

Section G

environmental

health

H E A L T H T R E N D S

The health of a human population depends upon many factors, including personal health attributes or genetic endowment; social and economic conditions; health related behaviour practices; as well as physical, chemical and biological agents in the environment.

There are three potential pathways for humans to be exposed to environmental contaminants: through ingestion (the water we drink and the food we eat), inhalation (the air we breathe) and dermal exposure (the things that come in contact with our skin).

Currently, we conduct surveillance of the environmental determinants of health using one of three different approaches:

- Surveillance of agents in the ambient environment;
- Health risk assessments (risk of exposure); and
- Surveillance of human health responses to environmental agents (health outcomes), of which this document is one example.

The goal of environmental health surveillance is to collect strategic information relevant to the link between the health of the environment and the health of the people. This includes identifying and defining priority contaminants; developing monitoring networks that include personal exposure measures; developing biomarkers of exposure and effect; and identifying biological markers for population exposure.

G.1 Agents in the Ambient Environment

A variety of agencies are responsible for monitoring agents in the environment to safeguard the health of the environment and the health of the people, and to ensure that development is sustainable. For example, Alberta Environment is responsible for licensing industrial development, and monitoring industrial agents in the environment. Alberta Environment and Environment Canada also monitor the condition of the ambient air in a variety of locations throughout the province. Environment Canada is responsible for identifying maximum allowable concentrations and determining appropriate application methods for all commercially sold pesticides, herbicides and insecticides. Results of these and other similar programs are published regularly and are not duplicated here.

G.1A Water

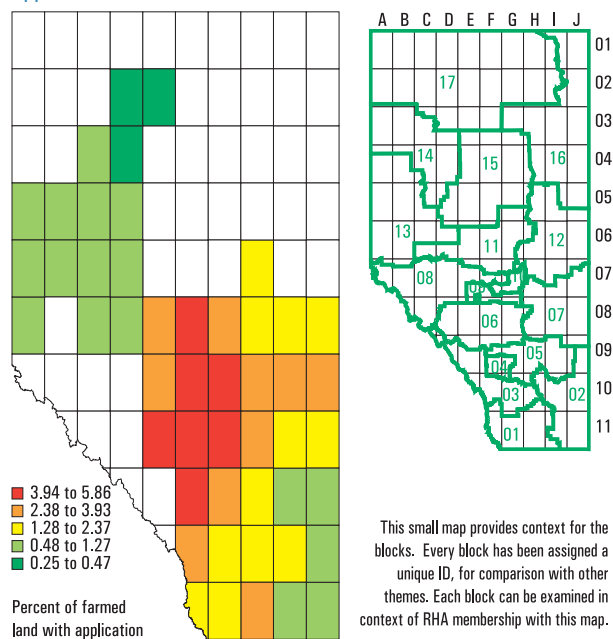
Alberta Environment has an extensive, long term, water quality monitoring network that collects information about the health of the rivers and streams in the province. Its goal is to ensure that the environment is protected and that development is sustainable.

Alberta Environment conducted a large scale evaluation of the water quality in the river basins of northern Alberta in 1996 that provided a benchmark to define the state of the Peace, Athabasca and Slave rivers as they currently exist. The study found reasons for concern about current conditions in some of the river systems and recommended immediate action. The specific river reaches where remedial action is needed illustrate the sensitivity of the river ecosystems and underline the importance of action. Even during the course of the study, technological improvements and more stringent regulations were implemented that resulted in measurable improvements in conditions in certain areas. More information about the Northern River Basins Study can be found at the Alberta Health and Wellness website.

Surface water can carry a variety of agents, including metals leached from the surrounding soil, contaminants transported into the water through drainage or rainfall, and microbial contaminants. Coliforms are bacteria that exist in all surface sources of water and are used as an indicator of microbial contamination. Water with high coliform content may contain a variety of microbial contaminants. One source of microbial contamination is mammal fecal matter. Surface water may contain fecal matter from wildlife as well as domestic animals. It may not always be possible to identify the source of fecal contamination in a water body.

Recent concerns have been raised about agricultural practices that result in higher levels of microbial contamination of the water. The application of large quantities of manure to fields may result in contamination through runoff into local streams and rivers. Allowing domestic animals to access streams for drinking water also results in increased contamination of local water sources.

Figure G.1A.1
Application of Manure, 1996



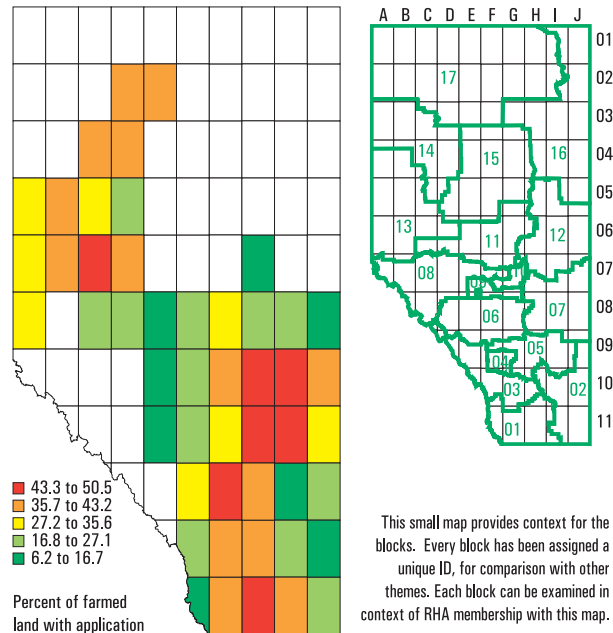
Source: Census of Agriculture, Statistics Canada, 1996

A variety of herbicides, insecticides and fungicides are applied to most of the arable land used for crop production in Alberta. These chemicals may become airborne during application and have the potential to cause respiratory problems for the local population. The chemicals may also leach into the water where they can react with other compounds and have the potential to contaminate the drinking water for those people living downstream.

Water contamination is particularly problematic in irrigated areas. Water sprayed onto fields flows back into irrigation canals, taking pesticides and herbicides with it. The water may be drawn out further down the canal system where it is reapplied to fields with additional pesticides and herbicides. The irrigation water eventually flows back into the main river system, where it may become a source of human drinking water.

The Alberta Farmstead Water Quality Survey, a 1997 study conducted under the Canada-Alberta Environmentally Sustainable Agriculture Agreement (CAESA) found that the pesticide levels in streams and irrigation canals in some areas of southern Alberta exceeded the irrigation guidelines of the Canadian Guidelines for Water Quality. The report recommended an evaluation of pesticide application volume and practice in the Alberta context.

Figure G.1A.2
Application of Pesticides, 1996



Source: Census of Agriculture, Statistics Canada, 1996

Other contaminants of concern include trihalomethanes (a contaminant that is created by chlorination when the water contains a high level of organic matter) and toxins produced by algae.

Provincial Strategies

- A joint study involving researchers from Alberta Agriculture, Food and Rural Development, Alberta Environment, Alberta Health and Wellness, and the universities of Alberta and Calgary will attempt to identify the contribution of livestock production to the levels of *giardia* and *cryptosporidium* in the North Saskatchewan River.
- The Oldman River Basin Water Quality Study will provide a detailed assessment of the quality of the water in the Oldman River basin, including levels of fecal coliforms, and E. coli, as well as pesticides, herbicides and fungicides.
- A subcommittee of the AESA Council, with support from Alberta Health and Wellness, is developing a long term water quality monitoring program to track and evaluate changes in agricultural practice and standards.
- Alberta Environment, in conjunction with Alberta Health and Wellness, Alberta Agriculture, Food and Rural Development and Health Canada is evaluating pesticide application volume and practice in the Alberta.

G.1B Air

Livestock produce a number of byproducts, and have been identified as the source of waterborne contaminants such as fecal coliforms, *cryptosporidium* and nitrates, as well as airborne contaminants including particulates, hydrogen sulfide (H₂S), methane and ammonia gases. In fact, livestock have been identified as one of the sources of greenhouse gases produced in Alberta. Although there are other sources of methane production in Alberta, such as oil and gas operations, the contribution from livestock is significant. Projected increases in intensive livestock production may increase the burden of methane and ammonia in Alberta by as much as three times.

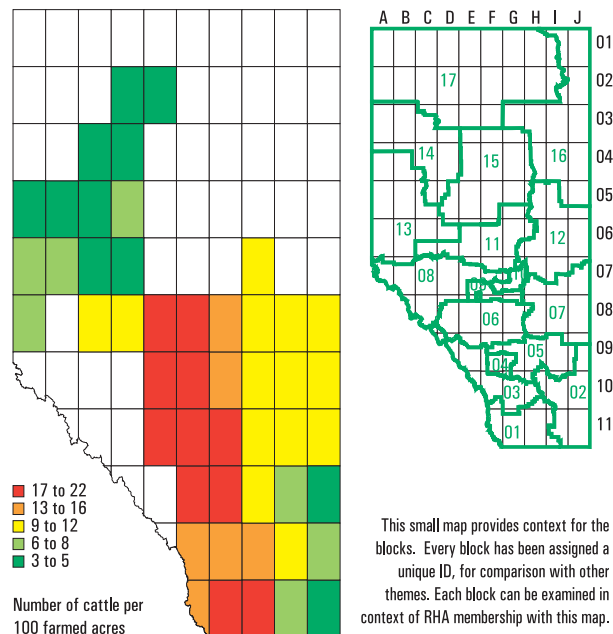
In addition to the potential impact on the quality of the water discussed above, the airborne contaminants livestock may produce (such as methane, ammonia and particulates) have the potential to cause respiratory problems in humans living nearby.

The accompanying map illustrates cattle density. The majority of the large herds are located in the southern areas of the province.

These agricultural maps were generated using the 1996 census of agriculture. The reporting units for this census are consolidated census sub-divisions (CCSDs) which are equivalent to the county, municipal district, improvement district, and special area boundaries. The reported numbers were divided by the total number of farmed hectares in order to obtain a measure of intensity of activity in areas where farming occurs. A land-use-classified satellite image was obtained for the province based on 1996 images, and the agriculture and rangeland categories were extracted.

The pixels corresponding to each of these activities (each pixel has a ground size of one km²) were extracted and converted to a point file. This point file was overlaid on the agricultural census data in order to obtain a more accurate representation of the intensity of the activity throughout the province. These data points were overlaid on the latitude-longitude blocks and the mean of all corresponding points was assigned to each corresponding block.

Figure G.1B.1
Cattle Density, 1996



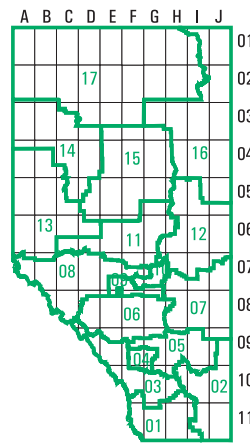
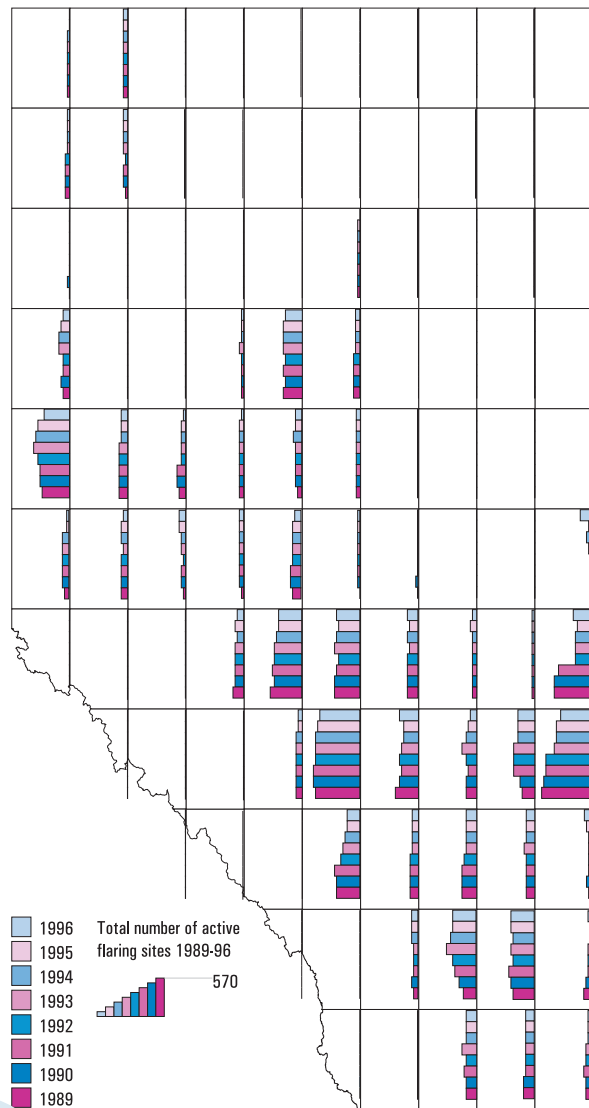
Source: Census of Agriculture, Statistics Canada, 1996

The impact of solution gas flaring on human health in Alberta is not known, but health concerns associated with flaring activity have been raised through the Clean Air Strategic Alliance (CASA). Solution gas flaring occurs throughout the more populated areas of the province.

The Canadian Association of Petroleum Producers commissioned the Alberta Research Council to study flare gas emissions. The study findings caused increased concern because the actual efficiency of

some flares was found to be 60 to 70 per cent compared with previous estimates of over 90 per cent. The study identified compounds in the flare emissions that are identified on the priority substance list (i.e. benzene). This report has raised the previously heightened concerns of people and particularly of residents living around the flares.

Figure G.1B.2
Solution Gas Flaring Activity: Total Annual Volume of Contaminants, 1989 - 1996



This small map provides context for the blocks. Every block has been assigned a unique ID, for comparison with other themes. Each block can be examined in context of RHA membership with this map.

Source: Alberta Energy Utilization Board

The total annual volume of contaminants from solution gas flaring in Alberta increased between 1989 and 1993, but has decreased each year since.

Preliminary analysis of the correlation between flaring activities and physician claims for asthma does not indicate any relationship. The lack of a positive correlation in this study does not exclude the possibility of human health effects below the detection limit of this type of study. The study was well received by industry and non-government organizations on the CASA working group but has not completely relieved health concerns over flaring impacts.

The map was created by counting the number of active wells in each block using their geographic position and then summing the total flaring activity for each year for all wells in each block.

Provincial Strategies

- Alberta Health and Wellness will make efforts to address site-specific concerns by measuring personal exposure to the air contaminants in areas of flaring. The department will continue to develop the capability to analyze health data and seek to improve links with Alberta Environment and AEUB data.
- The CASA flaring working group is seeking consensus for a proposal to reduce flaring levels by 15 per cent by the end of 2000, 25 per cent by the end of 2001, 40 to 50 per cent by 2003, and 60 to 70 per cent by 2006. Alberta Health and Wellness supports all efforts to reduce the impacts of flaring and supports the proposal on the table at the CASA flaring working group.
- An ad-hoc steering committee is currently preparing a final draft of the proposed Western Canadian Study on Animal and Human Health Effects Associated with Exposure to Flare Emissions.

G.2 Health Risk Assessment

Health risk assessments take two main forms in Alberta: environmental impact assessments and regular monitoring programs. Environmental impact assessments (EIAs) are carried out under the authority of the Environmental Protection and Enhancement Act - 1992. Section 11 states that - “The Minister shall, in recognition of the integral relationship between human health and the environment, co-operate with and assist the Minister of Health in promoting human health through environmental protection.” Section 47(g) further states that - “An environmental impact assessment report shall be prepared in accordance with the final terms of reference issued by the Director under Section 46(3) and shall include the following information unless the Director provides otherwise: an identification of issues related to human health that should be considered.”

The purpose of an EIA is:

- To support the goals of environmental protection and sustainable development;
- To integrate environmental protection and economic decisions at the earliest stages of planning and activity;
- To predict the environmental, social (including human health), economic, and cultural consequences of a proposed activity and to assess plans to mitigate any adverse impacts resulting from the proposed activity; and
- To provide for the involvement of the public, proponents, the government and government agencies in the review of the proposed activities.

In addition to participation in the EIA process, there are several regular monitoring programs currently in place to evaluate the risk of exposure and prevent adverse human health problems resulting from exposure to environmental contaminants.

G.2A Drinking

Urban communities provide their residents with treated water. The type of treatment varies from community to community, and regular testing indicates that in general the water meets the guidelines for human consumption. The majority of the residents in the province obtain their drinking water from this source, including some rural residents with cisterns that are filled using water from these municipal sources. The remainder of the population relies on well water and a small proportion relies on alternative water sources, such as dugouts, canals, streams and lakes, etc. This section explores the proportion of residents with access to municipally treated water summarized to the regional health authority (RHA) level. An analysis of provincial residents with access to well water and the testing performed on these facilities is currently under way.

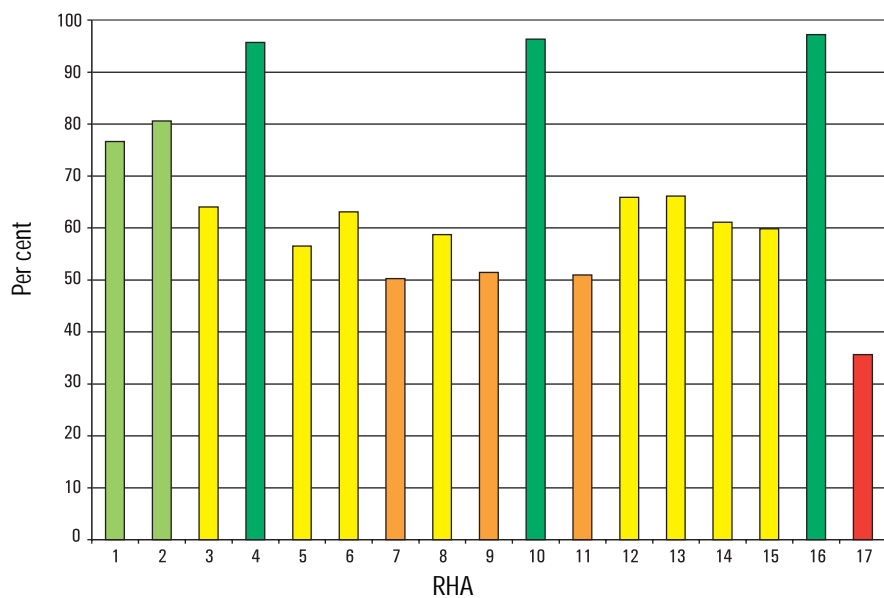
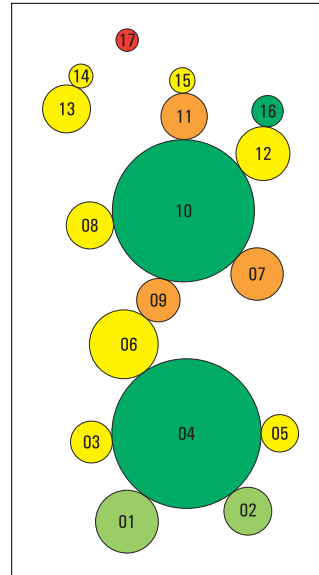
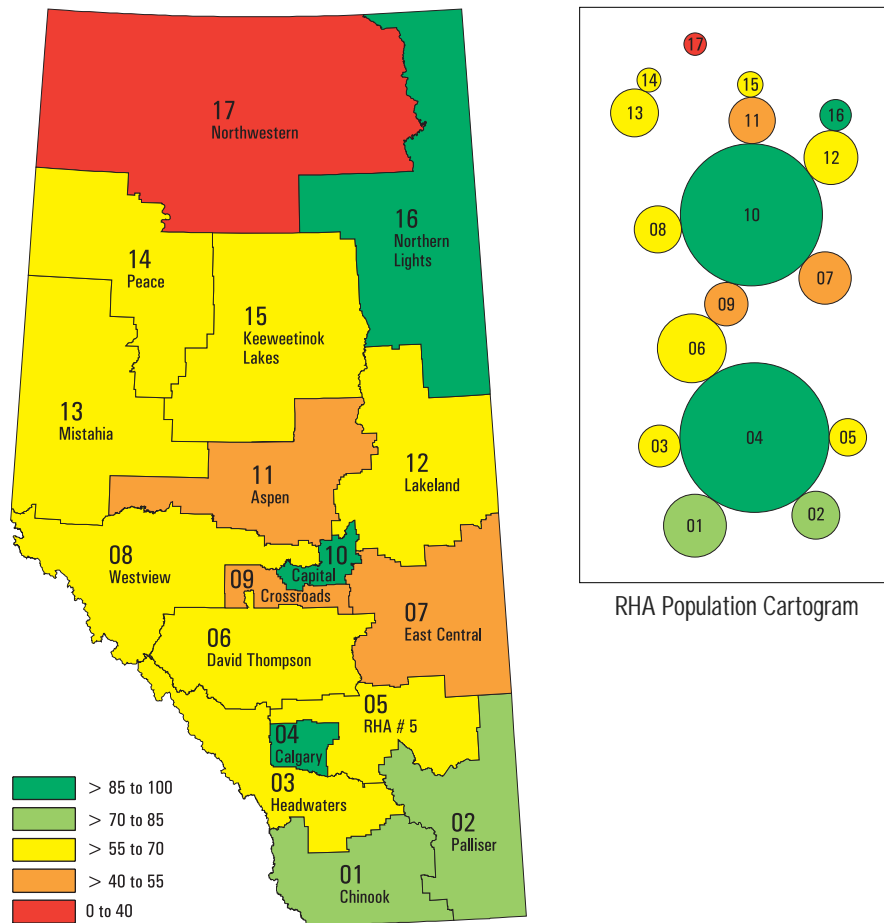
In 1996, Alberta Environment conducted a survey to determine treatment processes and the population served by each municipal water treatment facility. This information was examined along with the 1996 population census data to determine the proportion of the population with access to treated water within each of the RHAs. Each facility was assigned to an RHA, based on its geographic location and the population “served” was also assigned to the RHA. This created a figure for the total population within each RHA with access to municipally treated water. The total population for each RHA was calculated based on enumeration area populations as they appear in the 1996 census.

The map on page G10 illustrates that there are three RHAs with a high percentage of the population who have access to municipally treated water, namely the Calgary, Capital, and Northern Lights regions. The lowest percentage with such access is in the Northwestern region. The percentage of the population with access to municipally treated water is a function of the proportion of the population who live in urban centres.

People who do not have access to municipally treated drinking water must obtain their drinking water from alternative sources. They are responsible for ensuring that their water is safe to drink by having the water tested on a regular basis and by applying the appropriate treatment options based on the water quality reports. Water analysis, testing for routine chemistry, trace metals and microbial contamination is funded by Alberta Health and Wellness and conducted by the Provincial and Public Health Laboratories. Regional health authorities may require a handling fee.

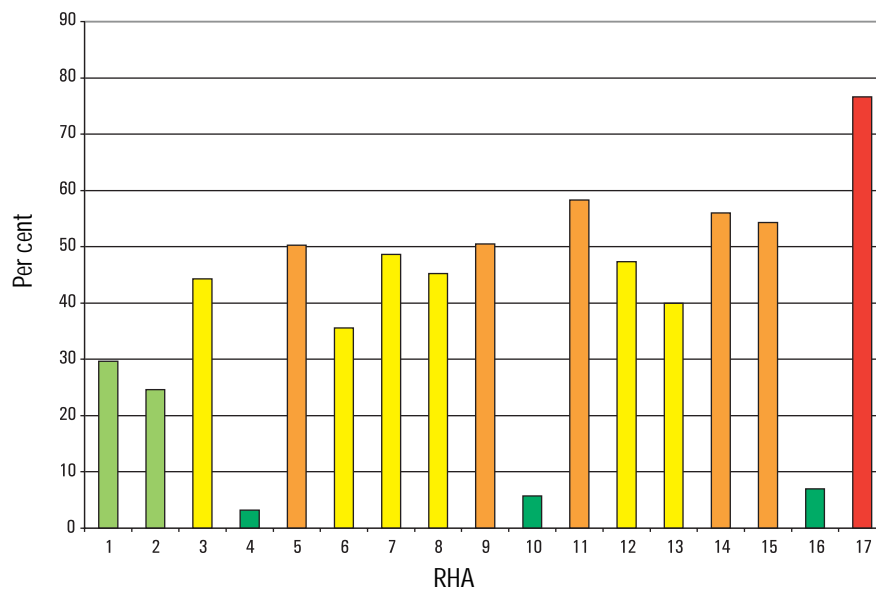
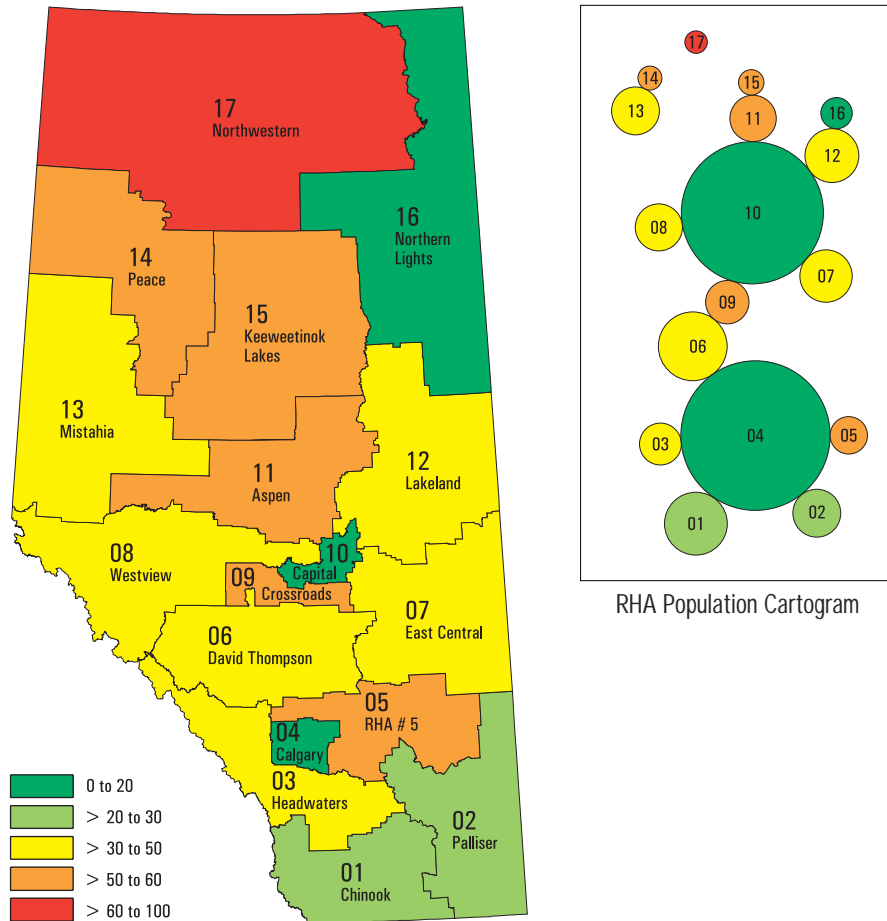
Rural populations were calculated using the 1996 population census. The urban population can be calculated by examining urban census sub-divisions (cities, towns and villages). These numbers were divided by the total RHA population calculated above to obtain percentage of urban population. This number subtracted from 100 yields the rural population for each RHA. The resulting graphic is very similar to that showing the percentage of population with access to municipally treated water. The three RHAs with the smallest rural population are the Calgary, Capital, and Northern Lights regions, and the one with the highest percentage of rural population is the Northwestern region. This pattern is similar to that indicated for access to treated water. The small differences among the graphics are mostly a result of the classification breaks.

Figure G.2A.1
Proportion of the Population With Access to Treated Drinking Water, 1996



Source: Alberta Environment, 1996

Figure G.2A.2
Rural Population Density



Source: Statistics Canada, 1996

Microbial contaminants are a common concern that water treatment facilities must address. Small water treatment facilities may have difficulty meeting standards for drinking water because they have to deal with lower quality water sources with fewer resources than larger systems. A number of boil-water orders were issued during 1997 because treatment facilities were unable to effectively remove all coliforms from the water.

Public health education programs have continuously emphasized the need for treatment of any surface water source used for human consumption. However, diagnostic patterns for waterborne diseases such as giardiasis and cryptosporidiosis suggest that people continue to drink untreated surface water despite these education programs.

G.2B Breathing and Eating

Breathing

The Alberta Oil Sands Community Exposure and Health Effects Assessment Program was an issue-specific risk assessment conducted by Alberta Health and Wellness in cooperation with a variety of partners. The program gathered measures of personal exposure to a number of airborne contaminants in addition to measures of biological markers of exposure. The information collected through this study is currently being analyzed.

Eating

Over 100 fish advisories exist in the province, and these are contained in the provincial Sport Fishing Guidelines.

In addition to the regular health risk assessment monitoring programs conducted in Alberta, specific studies of the risks of local environmental hazards are occasionally required. For example, the Swans Hills Community Health Risk Assessment indicated that the local environment was contaminated with PCBs from an accident at the Swan Hills Special Waste Treatment Facility. This resulted in the issue of a consumption advisory that recommended restricted consumption of wild game and fish caught within a 20-mile radius of the facility.

Provincial Strategies

- The **Swan Hills Long Term Monitoring Program** was developed to monitor the levels of contaminants found in wild game and wild fish in the vicinity of the Swan Hills Special Waste Treatment Facility, and will update the consumption advisories as necessary.
- As a follow-up to the **Northern River Basins Study**, Health Surveillance (Alberta Health and Wellness), in cooperation with Alberta Environment, regional health authorities, the University of Alberta, Environment Canada, Health Canada and industry are developing a process for the review of fish consumption advisories in the province. The proposed protocol involves the preparation of a science assessment document (SAD) by industry. A science advisory committee (SAC) will review it to validate and interpret the results, and to provide advice to a public health advisory committee (PHAC). The PHAC, which will include representation from the appropriate regional health authority, will then provide recommendations to industry on the provision of more data, or will recommend to the provincial health officer to maintain, remove or establish a fish advisory. Fish consumption advisories are a shared responsibility between Alberta Health and Wellness and Alberta Environment. A pilot project to validate the fish consumption advisory process has been established involving Weyerhaeuser Canada and the Mistahia Regional Health Authority. A pilot project to define an appropriate risk communication strategy for the fish consumption advisory process has been established involving the University of Alberta and Weldwood Canada.
- Alberta Health and Wellness leads a multidisciplinary team that conducts the required health impact assessment within the broader EIA review framework. The team makes recommendations to Alberta Environment and identifies any outstanding issues.

G.3 Surveillance of Human Health Responses

A number of diseases are caused by exposure to bacteria or viruses in the ambient environment, such as food- and waterborne diseases (*E. coli*, giardiasis, cryptosporidiosis, campylobacter enteritis, salmonellosis, shigellosis), and viruses contracted from wildlife such as Hantavirus. These diseases are routinely monitored to enable timely and effective management of potential sources of exposure. The distribution and frequency of these diagnoses is discussed in Section E — Communicable Diseases.

Additional examples of the surveillance of health responses include special studies evaluating priority health issues such as the Northern River Basins Human Health Monitoring Program.

The Northern River Basins Human Health Monitoring Program Report reported a slight elevation in the rate of diagnosis of certain specific subtypes of congenital anomalies in the Mistahia and Peace River regions compared to other areas of the province. As a follow-up, an evaluation of the records was conducted to determine if the higher rates should be a reason for concern. It was concluded that the higher rates were an artifact of better diagnosis and reporting, rather than an indication of change in the number of babies born with these specific conditions.

Provincial Strategies

- Alberta Health and Wellness conducts regular monitoring of a variety of chronic and acute diseases to identify potential outbreaks or problem areas.
- The Alberta Congenital Anomalies Surveillance System (ACASS) is responsible for monitoring and reporting on the diagnosis of congenital anomalies in the province.

G.4 Environmental Health Strategies

In addition to surveillance of environmental health issues, Alberta Health and Wellness provides expertise and leadership in environmental health when working with regional health authorities, provincial departments, federal agencies, and many organizations. The department is involved in policy, legislation, and regulation review and development. Achievement of integration and coordination of roles, responsibilities, policies and legislation among the many stakeholders is critical. Some examples of the key areas Alberta Health and Wellness is currently involved with include:

Legislation, Regulation and Standards Review and Development

- Biomedical wastes
- Bottled water and packaged ice
- Farmers' markets
- Facility standards
- Meat facilities
- Intensive livestock
- Barbershops and beauty parlors
- Workcamps

Integration and Coordination of Food Safety

- Canada Food Partners - education, training, laboratories, emergency response, inspections
- Certification of Food Sanitation — education of food service workers

Health and Safety Reviews

- Sour gas

