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Hand held computers improve rangeland health data collection and analysis

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Most British Columbia (BC) Ministry of Forests and Range (MFR) Range staff use paper forms to collect rangeland health data. They have requested improved methods of collecting and analysing data. Monitoring and tracking rangeland health with a hand held computer linked to a Global Positioning System (GPS) enhances field data collection and analysis. Range staff are beginning to use digital forms, a process which notably reduces the time taken to complete analysis and write reports after data collection. This paper outlines the need for advances in data collection, the practicalities of electronic data collection and the uptake of new technology by Range staff.

Prior to 2004, Range staff collected field data with paper forms. A field day required a large paper map for navigation, clipboards to write on and water resistant paper forms to record observations. Staff carried a separate GPS unit to collect spatial data and transferred it to the paper form. Analyzing data and generating reports required three office days for each single day spent in the field. Field observations from one week generated a box full of forms which in turn required nearly a month to analysis and summarize.

The MFR model of electronic data collection requires a Personal Desktop Assistant (PDA), GPS, and ArcPad mapping software to support data collection. Users navigate, orientate themselves and collect data within base layers downloaded from a central data repository and displayed on the screen of their PDA. Available information includes 5 metre resolution satellite imagery, contour lines, a vegetation layer and a blended biological, geological and climatic layer. Data are recorded in the form of shapefiles, which are directly compatible with the ArcMap programs used by the MFR geomatics specialists.

Effective electronic data collection requires an operator with knowledge of the ecosystem, PDA, GPS and appropriate protective cases. A compact flash or secure digital memory card of at least 1 gigabyte is necessary to store base imagery, useful shapefiles and inspection forms. Operators may find useful a telescopic pole to elevate the GPS and a mobile battery to extend field time. Most basic PDAs will have the necessary processing speed and radio receiver to operate the ArcPad software and link with a GPS. Total cost for equipment and software is between \$2,000 and \$3,000.

Operating time with an extended battery is 6 to 7 hours. Users can increase field time by carrying a spare battery or mobile battery, or charging the PDA and GPS in the truck between inspections. Operators can partially fill out inspection forms in the field and edited them back in the office. The processing power of the PDA allows the operator to carry additional electronic information from each range client or a spread sheet to calculate rangeland carrying capacity. Collecting data with a hand held computer allows for consistent collection of information in the form of a permanent legible electronic file that is easy to store and sort. Electronic data collection can include recording range use, more elaborate inspections to determine rangeland health, identifying the location of range improvements, identifying the location of new invasive plants, determining the carrying capacity of a particular pasture, navigating in the field, linking digital pictures with the appropriate inspection form and recording additional notes.

Range staff have created a guide to system operation because users are located in different areas of the province. The guide addresses topics including: using ArcPad with electronic forms, acquiring and using underlying spatial data and addressing PDA challenges. New users are most successful in learning the technology when they are interested in it and recognize its benefits. Beginners often feel frustrated using this hand held electronic data collection system because they expect the speed and response of their personal computer and underestimate the importance of maintaining a line-of-sight between the GPS and the sky.

Range staff report that the conversion to electronic data collection reduces analysis and summary time by at least 75%. Unanticipated benefits of adopting the new technology include improved navigation and a visual summary of the extent of a monitoring regime, which improves the cost-effectiveness of subsequent field trips. Adopting this new technology is an important step to improving the understanding of the health of rangelands at a coarse scale. In the future, Range staff will be required to perform more mapping work while technological advances will likely provide us with faster PDAs capable of performing more tasks and processing finer resolution imagery.