Landscape Visualization:
An Extension Guide for First Nations and Rural Communities

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Executive Summary

In consultation processes with First Nations and rural communities to obtain input and reactions to proposed resource management plans, technical information is often presented in the form of flat paper GIS maps which are readily available and fairly easy to produce. The difficulty with conventional GIS cartography is that the mapping conventions and abstract two-dimensional (2D) presentation are often not easily understood by community members, who find it difficult to reconstruct the topography and planning scenarios that the mapping is intended to represent.

First Nations and rural communities have begun to ask how they can make use of newer tools such as three-dimensional (3D) computer visualization to improve communications and resulting decisions about the landscape. As an example, the Cheam First Nation and the Shuswap Nation Tribal Council (SNTC) expressed interest in the potential for emerging methods of computer-based landscape visualization to assist their communities in communications and planning on land/resource management issues. Researchers at the University of BC’s Collaborative for Advanced Landscape Planning (CALP) were invited to explore the possible benefits and limitations of realistic landscape visualizations relative to the conventional 2D maps that are typically employed by resource managers to consult with indigenous communities in BC. In addition, the authors conducted a needs assessment and implementation plan to assist the SNTC in how to best use visualization technology, and how to develop a local capacity in landscape visualization. The results of these and related studies, developed in collaboration with our First Nations partners and reported here, provide some useful information to other indigenous and rural communities seeking access to these new visualization technologies and the potential benefits they may bring.

Landscape visualizations are pictures of real places seen in perspective, which show visible or non-visible features of recognizable landscapes in the future, the present, or the past. A computer generated, realistic 3D model of terrain and vegetation allows community members to get a feel for the landscape with which they are familiar and see what a land claim or forest management proposal will look like on the ground.

The research conducted by the authors (as well as by other investigators working with aboriginal and non-aboriginal communities) points to the need for accurate and fairly realistic visual representations of land-use plans, typically prepared with 3D computer modeling programs, to enhance understanding by local communities.

This publication is intended to help First Nations and rural communities to understand the pros and cons of landscape visualizations, by providing some examples of how
they have been used and received by communities, and suggesting practical ways in which communities can begin to use these technologies appropriately, using external or internal resources such as existing community GIS facilities. While the publication is focused on the needs of First Nations and highlights results from collaborative research with primarily indigenous communities, we believe that the recommendations will be useful and applicable to many kinds of local or rural communities.

Potential Benefits of Landscape Visualization

The potential benefits of landscape visualization that have been identified in a First Nations context, but which may also be applicable to rural communities, include:

• Better explanation of complex projects, mapped information, and technical issues to elders and other community members who may not be familiar with reading maps and interpreting other technical documentation.
• Accessing cultural/ecological values, knowledge, and context from the elders and those who know the area well.
• Helping to illustrate cultural/spiritual values to western planners and decision-makers, through highlighting particular important places, features, and spatial and ecological relationships.
• Providing a check on information supplied by others (e.g. government agencies or forest companies), to highlight concerns or errors that would not otherwise be discovered based on map or report information.
• Demonstrating local leadership and technological achievement, since many companies and government agencies lack the capacity to produce accurate visual simulations themselves.
• Providing a simple way to verify actual performance, once projects have been implemented, through comparison with the visualization of predicted conditions.

Potential Barriers to Successful Implementation

The difficulties associated with implementing an integrated GIS/landscape visualization system result from the technical complexity of the software itself.

A range of visualization software is available including some relatively easy-to-use programs such as ArcView 3D Analyst and Adobe Photoshop. These methods however, have either very limited realism or limited accuracy currently.

The current standard for realistic landscape visualization software is Visual Nature Studio (VNS), formerly known as World Construction Set (WCS), which is the preferred modeling application used by the BC Ministry of Forests, and many landscape planning consultants. Programs such as this are capable of producing highly realistic simulations
which, based on our research findings, are credible and understandable among First Nation communities. However, implementing VNS/WCS or similar programs is hampered by the following considerations:

- Difficulty of use of the available software, and consequent training needs. VNS/WCS is not simple to learn or implement. The program requires extensive training, experience, and regular use to make it work efficiently.
- The short supply of trained or capable individuals available on a continuous basis to develop and sustain a visualization capability. Staff trained in general computing, GIS, environmental planning or landscape architecture, and visualization, are hard to find. Access to trainers and to troubleshooters who can help a new preparer to succeed is often limited, especially in more remote communities.
- Assuring adequate volume and regularity of use. Without a steady supply of projects and appropriate applications of visualization, the skills gained in training are usually lost relatively quickly.
- The lack of good data for visualization preparers, e.g. tree images to populate visualizations of future conditions.
- The possibility of biased or misleading simulations (either deliberately or unintentionally), which could lead to poor planning decisions and threaten the viability of desired ecological outcomes and the credibility of future visualization efforts.

Implementation Recommendations

Based on the authors’ experience, direct comments from our First Nation partners and, in particular, analysis of the SNTC context and limitations, we draw the following conclusions:

- Landscape visualizations which combine realism and meaningful labels/symbols to portray non-visual information, would be very helpful to First Nations and rural communities in their deliberations on land and resource management issues. This may be a matter of some urgency in helping to articulate and document important oral history data, given the age of many elders.
- There are serious limitations of continuous funding and trained staffing that would make long-term implementation of sophisticated visualization systems difficult at present within many band/tribal council and rural community administrations. However, the existence of technical staff trained in GIS at local resource centres such as the SNTC and Sto:lo Nation offices, does make it feasible to implement some level of 2D/3D visualization, with the prospect of a more fully developed visualization capability in-house as the ease of use of the software increases, and the long-term staffing/funding situation stabilizes.
- Based on our assessment of resources, skill base and land management goals for First Nations and rural
communities in BC, there are three options or levels for integrated GIS/landscape visualization implementation: Third-Party Implementation, Basic Implementation, and Advanced Implementation.

**Level 1: Third-Party Implementation**
- Visualization implementation within a First Nations band, tribal council administration or rural community context is constrained by limited financial and human resources;
- Visualization work is contracted-out to external consultants or is provided by planning agencies to the First Nation’s or rural community’s specifications;
- The First Nation/rural community assumes the role of reviewer of the visualizations, which ultimately requires that First Nation/rural community resource managers and decision-makers are familiar with visualization preparation and presentation standards (See Part 3) and can probe the simulations and simulation preparer(s) for sources of error and/or bias.

**Level 2: Basic Implementation**
- The First Nation/rural community relies primarily on existing computer resources in-house (e.g. ArcView, AutoCAD and Microstation) to produce visualizations with a low to moderate level of realism;
- Intermediate simulation techniques such as photo-montage (Photoshop) are taught to community staff to advance the realism of existing visualization technologies;
- Suitable training for 1 permanent staff member should be provided through a ½ to 1 day course in visualization techniques, concepts, and standards.

The overriding advantage of Level 2 implementation is that the techniques can be easily learned, and visualization skills can be recaptured with relative ease - i.e. compared with the skill sets associated with Level 3 technologies and methods.

**Level 3: Advanced Implementation**
- A full VNS capability is built on the First Nation’s or rural community’s existing GIS platform;
- A minimum of 2 days of instruction in the use of VNS software, plus a 1-2 day course on the principles and methods of landscape visualization, are required;
- Periodic retraining should be undertaken as the technology advances;
- A steady workflow (4 or more projects/year) is necessary for users to remain proficient with the technology and visualization techniques.

Depending on the number of GIS/visualization projects that the First Nation/rural community will assume, staff levels and the availability of funding, and the rate of implementation, the First Nation/rural community may choose one or a combination of the levels described.
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At the very least, Level 1 should be implemented broadly, to begin requesting and using visualizations in project transactions and to initiate an improved understanding of visualizations. Levels 2 and 3 can be seen as sequential stages, as the First Nation/rural community becomes more confident in its visualization capabilities. It is recommended that Level 3 implementation in-house not be attempted until at least one of the following conditions is in place:

i. Long-term GIS computing staff are in place and a steady workflow for over a year can be assured, or
ii. Emerging integrated GIS/visualization software becomes available and can be shown to be simple to use and effective.

Program Management Issues

Once visualization is implemented and becomes part of an operational unit within the tribal/band/rural community administration, there are particular ongoing considerations that should be anticipated as the community works with the new application:

• “Use it or lose it.” More advanced visualization needs a steady volume of work at the appropriate level for preparers to become and remain proficient in their use of the computer software. Computer technologies, particularly desktop systems, evolve rapidly and practitioners can easily lose touch with applications as the software developer modifies them. Skills decline without frequent application and use.
• Community administrators should be wary of “low-end” or beginner VNS users when hiring new staff for in-house projects (or contracting services out if Level 1 implementation is chosen). Preparing landscape visualizations is not a simple and straightforward task, and costly and time consuming errors may result from unrealistic expectations of inexperienced users attempting to train themselves on the job. Adequate time for learning is required.

The groups or band offices that do begin preparing visualizations themselves should take the lead in demonstrating and applying their new tools, to disseminate the knowledge and build realistic expectations for visualization among their community members. Care should be taken not to attempt high levels of realism and sophistication in initial applications, and to disclose mistakes or omissions in the visualization process as learning proceeds. This should help grow a practical, effective and manageable visualization capability as an integral part of resource planning in the community.
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