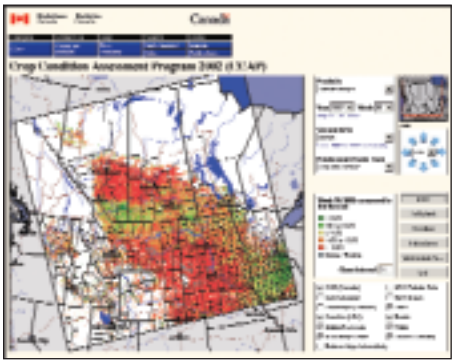
Drought Monitoring Online

The Agriculture Division of Statistics Canada has a mandate to collect census and survey information regarding all forms of agriculture in Canada, and provide it in an expeditious manner to clients, often government policy makers. Long ago Statistics Canada realized that new technologies such as satellite remote sensing and GIS could reduce costs and provide valuable information in support of its operations.

The Crop Condition Assessment Program (CCAP), developed and maintained by the Spatial Analysis and Geomatics Applications (SAGA) group within the Agriculture Division, is a prime example of an application project that has provided substantial benefit to Statistics Canada and CCAP subscribers. The CCAP combines remote sensing, GIS, and the Internet to provide timely and reliable information on crop and pasture/rangeland conditions for the predominately spring wheat growing regions of western Canada and the northern plains of the U.S.

Severe droughts, increasing competition among grain exporters, and the instability of grain markets have underscored the importance of having accurate and timely information on crop conditions and potential yield. CCAP is able to supply the user community with frequent updates over a large geographic area. The National Oceanic and Atmospheric Administration (NOAA) series of satellites carrying the Advanced Very High Resolution Radiometer (AVHRR) records images of the entire earth's surface twice daily. Although designed for atmospheric observations and weather forecasting, there are two AVHRR spectral bands (red and infrared) that have proven to be extremely useful to the CCAP for vegetation monitoring.



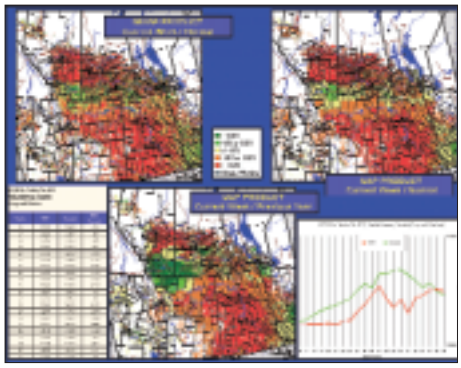
Web-based interface for the CCAP.

NOAA satellite data for this project are collected daily during the growing season at the satellite receiving station in Prince Albert, Saskatchewan. The data are transferred to the Manitoba Remote Sensing Centre (MRSC), where they are input, pre-processed, geocoded, and resampled. A composite of processed images covering the latest seven-day period is produced to remove as much of the cloud effects as possible, which substantially improves the quantitative analysis capability for vegetation condition monitoring. These products are then immediately transferred electronically to Statistics Canada where additional value-added processing, required for monitoring and measuring vegetation change, is completed and the results posted on the Internet using MapObjects IMS.

"We can now process the satellite images and put the value-added products on the Internet nearly 300 times faster than before, thanks largely to Statistics Canada's expertise, more powerful computers, improved software, and better algorithms," said David Caissy, Programmer/Analyst, SAGA.

SAGA used MapObjects and MapObjects IMS to build an interactive mapping interface that allows subscribers to view, via the web, several types of weekly value-added satellite images and map products in addition to statistical and graphical data. CCAP image products show vegetation conditions on a pixel by pixel basis while map products illustrate the predominant vegetation condition within western Canada by Census Agriculture Region (CAR) or Census Consolidated Sub-division (CCS), or within the U.S. image region by county.

"Subscribers from federal and provincial governments, grain marketing agencies, and crop insurance companies view SAGA's weekly value-added products on the Internet in less than 24 hours after the last satellite overpass," said Richard Dobbins, Senior Analyst, SAGA. "This is a substantial improvement compared to a decade ago when processing and distribution took five days."



Several value-added products are available through the CCAP.

Depending on their particular requirements, using the GIS interface, subscribers can either view cropland and/or pasture/rangeland areas of interest, together or as separate classes. This type of qualitative analysis allows users to quickly assess weekly conditions. Water bodies, rivers, roads, and major cities and provincial, CAR, CCS, state, and county boundaries may be overlaid on the image to aid in area location.

Using ArcView 3.2 and Avenue, a detailed, quantitative analysis is accomplished by SAGA to calculate the mean Normalized Difference Vegetation Index (NDVI) value on a weekly basis for crop and pasture/rangeland masks and for each CAR, CCS, and county. The NDVI emphasizes differences between stressed and unstressed vegetation, providing an indication of plant health. Mean NDVI data by CAR, CCS, or county can be plotted, viewed, compared, and analyzed with any other year in the statistical archive. The tabular and/or graphical data can either be electronically exported into reports or presentations, or users can produce hard-copy colour print-outs of their analysis.

"In addition, coupling CCAP with the capability to accurately and reliably forecast spring wheat production for western Canada, well in advance of Statistics Canada's first survey information on spring wheat yield based on farmer observations, gives users a very useful

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tool for making management decisions," said Gordon Reichert, Manager, SAGA. "Users require the most up-to-date information possible on how much, and where, week-to-week conditions have either deteriorated, remained unchanged, or improved."

Demands by private industry, grain marketing agencies, agri-business, and government to produce accurate, timely production forecasts well in advance of statistical survey estimates, re-emphasizes the importance of using remotely sensed data, GIS, and the Internet.

A free demo is available at: http://gem.statcan.ca/ccap.asp