to have adverse health effects on human health and the environment are measured - sulphur dioxide, ozone, nitrogen dioxide, total reduced sulphur compounds, carbon monoxide and fine particulate matter. In Huron County, elevated concentrations most often occur for ground-level ozone and fine particulate matter in the summer months, which is generally attributed to the long-range transport of these pollutants from the U.S.<sup>17</sup> By contrast, elevated concentrations of nitrogen dioxide, sulphur and carbon monoxide are more likely to occur in urban centres due to higher levels of vehicle and industrial facility emissions.

Concentrations of each of these six pollutants are converted into a number ranging from zero upwards using a common scale to produce an Air Quality Index (AQI). The pollutant with the highest number at a given hour becomes the AQI reading. For example, if the value of ozone is highest at 54, then the AQI becomes 54. Because measurements are taken on an hourly basis, the AQI changes as the air quality changes. An AQI value below 32 indicates that the air quality is relatively good. An AQI between 32 and 49 indicates moderate quality at which adverse

**Figure 3.** The number of smog advisories and the number of days advisories were in effect for Huron-Perth and Ontario, 2003-2007. Source: Smog Advisory Statistics, Ministry of the Environment.



health effects may be experienced by sensitive individuals, while an AQI of 50 or greater means poor air quality. If poor readings are predicted to be sustained over a period of time and over a wide area, then a Smog Alert is issued for that area.

The number of smog advisories issued in Ontario and in Huron-Perth, along with the number of days those advisories were in effect, are shown in **Figure 3**. In 2007, 13 smog advisories were issued for Ontario, spanning a total of 39 days; while in the Huron-Perth area, 12 smog advisories were issued which covered 27 days.<sup>18</sup> This is similar to the City of Toronto which had 11 smog advisories spanning 29 days in the same year. Over the past five years, Huron-Perth has experienced a similar number of advisories and span of advisories as the province and other regions in Southwestern Ontario (data not shown).

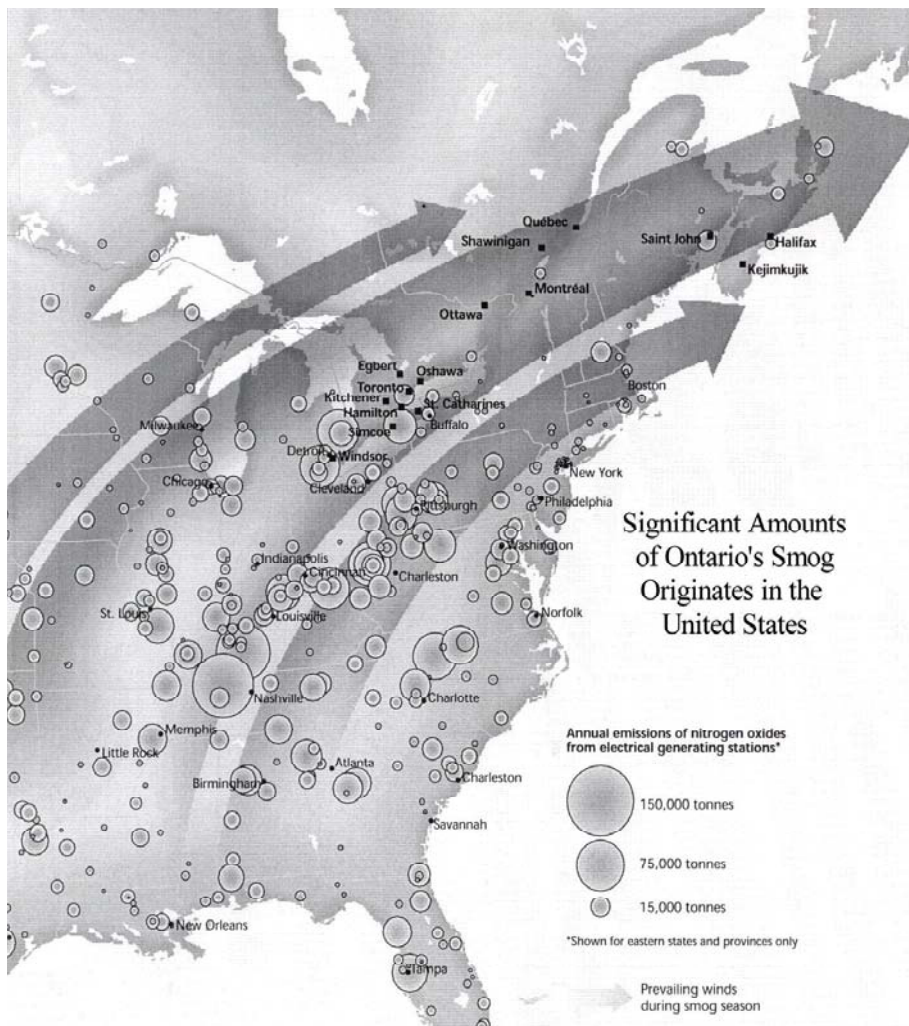
Smog alerts come in the form of “smog watches” or “smog advisories”. Smog advisories are issued when there is a strong likelihood that widespread elevated and persistent smog levels are expected.

(source: <http://www.airqualityontario.com/press/faq/cfm>)

In Huron County, elevated ozone and fine particulate matter levels that result in smog episodes are typically due to weather patterns that affect the lower Great Lakes region.<sup>17</sup> These weather patterns are associated with slow-moving high pressure systems across the region and result in the transport of smog pollutants from neighbouring industrialized and urbanized states in the U.S. during warm south to southwesterly air flow conditions (**Figure 4**).

Monitoring air quality is important as poor air quality can cause short- and long-term adverse health effects. Air pollution is harmful to both the respiratory and cardiovascular systems and can cause eye and nose irritation; aggravate heart problems, bronchitis, asthma, and other lung problems; and reduce lung function.<sup>19</sup>

Illness costs of air pollution have been estimated



**Figure 4.** Transboundary flow of air pollution from the United States to Southwestern Ontario. Source: Used by permission by the Canadian Geographic using data from the Natural Resources Defense Council, Environment Canada, Health Canada, Ontario Power Generation, Nova Scotia Power and Pollution Probe. Note: The data upon which this figure was created is at least ten years old and may not accurately reflect current air pollution patterns.

by the Ontario Medical Association (OMA) using modelling techniques based on time-series and cohort epidemiological studies.<sup>20</sup> These costs are shown for Huron County in **Table 3**. For 2005, an estimated 39 premature deaths occurred in Huron County due to short and long-term exposure to smog.<sup>21</sup> The majority of premature deaths were suffered by seniors because seniors are more likely to have a pre-existing respiratory or cardiovascular condition which increases their vulnerability to smog pollutants. Almost 400 emergency visits were estimated to occur, with most of these visits and hospital admissions likely due to cardiovascular illness. Minor illnesses associated with air pollution exposure are less severe but the most common, with 193,110 minor illness days estimated in Huron County.

Recently, the OMA released new estimates for local premature smog deaths which reflect improving scientific evidence that allows the model to more accurately estimate smog-related health effects. For 2008, there will be an estimated 60 premature deaths due to smog in Huron County.<sup>22</sup>

## Conclusion

Many characteristics of Huron County's rural environment impact the health of its residents. While the rural landscape provides Huron County residents with access to beautiful beaches and profitable farmland, the reliance on private wells for drinking water and also the proximity of Huron County to the United States present possible health risks. Over a third of Huron County households report that private wells supply their tap water, yet only a small percentage of these households have their water tested for bacteria at least three times a year as recommended. While the majority of water sample submitted are tested as safe, this still leaves a large number of households vulnerable to poor water quality. In terms of air pollution, despite lower population density and reduced greenhouse gas emissions, Huron has comparable smog advisories as Toronto due to transboundary air pollution. These health risks should continue to be communicated with the public so that appropriate actions can be taken to protect their health.

Outcome	Number
Premature Deaths	39
Hospital Admissions	107
Emergency Visits	362
Minor Illness Days	193,110

**Table 3.** Estimated health outcomes of outdoor air pollution in Huron County for 2005. *Source: Ontario Medical Association, June 2005.*

- 1 Statistics Canada. 2006 Census. Accessed from <http://www12.statcan.ca/english/census/index.cfm>.
- 2 Canadian Institute for Health Information. How Healthy Are Rural Canadians? Ottawa, ON: Canadian Institute for Health Information, 2006.
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- 16 Statistics Canada. 2006 Census. Accessed from <http://www12.statcan.ca/english/census/index.cfm>.
- 17 Ontario Ministry of the Environment. Air Quality in Ontario, 2006 Report. Accessed 20 June 2008 from <http://www.ene.gov.on.ca/publications/6552e.pdf>.
- 18 Ontario Ministry of the Environment. Smog Advisory Statistics. Accessed on 4 February 2008 from <http://www.airqualityontario.com>.
- 19 Ontario Ministry of the Environment. Smog. Accessed 19 June 2008 from <http://www.ene.gov.on.ca/en/air/smog/index.php>.
- 20 Ontario Medical Association. The Illness Costs of Air Pollution. Accessed 19 June 2008 from [http://www.oma.org/Health/smog/report/ICAP2005\\_Report.pdf](http://www.oma.org/Health/smog/report/ICAP2005_Report.pdf).
- 21 Ontario Medical Association. Illness Costs of Air Pollution (ICAP) – Regional Data for 2005. Accessed 20 June 2008 from <http://www.oma.org/Health/smog/regionaldata.pdf>.
- 22 Ontario Medical Association. Local Premature Smog Deaths in Ontario. Accessed 19 June 2008 from <http://www.oma.org/Media/news/pr080606b.asp>.