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CUMULATIVE ENVIRONMENTAL MANAGEMENT ASSOCIATION

Visual Landscape System for Planning and Managing Aesthetic Resources

Working Group: Sustainable Ecosystems Working Group
Final/Approved Report Date: March, 2003

Contract # 2001-0020 & 2002-0008
Visual Resource Inventory Techniques and Visual Resource Assessment
RDI Resource Design Inc. - Forest and Land Planning Services

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CEMA Disclaimer

Contract Name: Visual resource Inventory Techniques and Visual Resource Assessment

Consultant Name: RDI Resource Design Inc. – Forest and Land Planning Services

This report was commissioned by the Cultural and Historical Resources Subgroup of the Sustainable Ecosystems Working Group of the Cumulative Environmental Management Association (CEMA), in its tasks of developing a Visual Landscape System. Specifically, this report was intended to develop a Visual Landscape System that would assist SEWG in meeting the regional vision of sustaining aesthetic resources with the goal of developing management objectives and management option recommendations. The Visual Landscape System (VLS) is a multiple-phase procedure for managing aesthetic resources within the Wood Buffalo Region of the Cumulative Environmental Management Association (CEMA). The purpose of VLS is to provide the regional planning, operational design, and assessment mechanisms for achieving the CHR goals and objectives of integrity and sustainability of aesthetic values.

This report has been completed in accordance with the terms of reference issued by the Cultural and Historical Resources Subgroup of the Sustainable Ecosystems Working Group. The Sustainable Ecosystems Working Group has closed this project and considers this report final.

The Sustainable Ecosystems Working Group does not fully endorse all of the contents of this report, nor does the report necessarily represent the views or opinions of CEMA or the Sustainable Ecosystems Working Group members.

The conclusions and recommendations contained within this report are those of the consultant, and have neither been accepted nor rejected by the Sustainable Ecosystems Working Group.

Until such time as Sustainable Ecosystems Working Group issues correspondence confirming acceptance, rejection, or non-consensus regarding the conclusions and recommendations contained in this report, they should be regarded as information only.

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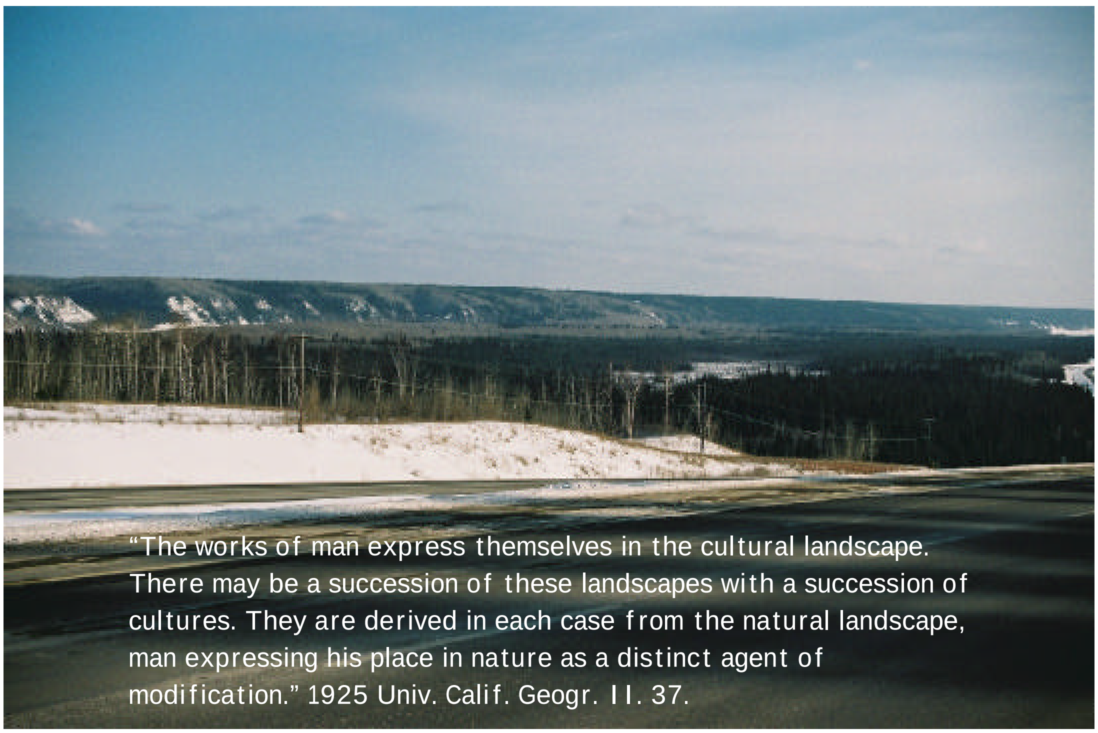

Prepared for
Cumulative Environmental Management Association
Sustainable Ecosystems Working Group
Cultural and Historical Resources Subgroup
By

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RDI Resource Design Inc
Forest and Land Planning Services

March 2003 Final Draft

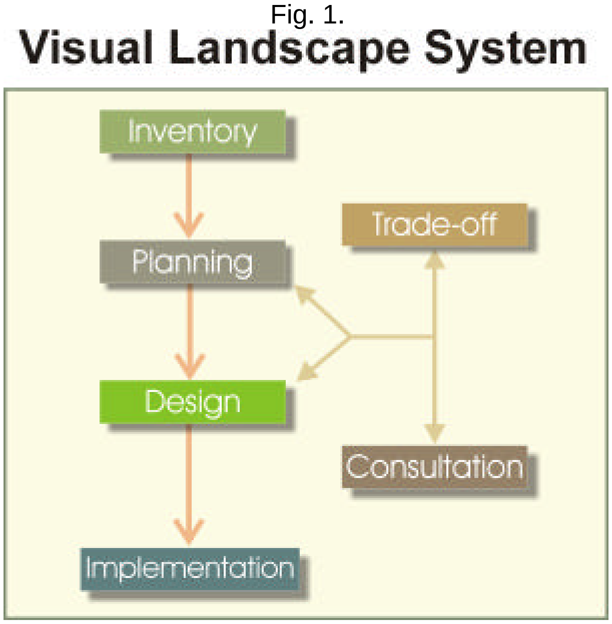
Executive Summary

The Cultural and Historical Resources Subgroup (CHR) of the Sustainable Ecosystems Working Group (SEWG) is charged with meeting the regional vision of sustaining aesthetic resources with the goal of developing management objectives and management option recommendations. The Visual Landscape System (VLS) was developed to achieve that goal.

The VLS process is a synthesis of established procedures for visual resource management that have evolved over three decades in Alberta (Sustainable Development), British Columbia (Ministry of Forests), Great Britain (Forestry Commission), and USA (Bureau of Land Management, USDA Forest Service). The process is adapted to the characteristic landscapes and resources surrounding Fort McMurray, Alberta.

The VLS has six phases (Fig. 1). Inventory, Planning, Design, and Implementation are the 4 primary phases shown on the left side of Figure 1. The ones on the right, Trade-off and Consultation, are supporting phases which are conducted as separate initiatives involving all resource considerations. The content, procedures and output of each primary phase are described in the specific sections in Part 2 of the VLS document.

Fig. 1.



Landscape Integrity, *the visual condition of the landscape compared to the natural or natural-appearing landscape*, provides the common language and measurement criteria across all phases:

1. Describing present conditions,
2. Setting specific and cumulative management objectives in the Landscape Plan,
3. Designing management options to meet those objectives,
4. Implementing and monitoring land-use,
5. Valuing landscape trade-off considerations, and,
6. Measuring public preferences and expectations for aesthetic quality.

RDI conducted a foundational inventory in 2001 to test the system and to provide baseline data for planning, design and evaluation of land-use alteration. The data from the inventory is assembled as a separate appendix to the VLS document. The results are summarized in the VLS document and were used to produce the regional landscape integrity objectives.

Contents

1. Introduction

The Visual Landscape System (VLS) is a multiple-phase procedure for managing aesthetic resources within the Wood Buffalo Region of the Cumulative Environmental Management Association (CEMA). Ken Fairhurst, RDI Resource Design Inc (RDI), developed the procedure for the Cultural and Historical Resource Subgroup (CHR) of the Sustainable Ecosystems Working Group (SEWG), under contract with CEMA, Reference Numbers 2001-0020 and 2002-0008. The purpose of VLS is to provide the regional planning, operational design, and assessment mechanisms for achieving the CHR goals and objectives of integrity and sustainability of aesthetic values.

The goal of the Cultural and Historical Resources Subgroup (CHR) of the Sustainable Ecosystems Working Group is:

- to develop management objectives and management option recommendations to sustain the cultural, historical, recreational and aesthetic resources for the Regional Municipality of Wood Buffalo.

The CHR is charged with meeting the following indicators for achieving its goal with regards to sustaining aesthetic resources:

- Percent of high and moderate scenic values maintained within key viewsheds and important recreational capability areas
- Percent of key viewsheds and important recreational capability areas with locally natural landscape character.

Scenic values and landscape character are collectively represented by the term "landscape integrity" in the VLS.

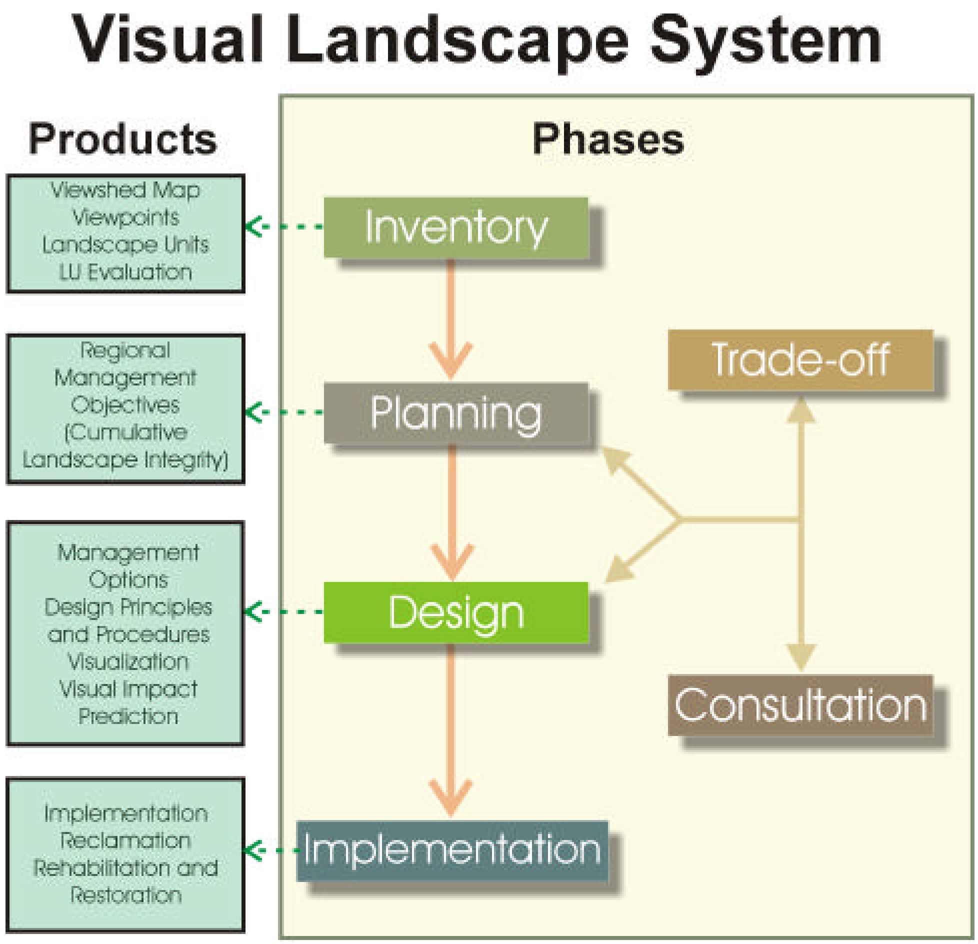
The VLS process is a synthesis of established procedures for visual resource management that have evolved over three decades in Alberta (Sustainable Development), British Columbia (Ministry of Forests), Great Britain (Forestry Commission), and USA (Bureau of Land Management; USDA Forest Service). A preliminary VLS synthesis leading to the CEMA model was produced by RDI in 2001[1]. The VLS is adapted to the characteristic landscapes and resources surrounding Fort McMurray, Alberta.

Phases

There are six phases in the Visual Landscape System. Each phase may not be necessary, or may logically be conducted in a different order depending on characteristics of a particular development initiative. The primary phases are Inventory, Planning, Design, and Implementation. There are two secondary, or modifying phases, Trade-off and Consultation, that are best conducted as a separate, comprehensive approach involving all resource considerations.

A diagram of the system's phases and products is presented on the following page. Each phase is briefly described following the diagram, and in more detail in subsequent sections.

[1] Ken B. Fairhurst, RDI Resource Design Inc. *Visual Landscape System (VLS) – a guide for visually effective design of timber harvesting*. Western Forestry and Conservation Association, Olympia, WA, September 24, 2001.



One common element, Landscape Integrity, is used throughout the VLS. Integrity classes are used to describe present conditions, serve as management objectives, provide a consistent means to judge management options, are a basis for monitoring of land-use implementation, assist landscape trade-off considerations and facilitate the expression of public preferences and expectations for aesthetic quality. In summary the following table provide the phases, descriptions, and acronyms of Landscape Integrity:

Phase	**Landscape Integrity Descriptor**	**Acronym**
Inventory	Existing Landscape Integrity	ELI
Planning	Objective Landscape Integrity	OLI
Design	Predicted Landscape Integrity	PLI
Implementation	Achieved Landscape Integrity	ALI
Trade-off	Costs/Benefits of Integrity	Modifier of OLI
Consultation	Preferred/Expected Integrity	Modifier of OLI

Phases of VLS and the use of Landscape Integrity:

1. Inventory

Inventory is a mapping, photography and evaluation exercise that defines the basic Landscape Units (LUs) and rates those units to give guidance for planning and management of landscape resources. Existing Landscape Integrity (ELI) is rated in the Inventory. Inventory is most appropriately conducted as the first stage of the VLS, over a definable landbase such as the viewshed of a highway corridor, a recreational waterway, or a residential community.

2. Planning

Planning is the phase in which interpretation is made of the data gathered during the Visual Landscape Inventory and where management objectives, known as Objective Landscape Integrity (OLI), are established as a comprehensive Landscape Plan for the region or sub-region. Final decisions may be the result of a larger resource planning process where all other resource values and needs are considered in the selection, and with consideration of the results of Trade-off and Consultation.

3. Design

Design provides the principles and procedures for developing and choosing management option recommendations by which resource development can achieve the objectives of the Landscape Plan. A formalized assessment procedure is used to predict the ability of a development to achieve the OLI and offers guidance to refine the design if necessary. Visual impact assessment procedures are implemented, including visual simulation techniques.

4. Implementation

Implementation is the phase in which operations are monitored as they are implemented and afterwards to ensure the objectives of the Landscape Plan is achieved. In this stage, design problems related to on-the-ground realities are determined and rectified. Planned or newly determined follow-up restoration and rehabilitation procedures are implemented as necessary to achieve the planned Landscape Integrity.

5. Trade-off

Trade-off is the phase during which the alternative limits of change in resource development for achieving Landscape Integrity objectives are examined for their influence on a range of interests, including economic, social and environmental. Factors may be easily quantifiable or monetized, and not so easily quantified, i.e., qualitative factors, intangibles. Trade-off has, as a key component, an assessment of risk and uncertainty with regard to environmental, economic, and social impacts of achieving the Landscape Plan. Trade-off is best conducted as part of a separate, comprehensive approach involving all resource considerations.

6. Consultation

Consultation is a methodology for acquiring public input into the VLS in terms of expectations for landscape quality expressed through the OLI in the Landscape Plan. Consultation is best conducted as part of a separate, comprehensive approach involving all resource considerations.

2. Phase Descriptions and Procedures

VLS phases, and their procedures and products of each phase are presented in the following subsections.

2.1 Inventory

The Inventory Phase is a mapping, recording and rating exercise that is used to locate and evaluate basic elements of the visual landscape. It is used to provide baseline data for planning and management of site specific and cumulative effects of land-use development on visual landscape resources within a locality and along entire viewshed corridors. The inventory procedures have been adapted to fit the characteristic landscape of the CEMA Wood Buffalo Region.

2.1.1 Purposes of Inventory

1. To document the visible landscape of a resource management unit, travel corridor, or other significant viewshed, by mapping the visible extents and obtaining a photographic record.
2. To differentiate homogeneous components of the visible landscape termed Landscape Units (LUs), based on biophysical and viewing related characteristics.
3. To provide the necessary data for landscape analysis and planning.

An operational inventory was conducted by Ken Fairhurst, RDI, in March 2002 to develop, test, and demonstrate the landscape inventory procedures. Viewpoints identified in the inventory are presented on the Composite Visibility Map accessed by linking to: *C:\CEMA_VLS\GIS\final.pdf*, which was produced through GIS analysis for the Planning Phase. To read a “PDF” file, the Acrobat Reader© is required. Landscape Inventory rating forms and summary spreadsheets are presented as a separate appendix.

The Wood Buffalo Landscape Inventory Model has 3 additional Landscape Unit types:

Valley Bottom Units – generally not seen except along shoreline edges. Complete to adjacent visible LU(s).

Highway Margin Units – generally not seen except along highway edge. Complete to 5 km width on each side of the highway.

Main Hill Units – distantly or potentially seen large landforms with relief greater than 100m in height such as Birch Mountains and Fort Hills. Complete from initial slope break (>20%) to height of ground.

2.1.2 Landscape Unit Delineation Procedures

The Visual Landscape Inventory represents the cumulative experience while travelling along a corridor, usually in both directions. The visual landscape should be rated under the most critical conditions, i.e. highest user periods or seasons of use, front or sidelight conditions, best viewing opportunity, and in clear weather. The entire visible landbase within the viewshed corridor is divided into structural entities called Landscape Units. A Landscape Unit is a homogeneous, more or less distinct, component of the visible landscape.

1. Delineate Landscape Units on 1:20 000 or 1:50 000 scale topographic maps based on like physiographic characteristics, (e.g. landform, landcover), similar visual patterns, texture, color, variety, and similar cultural impact (e.g. roads, structures, and surface disturbances). The main differentiation is by major topographic breaks

as seen from key viewpoints. Each LU is assigned a Landscape Unit number (LU#) and evaluated on a rating form, for its own characteristics in relation to neighbouring units and to the corridor overall.

2. Preliminary unit delineation can be commenced in the field, but unit boundaries will usually change with each new viewpoint being assessed.
3. Avoid over-segmentation and differentiation. Main differentiation is by major topographic breaks as seen from key viewpoints, viewing distance, viewing opportunity (e.g. direct view vs. peripheral view, long term view vs. glimpse view).
4. Final decisions about extents of visibility and location of unit boundaries will often require confirmation with hand-drawn sight-line cross sections or GIS visibility analysis.
5. Ensure that photo coverage is sufficient to cover each Landscape Unit. Photography is essential to refine the Landscape Units and provide good clues as to the locations of boundaries between neighbouring units. Collect a complete set of individual photos and/or photo-panoramas produced to provide a baseline record of current visual conditions. Photography assists Planning and Design.
6. Select a rating viewpoint from the array of viewpoints that the LU can be seen from. The rating viewpoint should display most of the extent of the LU or, if too large to be seen completely from a single viewpoint, it should provide sufficient evidence of the factors deemed important to the rating of the LU. Some viewpoints will be more important in themselves, such as highway rest stops, recreational development, or long-term residential or urban viewpoints. There may be only transitory, "glimpse-only" viewing opportunities for the rating process. These are acceptable provided they offer the best information. Additional viewpoints for the LU can be reviewed for the details they might provide, with that information added to the evaluation.
7. Prepare a Landscape Unit Rating Form for each Landscape Unit as assessed from the rating viewpoint(s). While a small number of units can be assessed in the field, accomplishment of this task over a large corridor may require more time than travel logistics, weather, or field time permits. Complete the process as an office project with analysis of the photography collected during the field trips. Add LU # to LU label, show on map, rating form and summary table.

2.1.3 Completing a Landscape Unit Rating Form

The Landscape Unit Rating Form (presented on the following pages) is completed for each Landscape Unit determined in the inventory process. The form is used to record the important characteristics of each unit as assessed from one or more rating viewpoint(s). Rating viewpoints should provide a good understanding of the unit as experienced by visitors to the area. As the inventory is intended to provide the cumulative experience of the landscape, gaining the overall impression of the unit is an important consideration when preparing the evaluation. While a small number of units can be assessed in the field, accomplishment of this task over a large corridor may require more time than travel logistics, weather, or field time permits. Complete the process as an office project with analysis of the photography collected during the field trips. A large amount of information about each unit is recorded on the form. A complete description of rating elements is presented following the sample rating form.

The Landscape Unit Rating Form contains the following components:

1. Rating viewpoint(s) are recorded in the upper left-hand corner of the rating form.
2. Map sheet number(s) is recorded to the right of the Rating Viewpoint.
3. Photo number(s) are recorded in the box furthest on the upper right of the form. If there are many photos, it may be best to link each form to a master spreadsheet, which has links to the digital photographic database to the summary spreadsheet to review all the photos.
4. Landscape Unit Label boxes are used to summarize the rating of each element on the form. To the left is a legend for the abbreviations in the boxes.
5. Conducted by: provides the name of the producer of the inventory.
6. Date: is the reference date of the inventory.

7. Element Rating area is used to complete the ratings for each of the 5 elements and their component factors. Moveable circles are placed over the appropriate ratings. Space is provided in the Landscape Attraction rating area to record vertical relief and percent slope of the unit.
8. Integrity Modifying Factors provide some additional contextual information. Moveable check marks are used to denote the appropriate conditions. Additional check marks can be added by copying an individual one.
9. Landscape Unit Comments on page 2 of the form is expandable as required to provide the opportunity for describing the unit characteristics more fully.
10. Landscape Unit Photography on page 2 of the form is expandable as required to provide the opportunity for inclusion of key photos of the unit.

All data from the baseline inventory conducted by RDI is found in the separate Appendix and on the data CD. Links are correctly established when the data is placed on the “C” drive of the viewer’s computer, maintaining the same folders as provided on the CD. A digital version of the rating form was produced to facilitate digital completion and storage:

C:\CEMA_VLS_VLS\Rating Sheet Master\CEMA LU Rating Form Template.dot

Forms completed for the CEMA Visual Landscape Inventory can be viewed by linking to: “C:\CEMA_VLS\Rating Sheets”.

VLS Landscape Unit Rating Form

Rating Viewpoint(s): | **Map #(s):** | **Photos:**

Rating Elements
- A: Attraction
- O: Observability
- S: Significance
- R: Risk
- ELI: Integrity (existing)
- OLI: Integrity (objective)

Landscape Unit Label – add values from each Element rating						
LU#	A	O	S	R	ELI	OLI*

*OLI is determined in the Planning Phase

Conducted by: | **Date:**

Assign appropriate ratings and place in LU label above. Add additional comments on side. Overall ratings in each category may be influenced more strongly by a single factor or few factors. If so, make note of this in the comments at side or on the reverse.

Attraction (A)			
Landform	high attraction; 31-60% slope 5; more than 60% slope 10	moderate attraction; 16-30% slope 3	low attraction; 0-15% slope -5
Vegetation	High attraction, interest 5	Moderate attraction 3	Minor influence: 1; neutral: 0
Water	High attraction, interest 5	Moderate attraction 3	Minor influence: 1; neutral: 0
Colour	High attraction, interest 5	Moderate attraction 3	Minor influence: 1; neutral: 0
Adjacent scenery	Enhances LU attraction 5	Moderate influence 3	Minor influence: 1; neutral: 0
Scarcity (in region)	Rare, unique 5	Distinctive, common 3	Minor influence: 1; neutral: 0
Land-Use Modification	Harmonious 5	Neutral; not present 0	Unharmonious -5
Overall Points:______ Rating:	**1 (High) 26 or more**	**2 (Moderate) 11-25**	**3 (Low) 10 or less**
Vertical Relief (m):		**Percent Slope (%):**	

For Landscape Attraction Factors above that are neutral or not present, assign a zero (0) rating.

Observability (O)			
Viewing Distance	Foreground/Middle ground < 5km (Front) 10	Background 5km – 15 km (Back) 3	Seldom Seen FG/MG/BG or >15km (Far Back) -5
Viewing Orientation towards LU	Focal; direct in Line of sight (LOS) 5	Oblique; Tangential to LOS 3	Peripheral; angled away from LOS 1
Viewing Frequency	Many opportunities 5	Some 3	Few 1
Viewing Duration	Long 5	Moderate 3	Glimpse 1
Overall Points: _____ Rating:	**1 (High) 17 or more**	**2 (Moderate) 8-16**	**3 (Low) 7 or less**

Significance (S)			
Circle Rating in Matrix	Landscape Observability (across)		
Landscape Attraction (down)	1 High	2 Moderate	3 Low
1 High	**1 High Significance**	**1 High Significance**	**2 Mod. Significance**
2 Moderate	**1 High Significance**	**2 Mod. Significance**	**3 Low Significance**
3 Low	**2 Mod. Significance**	**3 Low Significance**	**3 Low Significance**

Risk (R)			
Slope Class (Slope: ______%)	Steep 31-60%+ 5; Very steep >60% 10	Moderate 16-30% 5	Gentle 0-15% -10
Land-Cover Diversity	Low/uniform 5	Moderate 3	High 1
Topographic Diversity	Low/uniform 5	Moderate 3	High 1
Colour Contrast	Low/uniform 5	Moderate 3	High 1
Illumination	Front/side 5	Side only 3	Back-light 1
Overall Points:____ Rating:	**1 (High) 19 or more**	**2 (Moderate) 7 - 18**	**3 (Low) 6 or less**

Rating:	Existing Landscape Integrity (ELI)
1 Very High	No alteration evident, very subordinate, very high landscape conformity, (0%-1.5% alt. in LU)
2 High	Minimal alteration evident, subordinate, well-designed, high landscape conformity (1.6%-7%)
3 Moderate	Moderate alteration evident, dominant, moderate landscape conformity (7.1%-18% alt.)
4 Low	Intensive alteration evident, very dominant, low landscape conformity (18.1%- 30% alt.)
5 Very Low	Very intensive alteration evident, extremely dominant, very low landscape conformity (>30%)

Integrity modifying factors:

Cumulative effect of current alteration in locality/corridor: ☐ High ☐ Moderate ☐ Low ☐ n/a ✓

Perceived ecological integrity in locality/corridor: ☐ High ☐ Moderate ☐ Low ☐ n/a ✓

Locality influence: ☐ Urban ☐ Urban Fringe ☐ Rural, Developed ☐ Rural, Natural ☐ Industrial ✓ ☐ Recreational, Developed ☐ Recreational, Natural ☐ Backcountry ☐ Wilderness

Page 2 of Landscape Unit Rating Form Sample
Landscape Unit #________ Comments

The Wood Buffalo Landscape Inventory Model has two additional "fill" Landscape Unit types:

Valley Bottom Units – generally not seen except along shoreline edge. Complete to adjacent visible LU(s).
Highway Margin Units – generally not seen except along highway edge. Complete to 5 km width on each side of the highway.

Add some general or specific comments about the unit here. Space is not a limitation as additional pages will be created automatically.

Landscape Unit # Photography

(add one or more photos)
Click on image to insert new photo, click "insert", "Picture" "from file", "Photo file", "Roll #" "image #".
Add comments including photo # below each photo.

Note: if used as a word document, the rating form can be saved as a template. Marker circles can be moved to the correct rating and relevant information added.

2.1.4 Landscape Unit Elements and Rating Guide

Each LU is rated for each of 5 Landscape Elements, each with its own group of factors. A 6th element, Objective Landscape Integrity (OLI) is presented in the Landscape Inventory label, but is not derived until the Planning Phase:

Attraction (A)	biophysical characteristics of a Landscape Unit which attract attention and maintain interest
Observability (0)	viewing factors which raise or diminish the prominence of a Landscape Unit in view
Significance (S)	the relative importance of a landscape unit when combining Attraction and Observability in a matrix
Risk (R)	the predisposition of a Landscape Unit for revealing or absorbing and blending land-use alteration
Existing Landscape Integrity (ELI)	the current evidence and dominance of land-use alteration within a Landscape Unit, compared to the natural or natural-appearing characteristic landscape
Objective Landscape Integrity (OLI)	the planned Integrity level for the Landscape Unit derived in the Planning Phase

The Landscape Elements, and the planned OLI are recorded as part of the Landscape Unit Label in the following format:

Landscape Unit Label

LU #	A	0	S	R	ELI	OLI

The Landscape Unit Label is completed for each of the elements on the rating form and added to the inventory map. Specific instructions for each element follow.

1. Attraction

Landscape Attraction (A) is a rating of the prominence, features and other characteristics of each Landscape Unit. Attraction is a measure of “what” is seen in the view; and a weighting of how much each factor contributes to that attraction and grabs the attention of the viewer. Attraction is determined by the cumulative measure of 7 factors:

1. **Landform Slope / Relief / Characteristics**
2. **Vegetation**
3. **Water**
4. **Colour**
5. **Adjacent Scenery**
6. **Scarcity (in region)**
7. **Land-Use Modifications**

Circle each component factor rating as appropriate, add the ratings to obtain the total rating, and circle the Attraction rating class that corresponds to the sum rating. Add the Attraction rating class to LU label on the map, rating form and summary table. In some cases a single factor may dominate and should be used to select the overall rating. For Attraction Factors that are neutral or not present, assign a zero (0) rating. A written rationale may be useful to support the selection. For most Attraction Factors, on-site appraisal and/or photographic analysis are required.

Attraction Class Ratings

Class 1 High 26 or more
Class 2 Moderate 11-25
Class 3 Low 10 or less

Detailed description of the 7 factors of Attraction:

1. Landform Slope / Relief / Characteristics

Slope is an important contributor to Attraction. Slope categories are assigned to cover the full range of slopes from flat to vertical. In the Fort McMurray area, the terrain is quite gentle, except along the river escarpments. The prevailing lesser slopes in the area necessitated the development of narrower slope classes for the analysis. Depending on location of the viewer, the apparent slope (seen slope) may be greater than or less than physical slope. For example, elevated viewpoints can bring flat terrain into prominence, while steep terrain may be obscured by intervening vegetation if the observer is close and looking parallel up, down, or across the slope. Slope is easily measured on a topographic map (minumum 1:20 000 scale and preferably 1:5 000) scale by recording the rise of elevation in a portion that will give a good result (key slopes), then dividing it by horizontal distance along the same portion of the landscape measured to give a percent slope value. The slope check can be carried out several times for each landscape unit on the map or with a clinometer in the field to obtain an average of the “key” slopes. The procedure should not be used to determine the full slope range from bottom to top of each LU as terrain undulation might overwhelm the contribution of some steep key slopes in the measure.

Terrain variation in a particular view is generally the height of the escarpments (60m – 100m in the Athabasca; 100m – 150m in the Clearwater). The highest local landform, Stony Mountain, has an elevation of 760m and a vertical rise above the nearby Highway 63 landscape of only 300m. Viewing distance categories in the Inventory model reflect this restricted influence (see Observability). The influence of vertical relief is affected by viewer location. For example, a 50m high cliff in near view may be more prominent than a 300m high landform in distant view. For this reason, particularly within the characteristic landscape in the Fort McMurray area, vertical magnitude is entered as a relative factor within the Landform Slope/Relief/Characteristics category of the Attraction rating. The magnitude of the landform also influences viewing distances, as lower landforms are seen over shorter distances than larger landforms (see Observability – Viewing Distance). Vertical magnitude of the visible landscape can be measured directly on the topographic maps or by GIS analysis and recorded to provide “hard” data when differentiating landscapes and their comparative values.

Landform Slope / Relief / Characteristics Rating 1. Record key slope(s) in % Vertical rise / horizontal run x 100% . 2. Record vertical relief in view (elevation change).	Steep (31% to 60%) , generally wooded, with very apparent vertical relief relative to surrounding landscape. **5** Very steep landforms (>60%) such as prominent escarpments, canyons, cliffs, spires, or massive rock outcrops; or severe surface variation or highly eroded formations; or dominant detail features. Very High attraction. **10**	Moderate (16-30%) with apparent relief relative to surrounding landscape; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. Moderate attraction. **3**	Low (0-15%) and/or flat valley bottom with subtle vertical relief or flat; or few or no interesting landscape features. Low attraction. **-5**

2. Vegetation

Vegetation has an attraction capacity in the landscape. Patterns of mixed forest types, an unbroken forest canopy draping a hillside across the lake from a recreation site, the fine texture of young forest next to the course texture of older forest are all examples of the vegetation factor influencing attraction. Colour is considered for vegetation in itself in this category, while colour contrasts with other elements in the landscape are considered separately under the “colour” factor, which is presented after the “water” factor.

Vegetation Rating	A variety of vegetation types as expressed in interesting forms, textures and patterns; or highly uniform forest creating strong interest. High attraction **5**	Some variety of vegetation adding some interest in the landscape, but only one or two major types. Moderate attraction. **3**	Little or no variety or contrast in vegetation. Low attraction. Minor influence. **1** Neutral or not present/evident. **0**

3. Water

Water can provide a strong attraction capacity in the landscape. Often water bodies become the focus of recreation attraction, providing open viewing opportunity and increase the attraction of the surrounding landscapes. Water can be an important component of a scene. Water often provides an interface with the land which becomes, in itself, a point or zone of increased attraction and use. Still lakes can add reflection; rushing rivers can add movement; frozen water-bodies offer seasonal recreational attractions and add appeal in the landscape.

Water Rating	Strongly present, still or moving, being a dominant factor in landscape. High attraction. **5**	Flowing or still, but not dominant in the landscape. Moderate attraction. **3**	Absent, or present but not noticeable or increasing attraction. Minor influence. **1** Neutral or not present/evident. **0**

4. Colour

Colour in the landscape can be an attraction. The appeal of deciduous forests in autumn is well known, but vegetation effect has already been documented as a prior factor. Use the colour section to assess the contribution of all the elements that may exist and create attraction in the landscape together – rock, soil, snow, vegetation – their contrasts, patterns and combinations.

Colour Rating	Rich colour combinations, variety or vivid colour; or pleasing contrasts in the soil, rock, vegetation, water, or snowfields. High attraction. **5**	Some intensity of variety in colours and contrast of the soil, rock, and vegetation, but not a dominant scenic element. Moderate attraction. **3**	Subtle colour variation, contrasts, or interests; generally muted tones. Minor influence. **1** Neutral or not present/evident. **0**

5. Adjacent Scenery

When evaluating a single Landscape Unit, remember that it does not usually exist in isolation. When it is part of a larger panorama, it is important to consider the effect of the broader context or scene on the individual component of the scene that you are rating. Often the setting can have more attraction than the individual Landscape Unit, particularly if it that unit is a minor but key component of a scene. The attraction of that LU is raised by that influence of the surrounding landscape.

Adjacent Scenery Rating	Adjacent scenery greatly enhances visual attraction. **5**	Adjacent scenery moderately enhances overall visual attraction. Moderate influence. **3**	Adjacent scenery has minor influence on overall visual attraction. **1** Neutral or not present/evident. **0**

6. Scarcity

The scarcity factor permits the highlighting of special areas or features which prominence and other factors fail to recognize. Whether by historical or cultural significance or by environmental rarity, some features will have an important sense of place. Consider "scarcity" within the region.

Scarcity Rating	One of a kind; or uniquely memorable, or very rare within region; strong sense of place. **5**	Distinctive, though somewhat common within the region. **3**	Very common within the region; Minor influence on attraction. **1** Neutral or not present/evident. **0**

7. Land-Use Modification

The land-use modification factor considers the effects of current development modifications on attraction. Whether urban, industrial, residential, or recreational, developments may add appeal (positive attraction) or detract from the appeal of the landscape (negative attraction). Harmonious modifications have achieved a balance in the landscape and may make a positive contribution to the setting. Other modifications might be discordant if their presence seems out of place, disruptive to scenic enjoyment, too dominant, too repetitive, unpleasing to the eye, or are not designed to fit the landscape. The Design Phase presents criteria for assessment and guidelines to achieve greater compatibility in the landscape.

Land-Use Modification Rating	Modifications add favourably to visual variety in the characteristic landscape while promoting visual harmony; positive attraction. **5**	Modifications add little or no visual variety to the area, and introduce no discordant elements; neutral or not present/evident. **0**	Modifications are discordant and promote strong disharmony in the characteristic landscape; unharmonious; negative attraction. **-5**

2. Observability

Landscape Observability (O) is a weighting and rating of the viewing opportunities towards each Landscape Unit, considering the factors of distance, orientation frequency and duration of the viewing experiences. Observability provides a measure of “how” the LU is seen. In high relief landscapes, the visual influence may extend for great distances. In areas of flatter terrain, such as in the Fort McMurray area, the visual influence is more restricted. Viewing distance categories in the inventory have been adjusted to reflect this restricted influence. Observability considers the location of the landscape unit within the normal viewing experience as related to the mode and speed of travel, and to the angle at which the landscape unit is accessed by the viewer’s line of sight. Circle the most defining factor(s) that typify the viewing experience, and select the overall Observability rating and enter the value in the Landscape Unit label. In some cases a single factor may dominate and should be used to select the overall rating. A written rationale may be useful to support the selection.

Observability Class Summary Ratings

Class 1 High 17 or more
Class 2 Moderate 8-16
Class 3 Low 7 or less

The 4 factors of Observability are:

1. Viewing Distance

Viewing distance is the distance of the Landscape Unit from the viewer. As the inventory assesses the landscape as a cumulative experience while travelling the viewshed corridor, viewing distances to a Landscape Unit will often vary from close-up to distant. It is important to assess the individual LU landscape from the most significant viewpoint termed the “rating” viewpoint. More than one viewpoint may have to be assessed. If so, indicate the viewpoints on the rating form and note the viewing distance from the key rating viewpoint on the form and other viewing distances in the comments if considered important. Viewing distance has 3 categories, adjusted for the Fort McMurray characteristic landscape (see Landform Slope / Relief / Characteristics section of Attraction for a discussion regarding relief).

Foreground/Middleground – up to 5km viewing distance, the “front” zone purposefully merges foreground and closer middleground distance zones as it contains most of the important visible landscape extending from the road, lake, or river edge to the surrounding slopes in clearest, most proximate view. In this category, high detail is evident in the landform, vegetation and land-use modification. While detail and scale will increase closer to the viewer within this zone, quite often there is more intervening screening in the immediate foreground, whereas middleground views are frequently more open and less screened. The Characteristic low landscape of the Fort McMurray area rapidly diminishes viewing opportunity beyond the front zone.

Background – 5km to 15km, the “back” or background zone contains most of what is seen in “distant” views in the characteristic landscape. Details are less evident in this zone compared with the front zone.

Seldom Seen /Greater than 15km – this zone is a dual catch-all for areas in the viewshed that may be closer-up but seldomly seen, or are very distant (>15km away). The seldom seen component is useful for depicting the Landscape Units that are present but have very minor viewing opportunities, and the distance factor permits the inclusion of LUs with very low influence due to their distance from the viewer.

Viewing Distance Rating	Foreground / Middleground < 5km **10**	Background 5km – 15 km **3**	Seldom seen in Foreground/ Middleground/ Background, **-5**

2. Viewing Orientation

Viewing orientation addresses the relationship of the viewer to the Landscape Unit by way of the position and angle at which the LU is seen. Theoretically, we have the capacity to move our eyes and turn our heads and bodies to enjoy a full 360° panorama. Often the viewing experience is guided the mode of travel, which may channel our view along a particular direction, speed of transportation, which narrows our cone of vision, and by screening which restricts the scope and direction of view. This orientation can bring focus to certain landscapes and relegate others to minor experiences. Landscape Units that are focal and direct in view are given a higher weighting than more obliquely-seen (tangentially) or peripherally-seen Landscape Units. As well, LUs that are perpendicular to the line of sight are seen more clearly than those that angle away from the line of sight. Orientation has an important role in the Design Phase.

Viewing Orientation Rating	LU in focal position; perpendicular, direct in line of sight **5**	LU in oblique position; Tangential to line of sight **3**	LU in peripheral position, angled away from line of sight **1**

3. Viewing Frequency

Viewing Frequency is a relative measure of the number of viewing opportunities towards a Landscape Unit. Many or wide-open viewing opportunities invite more attraction than a single viewing opportunity.

Viewing Frequency Rating	Many opportunities **5**	Some opportunities **3**	Few opportunities **1**

4. Viewing Duration

Viewing Duration is a relative measure of the length of time that viewers likely spend engaging in viewing a particular Landscape Unit. Long duration would include experiences such as landscapes in view from recreational developments, towns, or residences. Moderate duration may include views from highway viewpoints and while travelling where the Landscape Unit is viewed for several minutes. Glimpse views come and go quickly (ephemeral due to the mode and speed of travel). Note that the eye can assemble a lot of information about a Landscape Unit in a matter of seconds, so don't undervalue the significance of glimpse views if they are otherwise appealing.

Viewing Duration Rating	Long **5**	Moderate **3**	Glimpse **1**

3. Significance

Landscape Significance (S) is a measure of the importance of a Landscape Unit, derived as the net influence of what is seen in the landscape (Attraction) and how it is seen (Observability). As evidenced in the Significance matrix, Observability rating has a moderating influence on Attraction, serving to raise or lower overall Significance depending on how directly a landscape is seen, how long it is seen, by how many, or with what level of interaction by the viewers.

High Significance indicates that a Landscape Unit is relatively very important within the viewshed corridor and warrants the highest level of attention during the planning and design phases. Moderate Significance indicates that a Landscape Unit is relatively important within the viewshed corridor and warrants moderate attention during the planning and design phases. Low Significance indicates that a Landscape Unit is has relatively low importance within the viewshed corridor and warrants the least attention.

Enter that rating into the LU label on the map, rating form and summary table. Circle the two component ratings then circle the appropriate Significance rating and add it to the LU label. Add the LS rating to LU label on the map, rating form and summary table. In some cases a single factor may dominate and should be used to select the overall rating. A written rationale may be useful to support the selection. For most elements, on-site appraisal and/or photographic analysis are required.

The following matrix is used to determine Significance. There are no component factors:

Significance Matrix **Circle S rating where A and O Ratings meet:**			
	Observability (0)		
Attraction (A)	1	2	3
1	**1- High**	**1- High**	**2- Mod.**
2	**1- High**	**2- Mod.**	**3- Low**
3	**2- Mod.**	**3- Low**	**3- Low**

4. Risk

Landscape Risk is the predisposition of a Landscape Unit for revealing, heightening exposure, or absorbing and blending land-use alteration based on inherent characteristics within the unit. Risk includes most factors that have already been addressed in Attraction (slope, land-cover diversity i.e. vegetation pattern, topographic variety, colour contrast), plus an additional factor – illumination. The similarity with Attraction is purposeful, in that the same factors in the landscape that attract the eye also can be assessed for their ability, or lack of it to assist land-use modifications to blend in. The ability to accept alteration/development will vary with quality and appropriateness of design as it relates to the landscape characteristics with regard to detailed factors such as colour, texture and pattern, and with bolder factors such as shape and scale. Risk is used and tested mainly in the Design Phase, serving general notice regarding the ease or difficulty of implementing land-use activities. Specific decisions regarding an activity must be addressed in the design phase, where design guidelines and constraints can be applied to encourage appropriate development that fits the landscape.

Circle the appropriate rating for each Risk Factor, summarize the ratings, and circle the appropriate R summary rating. Add the R rating to LU label on the map, rating form and summary table. In some cases a single factor may dominate and should be used to select the overall rating. A written rationale may be useful to support the selection. For most Risk Factors, on-site appraisal and/or photographic analysis are required. Record percent slope (vertical rise/run) for key slopes in view. Do not record total slope from top to bottom of the unit unless that is an indication of the key slope.

Risk Class Summary Ratings
Class 1 High 19 or more
Class 2 Moderate 7-18
Class 3 Low 6 or less

The 5 factors of Risk are:

1. Slope Class

Slope is the strongest contributor to Risk. The same slope classes are applied in Risk as in Attraction, but their influence is interpreted differently. For example, a steep slope with an absence of topographic and vegetative patterns offers less opportunity for land-use to fit in and become visually absorbed, and therefore is of higher risk. Low slopes and much diversity allow changes to fit in easily and become visually absorbed and blend in with little notice.

Slope Class Rating	Steep 31-60% 5 Very Steep >60% 10	Moderate 16-30% 5	Gentle 0-15% -10

2. Land-Cover Diversity

Land-cover diversity assists greatly with the ability to blend in land-use modifications when they are designed in consideration of the characteristics of that land-cover diversity without overwhelming it. The absence of pattern within a uniform land-cover may create a high (or exaggerated) risk of being very apparent. Where there is much pattern created by elements in the landscape such as forest types, natural openings, rock outcrops, and/or existing modifications, land-use modifications have a greater opportunity to be added in the landscape with low risk of being very apparent.

Land-Cover Diversity Rating	Low/uniform 5	Moderate 3	High 1

3. Topographic Diversity

Diversity of topography can encourage land-use modifications to blend in when they are designed in consideration of the characteristics of that topographic diversity without overwhelming it. Even terrain provides little opportunity to blend in land-use modifications and is considered high risk, whereas broken terrain with hills, hummocks and gullies, can offer many opportunities and is therefore lower risk.

Topographic Diversity rating	Low/uniform 5	Moderate 3	High 1

4. Colour Contrast

Colour contrast can assist or hinder the visibility of land-use modifications in the landscape. For example, brightly-coloured soils may be exposed during the modification which have a high risk of being strongly apparent, while muted tones may encourage the addition of a modification with low risk of being apparent at all. The influence of seasonal contrasts, such as snow on bare ground amidst dark forest, should be considered where use during that season is significant.

Colour Contrast Rating	Low/uniform 5	Moderate 3	High 1

5. Illumination

Illumination is a measure of the aspect of the Landscape Unit or direction it faces relative to normal sunlight angle which affect its brightness or depth of shade. North-facing slopes are frequently in shadows and have lower risk of exposure of land-use modifications than south-facing, higher risk slopes which may be brightly illuminated throughout most of the day.

Illumination Rating	Front/side 5	Side only 3	Back-light 1

5. Integrity

Existing Landscape Integrity (ELI) is an assessment of the influence of land-use alteration (disturbance) evident in the Landscape Unit measured by degree of current change from the natural or natural-appearing characteristic landscape. When disturbed areas reach a stage of revegetation where bare ground is no longer evident and full cover is restored and easily observed by the average viewer, that area has achieved visually-effective green-up (VEG) and no longer contributes to the disturbed area measurement. Until the VEG condition is achieved it is said to be nonVEG.

Integrity is measured in terms of Definition, Design Quality, and Quantification:

> **Definition**: the verbal definition of each Integrity Class that the current condition achieves.
> **Design Quality**: the effect of shape, pattern and other design criteria discussed in the Design Phase that assists the LU to achieve the Integrity Class.
> **Quantification**: the percent alteration (nonVEG disturbance) of the LU in perspective (camera) view that defines the current condition of the LU.[2]

The assessment is conducted from the rating point (usually the best viewing opportunity for that unit). Add the Integrity rating to LU label on the map, rating form, and summary table. In some cases a single factor may dominate and should be used to select the overall rating. A written rationale may be useful to support the selection. For most elements, on-site appraisal and/or photographic analysis are required.

Modifying factors include the type of locality along the spectrum from urban, industrial, through rural, to back-country, and wilderness, and the perceived harmony between visual and ecological landscape integrity within the locality/corridor. These influences are addressed in general in the inventory process and in more detail in the Planning Phase. Public expectations and preferences should be determined in the Consultation Phase.

Integrity is also assigned in the Planning Phase as management objectives (OLIs) that are comparable in definition and measurement to existing Integrity (ELI). Integrity is also used as a consistent reference element when considering management options, land-use decisions, trade-off and public consultation.

Integrity Classes

Class 1 (very high)	No alteration/development evident; very subordinate; or present and very minor with very high conformity in landscape; very well-designed to fit detailed Landscape Risk factors such as texture, colour and pattern; completely natural (preserved scenic quality) or natural-appearing (retained scenic quality) (0%-1.5% of LU in perspective view)
Class 2 (high)	Minimal alteration/development evident; subordinate; minor and well-designed to fit detailed Landscape Risk factors such as texture, colour and pattern; high conformity in landscape; partially retained scenic quality (1.6%-7% of LU in perspective view)
Class 3 (moderate)	Moderate alteration/development evident; dominant, well designed to fit bolder Landscape Risk factors such as shape and scale, moderate conformity in landscape; modified scenic quality (7.1%-18% of LU in perspective view)

[2] Quantification values adapted from results of BC Ministry of Forests' public perception research.

Class 4 (low)	Intensive alteration/development evident, very dominant in all views, very low conformity in landscape; designed to somewhat fit bolder Landscape Risk factors such as shape and scale; highly modified scenic quality (18.1%- 30% of LU in perspective view)
Class 5 (very low)	Very intensive alteration/development evident; extremely dominant in all views, very low conformity in landscape; cannot not fit even bolder Landscape Risk factors such as shape and scale; very highly modified scenic quality (30%+ of LU in perspective view)

3-1 Very low existing Landscape Integrity – Syncrude tailings work in progress.

Recovering Landscape Integrity

Recovering Landscape Integrity

2.1.5 Landscape Unit Summary Sheet

A summary table of all Landscape Units and ratings is prepared the Landscape Units, with links to the Rating Form for each unit, the ratings from the Rating Form, related photography with links to the image file, viewpoint number, mapsheet number, geographic location / view direction, and comments. This is best accomplished as a spreadsheet using software like MS Excel. The spreadsheet produced by RDI for the Inventory has the following format:

VLU & Link to Rating Form	A	O	S	R	ELI	OLI	IMAGE	VP	MAP	Location/ View Direction	Comment
AB01	3	1	2	3	2		Roll 11-11	A03	74D11	NW - GRANT ISLAND	NW to west shore
AB01	3	1	2	3	2		Roll 11-12	A04	74D14	E - CLARKE CREEK	Shore feature, dark
AB01	3	1	2	3	2		Roll 11-13	A04	74D14	N - CLARKE CREEK	
AB01	3	1	2	3	2		Roll 11-14	A04	74D14	E - CLARKE CREEK	Schmidt/ Clarke Ck. Shore
AB01	3	1	2	3	2		Roll 11-15	A04	74D14	E - CLARKE CREEK	Schmidt/ Clarke Ck. Shore
AB01	3	1	2	3	2		Roll 11-16	A04	74D14	E - CLARKE CREEK	Schmidt/ Clarke Ck. Shore
AB01	3	1	2	3	2		Roll 11-17	A05	74D14	N - POPLAR ISLAND	17-19 pan east shore
AB01	3	1	2	3	2		Roll 11-18	A05	74D14	E - POPLAR ISLAND	
AB01	3	1	2	3	2		Roll 11-19	A05	74D14	E - POPLAR ISLAND	
AB01	3	1	2	3	2		Roll 12-4	A09	74D14	W - NORTHLAND MILL	WILLOW ISLAND

The rating columns refer to the ratings assigned on the Landscape Unit Rating Form for each landscape element - Attraction (A), Observability (O), Sensitivity (S), Risk (R), and Integrity (ELI). An additional column is provided for Objective Landscape Integrity (OLI) which is determined in The Planning Phase. The complete Inventory Summary Sheet can be viewed by linking to: "C:\CEMA_VLS\VLI_Excel\CEMA VLU Ratings.xls". The photo file produced for the same inventory can be examined by linking to: "C:\Photo File\". An efficient viewer is desirable for reviewing the photography. One such viewer is Irfanview©. Which is provided in the Photo File folder.

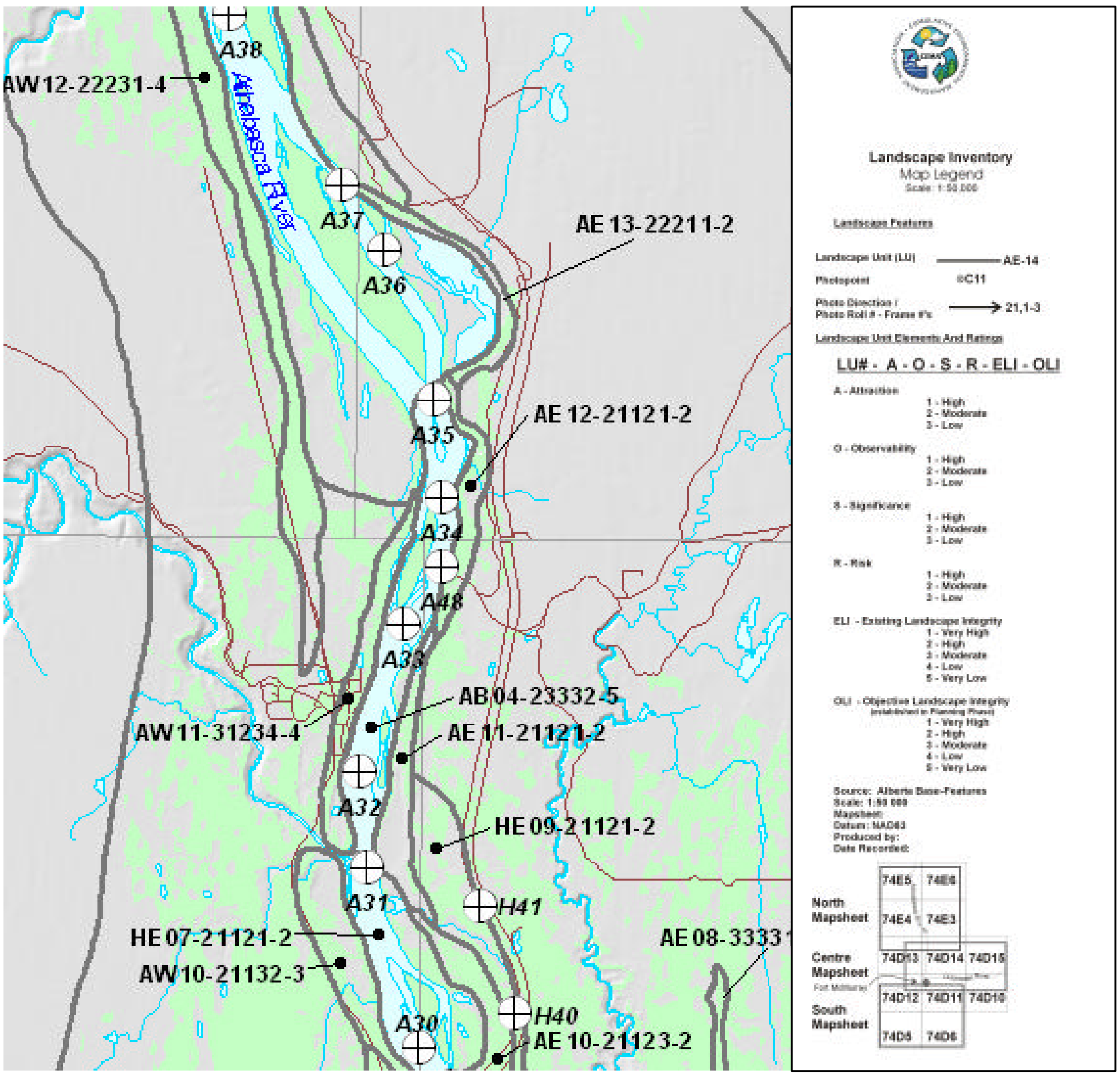
2.1.6 Operational Inventory

An operational landscape inventory was conducted by Ken Fairhurst, RDI, in March, 2002. Highway 63 was traversed by motor vehicle in both south and north directions from Jacos/Hangingstone area in the south to near Bitumount at the north end of the study area. Additional corridors assessed were Highway 69, including the airport and Vista Ridge, to the end of the road, Route 880 to Gregoire (Willow) Lake, the road up Stony Mountain, and Confederation Way in Fort McMurray. Two frozen rivers were traversed by snowmobile in March: the Athabasca from Fort McMurray north to Bitumount, and the Clearwater River from Fort McMurray east to Clearwater River Lodge. Guides were provided by Alberta Sustainable Resource Development, Land and Forest Division, Waterways Forest Area,

Landscape Units, viewpoints and photo numbers were recorded on NTS 1:50 000 maps. Data was later transferred to 1:50 000 Alberta Sustainable Resource Development Alberta Basefeatures digital maps 74D 5,6,10-15 and 74E 3-6 obtained from the Resource Data Division. Final map output was organized into 3 composite mapsheets titled South, Centre and North mapsheets. Maps were produced in digital and hard copy formats. The digital file was forwarded to the Resource Data Division for inclusion in the Alberta Base-features database. A map sample and legend are presented on the following page.

All Inventory data is presented on the Data CD. A photo file, found on the CD under "C:\Photo File\" is comprised of all 23 rolls of 35mm photography collected during field exercises and placed into digital ".jpg" format. The photo file is linked to individual Landscape Unit Rating Sheets "C:\CEMA_VLS\Rating Sheets" and to the Landscape Rating Summary spreadsheet titled "C:\CEMA_VLS\VLI_Excel\CEMA VLU Ratings.xls".

In all, 104 unit rating sheets were produced by RDI for Landscape Inventory. These are available in digital version as MS Word documents identified by each Landscape Unit name in the file folder named "C:\CEMA_VLS\Rating Sheets". Each sheet is linked to the summary MS Excel Summary Spreadsheet titled "C:\CEMA_VLS\VLI_Excel\CEMA VLU Ratings.xls". The spreadsheet further links Landscape Units and viewpoints to the photographic file. Note: to ensure the links are properly established when examining the data, place both the Photo File folder and the CEMA_VLS folder directly on your computer's C drive.



Visual Landscape Inventory Map and Legend. Green area is visibility as produced by GIS Visibility Analysis. Full maps are presented as Appendices.

2.2 Planning

Landscape Planning is the phase of the VLS where management objectives termed Objective Landscape Integrity (OLI) are developed. The objectives form a comprehensive regional or sub-regional Landscape Plan. The key benefit of the plan is that it is able to address the cumulative effects of land-use in the landscape. The Landscape Plan has the capacity to direct the intensity and dispersion of land-use activities across the landscape. The OLIs provide a systematic framework for comparing planned conditions with existing conditions, judging the timing, location and adequacy of land-use design and implementation, and facilitate trade-off and consultation.

OLIs are established in either of two ways. The “default” OLI is a “bottom-up” method that assigns OLIs based on present landscape values identified in the landscape inventory. The “planned” OLI is a “top-down” method that regional expectations for landscape quality. The two methods can be conducted independently. Either method may prevail, or one may be selected as the only method used to determine the final management objectives for aesthetic resources. Each method is described in the following Landscape Plan steps. Final decisions regarding landscape resources may be the result of a larger resource planning process where all other resource values and needs are considered in the selection (during the Trade-off Phase).

The suggested Landscape Plan would be built and maintained by a Landscape Planning Committee whose members may be derived from, or designated by, the CHR. The Landscape Plan would require periodic updating, preferably every 5 years. Plan updates would ensure that the plan remains valid, is inclusive of all new and proposed land-use development and landscape restoration initiatives, is responsive to changing values and expectations, and tracks the evolving mosaic of the landscape as it progresses along the visual spectrum of altered and natural.

The OLI classes are identical to the ELI classes used in the Inventory Phase:

1	**Very High Integrity**	No alteration; or no alteration evident, very subordinate, very high landscape conformity. (0%-1.5% alteration in Landscape Unit in perspective view)[3]
2	**High Integrity**	Minimal alteration evident, subordinate, well-designed, high landscape conformity. (1.6%-7% alteration in Landscape Unit in perspective view)
3	**Moderate Integrity**	Moderate alteration evident, dominant, moderate landscape conformity. (7.1%-18% alteration in Landscape Unit in perspective view)
4	**Low Integrity**	Intensive alteration evident, very dominant, low landscape conformity. (18.1%- 30% alteration in Landscape Unit in perspective view)
5	**Very Low Integrity**	Very intensive alteration evident, extremely dominant, very low landscape conformity. (>30% alteration in Landscape Unit in perspective view)

Landscape Plan Preparation

There are 10 steps to developing a regional Landscape Plan of management objectives. The process starts with a regional summary of current conditions, sets default objectives derived from inventory values, sets top-down objectives based on regionally directed targets, and follows through by monitoring the achievement of the objectives. The planning steps are shown on the illustration and presented in more detail following the illustration.

[3] Percent alteration limits derived from BC Ministry of Forests’ public perception research.

Steps for Completing a Regional Landscape Plan

1. Regional Summary of Existing Landscape Integrity

Existing Landscape Integrity (ELI) that was assessed for each Landscape Unit in the inventory process. Use the Existing Landscape Integrity Summary Form (below) to report the area in hectares and percent area of each class across the landbase.

Existing Landscape Integrity (ELI) Summary (viewshed only)	
Integrity Class	**Area (Ha)/Percent**
1 Very High	29043
2 High	9499
3 Moderate	2536
4 Low	1724
5 Very Low	1478

2. Objective Landscape Integrity Default in Each Landscape Unit

First determine a default OLI (OLI-d) for each Landscape Unit based on Significance and Risk identified in the Landscape Inventory using the following Significance:Risk (S:R) matrix. The resulting default OLI-d represents a generalized target based solely on the characteristics of the existing landscape and viewing opportunities (considered together as Significance), and the visual vulnerability inherent in that landscape (Risk).

Objective Landscape Integrity Default (OLI-d) Matrix

S: Significance	**R: Risk**		
	1 High	2 Moderate	3 Low
1 High	**OLI Class 1 Very High**	**OLI Class 2 High**	**OLI Class 3 Moderate**
2 Moderate	**OLI Class 2 High**	**OLI Class 3 Moderate**	**OLI Class 4 Low**
3 Low	**OLI Class 3 Moderate**	**OLI Class 4 Low**	**OLI Class 5 Very Low**

3. Objective Landscape Integrity Default Summary for the Region

Record in ELI/OLI-d Summary Table, indicating area in hectares and percent of landbase in each class. The Landscape Inventory conducted by RDI provided the following data.

Landscape Unit Type	**Hectares**
1. Viewshed units (visible from highways and rivers)	44,280
2. Highway Margin (NVS except roadside and intermittent glimpses)	135,997
3. Valley Bottom (NVS except shoreline and intermittent glimpses)	15,574
4. Included NVS	520
Total Landbase in inventory	196,372

4. Comparison of Existing and Default Objective Landscape Integrity for the Region

Compare the ELI and OLI-d by classes to determine surpluses and shortfalls (see following table).

Existing / Default Objective Landscape Integrity (ELI/OLI-d) Summary Viewshed Units only (44,280 ha.)		
Class	**ELI Area / Percent**	**OLI-d Area / Percent**
1 Very High	29043 / 65.59	13292 / 30.02
2 High	9499 / 21.45	12201 / 27.55
3 Moderate	2536 / 5.73	8821 / 19.92
4 Low	1724 / 3.89	3767 / 8.51
5 Very Low	1478 / 3.34	6199 / 14.00

Using the default matrix alone, each integrity class is currently under-represented except for Class 1.

5. Compare of CHR Indicators for Existing and Objective Landscape Integrity for the Region

Determine the CHR Indicators of Natural Landscape Character (Integrity Classes 1-2 from previous table) and High and Moderate Scenic Values (Integrity Classes 1-3 from previous table):

Regional CHR Indicators Viewshed Units only (44,280 ha.)			
Class	**ELI Area / Percent**	**OLI-d Area / Percent**	**Present Supply "surplus"***
Percent "natural " landscape character (Integrity Class 1-2)	38542ha. / 87.04%	25493ha. / 57.57%	29.57%
Percent high and moderate scenic values (Integrity Class 1-3)	41078ha. / 92.77%	34314ha. / 77.49%	15.28%

The default target CHR indicator of "Natural Landscape Character" is presently exceeded by supply of existing conditions by 29.47% when compared that determined in the default objective approach (Integrity Classes 1 and 2).

The CHR indicators of "High and Moderate Scenic Values" is presently exceeded by supply of existing conditions by 15.28% when compared that determined in the default objective approach (Integrity Classes 1-3). At this point the "bottom-up" approach is complete. *The options are to proceed directly to setting final management objectives (Step 7) based on the default OLI, or to continue to the "top-down" approach (Step 6) to provide further guidance based on regional expectations.*

*Caution: the default approach for selecting management objectives is influenced by the naturalness of current conditions. These qualities add value to the Significance rating in the Inventory and therefore tend to influence the OLI outcome in the matrix presented earlier. No determination has been made as to the appropriateness of a particular development, the costs or benefits of achieving the OLI-d (conducted in the Trade-off Phase), or the public support for the specific levels of landscape quality inferred by the OLI-d's in the sub-region or region overall or within a particular Landscape Unit (conducted in the Consultation Phase). Each of those aspects are considered in the subsequent steps that follow.

6. Initial Planned Objective Landscape Integrity for the Region

Next, set the initial planned OLI supply targets. These will provide further guidance in addition to the default objectives produced in Steps 2-5. *An option is to proceed only with the top-down approach by skipping steps 2-5.* The initial targets are built "top-down" for the entire landbase first, then are applied by individual Landscape Units using the OLI-d Matrix results (see Step 3) as a reference base, until the area in each class is achieved. The top-down initial planning target method can also be used to set area percent targets by Integrity

Class for specific sections of the Sub-region. Target options might range from a prevailing "natural" appearance or a dominant "altered" appearance. To demonstrate the effects of the top-down method, seven example OLI target options based on degree of naturalness are presented in the following table for discussion. Classes 1 and 2 (Very High and High Integrity) are both considered natural or natural appearing and are grouped together; Classes 3-5 (Moderate, Low, and Very Low Integrity) are all considered modified and are grouped together. Other options and percentage variations within options can be developed. Prior to final selection, the implications of the OLI-p's on resource development economics, engineering logistics, environmental considerations are examined in the Trade-off Phase, and public expectations are brought forward in the Consultation Phase.

Top-Down Initial Planned Objective Landscape Integrity (OLIpi)
by Regional Character Type

	Desired Character Type for Region (percent of inventoried landbase)						
Integrity Class	**1 Very Highly Natural**	**2 Highly Natural**	**3 Moderately Natural**	**4 Mid-Scale Natural**	**5 Moderately Altered**	**5 Highly Altered**	**7 Very Highly Altered**
1	**60**	**50**	**40**	**30**	**20**	**10**	**0**
2	**35**	**30**	**25**	**20**	**15**	**10**	**5**
3	**5**	**10**	**15**	**20**	**25**	**30**	**35**
4	**0**	**5**	**10**	**15**	**20**	**25**	**30**
5	**0**	**5**	**10**	**15**	**20**	**25**	**30**
Sum OLI Classes 1-2 (CHR Natural Landscape Character; High Scenic Values)	**95**	**80**	**65**	**50**	**35**	**20**	**5**
Sum OLI Classes 1-3 (CHR High and Moderate Scenic Values)	**100**	**90**	**80**	**70**	**60**	**50**	**40**

Example: Highly Natural Character Type for the Region

Select a regional character type that would be appropriate for the region. As an example, select "Highly Natural" as the desired or expected character type (column 2). To reach that level of overall integrity, 80% of the region's visual landbase would have to achieve Class 1 and 2 (natural or natural-appearing), while Class 3-5 (modified-appearing) would have to be limited to 20% of the landbase. The inventory indicated that 87% of the landbase is presently in Class 1 and 2 condition, suggesting that the current supply exceeds the management objective for those classes by 7%. Looking at it another way, a further 7% of the current visible landbase could be placed in Classes 3-5 and the region will still achieve the example "Highly Natural" character type.

To contribute to Class 1, the Landscape Unit must have no alteration evident (0%-1½% alteration as determined in perspective view), and Class 2 LUs may have no more than 7% well-designed land-use alteration evident in perspective view. Percentages of landbase in each class contributing to either the "natural" or "altered" categories may vary if reasonable justification is provided. For example, in Highly Natural there may be 35% Class 1 and 45% Class 2 if the Landscape Units assigned the Class have somewhat lower Landscape Significance or Risk in some instances only.

Once the Sub-regional target for each Class is selected, Integrity Classes are assigned to individual Landscape Units until the area contribution for the landbase for each Class is reached. Assignment will follow the OLI-d Matrix result calculated in Step 2. Sub-regional targets may be further refined for specific sectional targets to provide flexibility in a particular section for a period of time while maintaining the overall selected targets. Examine ELI Classes 1-3 for capability to meet OLI-p's for the same classes. Locate deficient ELI Class areas, if any, that may require special consideration for landscape integrity rejuvenation or postponement of further development.

The Landscape Plan provides the flexibility for assigning interim OLIs in some Landscape Units or corridor segments that will support a measured amount of intensive development provided there is a commitment to future restoration practices that will ensure the final OLY targets can be achieved within a stated period of time. Locate areas that may require interim exemption based on approved development/restoration plans and track their influence on OLI summary. Locate potential exchange areas where OLI-p supply targets are over achieved in Classes 1-3. Include all proposed development across full planning horizon in estimates - show in stages as appropriate. Target OLIs may be shifted over time and space according to the Landscape Plan for the Sub-region, directing land-use development attention away from a corridor segment that has already exceeded the desired or approved level of landscape integrity towards an area that is under-implemented where development may be concentrated for a period of time. If the scale of a single resource development is very large, its influence on the overall supply of Landscape Integrity in the Sub-region must be determined as part of the Landscape Plan. The comprehensive planning process should consider all large-scale development proposals together, rather than piece-meal.

When deriving OLIs for an area outside the known landscape inventory landbase, first conduct a Landscape Inventory for the area, apply the same OLI target decision procedures, and vet them through the Landscape Plan Committee as recommended standard procedures. Individual large-scale processes should be coordinated on an annual basis, with influences tested for compatibility with the Sub-regional Landscape Plan by the Landscape Planning Committee.

7. Landscape Integration

Landscape Integration is a rigorous, comprehensive set of procedures in which visual landscape goals and targets are examined in the context of the full range of values, expectations, costs, and benefits influencing land and resource management decisions in the Sub-region. Trade-offs may need to occur amongst sometimes competing considerations for environmental protection, recreational amenity, resource development requirements, and others determined in the Landscape Plan. Landscape Integration incorporates the procedures and outcomes of comprehensive Trade-off and Consultation.

8. Final Planned Objective Landscape Integrity

Upon completion of Landscape Integration, set the final planned OLI (OLI-pf) for each Landscape Unit in the landbase. Make the final targets known to stakeholders for use in the Design Phase.

9. Development Monitoring

The mosaic of Landscape Integrity within the Sub-region will change temporally and spatially. Those changes must be tracked and commitments monitored. The time horizon is critical to the supply of Landscape Integrity. Integrity will always tend to revert back to natural, or natural-appearing, over time or through intervention (by design, implementation, and/or rehabilitation – see Design and Implementation Phases). The time to achieve Class 1 Integrity will vary greatly with the industrial process, such as whether it involves landform alteration or just landcover alteration. Some processes can be considered “permanent”, strongly evident through several 20-year planning windows, such as oil sands mining development, while others are temporary, such as timber harvesting, and may have the capacity to revert to Class 1 within a single 20-year planning window. Procedures for monitoring are fully described in the Implementation Phase.

10. Update Landscape Plan

The Landscape Plan requires periodic updating, preferably every 5 years. Plan updates will ensure that the plan remains a viable and useful mechanism for managing the visual resources of the Sub-region, and is responsive to changing environmental, social, and technological needs and expectations. Include all new and proposed land-use development and landscape restoration initiatives. The update will also track the evolving mosaic of the landscape as individual Landscape Units are newly altered, and others are restored to natural and natural-appearing visual conditions.

2.3 Design

Landscape Design is the phase of VLS where management option recommendations are tested and selected. The purpose of the Design Phase is to enable resource development to achieve the landscape integrity objectives that were provided in the Landscape Plan. To ensure the opportunity for greatest effectiveness and flexibility, Design should be commenced early in the resource planning process. Design is a "creative process aimed at reconciling differences between competing values and uses of land in a way that ensures a better fit with the landscape."[4] A formalized assessment procedure is used to predict the ability of a development to meet the plan and to refine the design if necessary. The principles, procedures, and practices of Design are presented in this chapter, preceded by an introduction to the history and foundations of landscape design. General design Principles (Sec.2.3.3) provide the foundations for the Procedures (Sec. 2.3.4) and Practices (Sec. 2.3.5) that follow.

Design assists and influences land-use planning in the following ways:

- provides the generic principles of design that can ensure greater integrity when designing land-use to fit the landscape
- provides the procedures for assessment of design
- assists in the formulation of the earliest conceptual plans
- guides the development and testing of detailed alternatives
- avoids unnecessary visual impacts
- resolves unavoidable conflicts as much as possible
- communicates proposed land-uses and their cumulative effects in an easily understandable visually recognizable format
- predicts what the landscape will look like in the future, individually and cumulatively
- can be applied to any land-use activity

Without appropriate design, some types of development may be cancelled, deferred, or may take much longer to achieve the integrity class required by the Landscape Plan. The on-going or residual effect will influence adjacent development scope and timing, and may influence overall development progress in the sub-region or region.

The Design Phase provides specific recommendations for a wide array of resource management and land-use activities. The same process can be applied to those activities not specifically identified, and is intended to be comprehensive in recognizing the interactions and cumulative effects amongst the activities. These include:

- **Oil and Gas Extraction** (development, facilities, waste/wastewater management, reclamation, vegetation establishment)
- **Forestry** (timber harvesting, reforestation, reclamation, facilities)
- **Other resource development** (gravel, etc.)
- **Other Manufacturing** (concrete, etc.)
- **Transportation** (roads for exploration, access, development; highways; railways)
- **Utilities** (transmission lines, corridors, generation, and conversion facilities).
- **Urban** (development, structures/facilities, transportation, waste/wastewater management)
- **Recreation, historical sites and special features** (Natural Areas, Environmentally Significant Areas, Heritage Rivers)

[4] BC Ministry of Forests, 1994. Visual Landscape Design Training Manual. Rec. Br. Publ. 1994:2

2.3.1 A Brief History of Landscape Design

Afforestation in Scotland with poor conformity to the topography

Broad-scale landscape design and management practices have been influencing land-use planning for many decades. The British Forestry Commission commenced the process in the early 1960's to find ways to overcome the regimented patterns of afforestation and the dark non-native coniferous plantations placed in straight lines and blocks on rolling, formerly open hills.[5] Borrowing from the British initiatives, the US Forest Service introduced a formal program of landscape management in 1971, with the issuance of publications covering diverse topics such as transmission corridors, roads and ski hills, and recreation.[6][7] The Bureau of Land Management also implemented a visual resource management program on its lands in response to Environmental Policy Act of 1969 to ensure "esthetically pleasing surroundings"[8] providing guidance on a wide range of land-uses including mining and mine reclamation, structures and utilities.[9] British Columbia introduced visual landscape management in 1980,[10] and later further emphasized landscape design in 1994.[11] Much of the B.C. design system was adopted from the British system that was first published in 1989[12].

Protection of aesthetic values was specified as early as 1977 in Alberta.[13] Visual landscape analysis and planning commenced in 1984[14], and was formalized with the issuance of the Forest Landscape Management Strategies for Alberta[15] in 1988. VRM continues today with a continuing

[5] Sylvia Crow, 1966. Forestry in the Landscape. Forestry Commission, Booklet No. 18. 1966.
[6] USDA Forest Service, 1973. National Forest Landscape Management, Volume 1.
[7] USDA Forest Service, 1974. Visual Management System. National Forest Landscape Management, Volume 2, Chapter 1; and subsequent chapters.
[8] Bureau of Land Management. 1984 Visual Resource Management. BLM Manual 8400.
[9] Bureau of Land Management. 2000 Visual Resource Management. National Training Center, Course No. 8400-05.
[10] BC Ministry of Forests, 1981 Forest Landscape Handbook.
[11] BC Ministry of Forests, 1994. Visual Landscape Design Training Manual. Rec. Br. Publ. 1994:2
[12] Forestry Authority, Forestry Commission, 1994. Forest Landscape Design Guidelines. HMSO
[13] Alberta Energy and Natural Resources, 1977. Timber Harvest Cutblock Design. Edmonton. ENR No. T/116.
[14] Fairhurst, K.B., 1984. A Landscape Assessment of the Hidden Creek Harvesting Proposal, Alberta Energy and Natural Resources. Unpubl. Rep.
[15] Alberta Forestry, Lands and Wildlife, Forest Service, 1988. Forest Landscape Management Strategies for Alberta. Pub. No. T/228.

presence in the Timber Harvest Planning and Operating Ground Rules,[16] and supported by the 1999 Field Guide to Visual Resource Assessment.[17]

Old photo of patch and strip logging in the Hinton area of Alberta

2.3.2 Ecosystem- Based Design

The landscape is not a blank slate on which we can design and implement land-use to just to "look good". The landmark publication A Field Guide to Ecosites of Northern Alberta[18] promoted the concept of ecosystem-based integrated planning to balance "the use of various resources at a sustainable level without degradation of alternate resource values". In the introduction of that field guide, ecosystems are described as "complex and evolving systems with the flow of energy and matter determined by the interaction of climate, landforms, topography, soils, vegetation, animals and all other organisms. At the same time, the Oil Sands Vegetation Reclamation Committee was formed to prepare guidelines on the establishment of forest vegetation (ecosystems) for reclaiming oil sands leases in northeastern Alberta.[19] The Committee designed a seven-step process for establishing vegetation for different land-use objectives and their integration. Important in this process, from the perspective of the VLS, was the identification of design criteria for target ecosites and landscape patterns, and the recognition of end-use options which identified aesthetics as either a primary or associated "use". Aesthetics can be integrated into the design options and be a resulting benefit of the process.

Ecosystems are the environmental context for aesthetics.[20] The landscape that we see and must work with is the product of those forces that already are providing the forms, patterns, flows, and intricate relationships that shape the location and concentration of natural resources, recreational

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[16] Generic and specific to each Forest Management Area e.g. Sundance Forest Industries Ltd., January 12, 2001.

[17] Alberta Environment, 1999. A Field Guide to Visual Resource Management (VRA) in Alberta. Compiled by T.L. Turner, Resource Analysis Centre.

[18] Beckingham, J. D., and J. H. Archibald. 1996. Field Guide to Ecosites of Northern Alberta. Special Report 5. Canadian Forest Service.

[19] Oil Sands Vegetation Reclamation Committee, 1998. Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil sands Region.

[20] USDA Forest Service, 1995. Landscape Aesthetics a Handbook for Scenery Management. Agriculture Handbook No. 701.

amenities and scenic values. For land-use to be meet the SEWG's overall goal of ecosystem/landscape sustainability[21], and, within that, the CHR goal[22] of aesthetic sustainability, land-use must be designed to fit this largely pre-drawn "picture". SEWG's mandate encompasses several core ecosystem and landscape components that the Design Phase can and should be integrated with to support overall sustainability: biodiversity; wildlife; landscape components (vegetation, forest and soil resources, landscape and watershed integrity); cultural and historical resources (including recreational and aesthetic resources); and non-renewable resources.

2.3.3 Design Principles

An over-riding concept when planning natural resource use is not "either human interests or nature" but "design with nature".[23] Traditional landscape design theory aims at a blending of land-use with the forms, lines, colours and textures of the landscape to minimize visual impacts and assure a greater and faster recovery of the natural, or natural-appearing state. The Principles provide the foundations for the Procedures and Practices in this chapter.

Several of the landscape design processes in use today by resource management agencies referenced on the preceding pages of this chapter provide a wealth of background understanding. Resource agency processes have variations on the principles, but the concepts remain very similar. The initial US Forest Service publication[24] defined 4 key concepts that are useful today and which are briefly described on the following pages.

1. **Landscape Character**
2. **Dominance Elements**
3. **Dominance Principles**
4. **Variable Factors.**

Suncor Millenium mine near the Athabasca River

[21] SEWG. Draft, June 15, 2001. Sustainable Ecosystems Terms of Reference and Work Plans.
[22] CHR, June 2001. Regional Vision and Goals for Cultural and Historical Resources.
[23] Ian L. McHarg, 1969. Design with Nature. Natural History Press.
[24] USDA Forest Service, 1974. Visual Management System. National Forest Landscape Management, Volume 2, Chapter 1; and subsequent chapters.

1. Landscape Character

The landscape character is the overall biophysical and cultural composition of each landscape that creates its particular identity. Each landscape has its own unique attraction determined by its shape and scale, and its composition and layout of features, patterns of textures and colours, and the way it is experienced. Landscapes may be panoramic, without boundary restrictions, enclosed, where spaces are confined (large or small), feature, where one or few elements dominate, or focal, where elements converge.

Fort McMurray neighbourhood conforms to shape and lines of major landform

Farms in Central Italy conform to shapes and lines of minor landforms

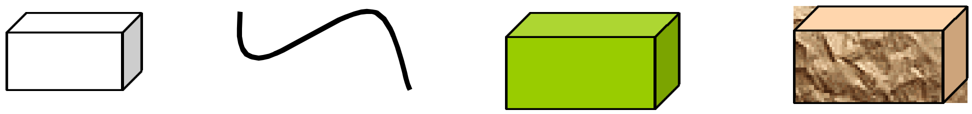
23-5 View across Clearwater River from Vista Ridge.

The Clearwater River valley is a broad U-shaped valley with moderate rolling side-hills. Distinct deciduous and conifer forest types contribute texture and colour contrast in winter. The ski-hill provides panoramic, continuous viewing.

Flat landscape restricts views along the ice-road extension of Highway 63 on the east side of the Athabasca River

2. Dominance Elements

Dominance elements are the basic ingredients of landscape perception having strength in themselves and in relation to each other. Elements of prime importance are:



Form line colour texture

Christina River

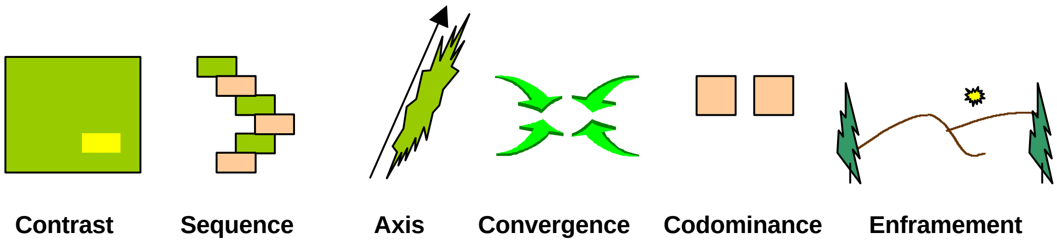
As an example of a description, each of the following elements can be found in the photograph above:

Form: rounded landforms with some steep escarpments
Line: horizontal ridge-lines, strong line effect of the river
Colour: subtle variation in the forest; stark contrasts with bare escarpment and river
Texture: fine to moderately coarse forest texture

Line effect and colour contrasts of Vista Ridge ski area

4. Dominance Principles

Dominance principles affect the perception of dominance elements. There are 6 of these principles:



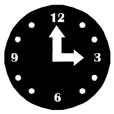

7-22 View east from Athabasca River near Highway 63 at Confederation Way, Fort McMurray.

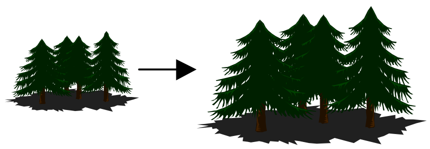
The patches on the escarpment create contrast, sequence and axis. The river creates contrast, and axis; the views along the back hills converge at the dark patch of trees and lead the eye up the small valley in the centre-right of the photo.

5. Variable Factors

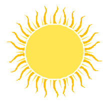
Variable factors affect how dominance elements are perceived. These include:

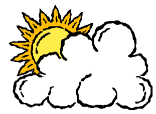
Time: of day, change over time



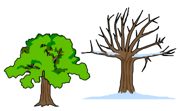


Lighting: direction, intensity, angle above horizon

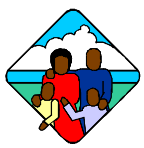


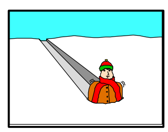


Season and Weather

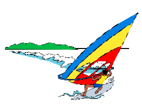


Viewing distance, angle of observation and duration





Movement: of landscape features, such as flowing water, and by the observer



All of the variable factors act together to affect how dominance elements are perceived:

Winter and summer conditions along the Athabasca River

Winter presents greater contrast in vegetation between bare deciduous and dark green coniferous; snow and ice creates high colour contrasts. Summer presents foliage and colour, lighting intensity, water reflectance and water movement.

6. Visually-Effective Green-up (VEG)


VEG is developing on the hillside

In the Wood-Buffalo Region, visually-effective green-up (VEG) is achieved when an area is re-vegetated with an ecologically-appropriate mixed-wood boreal forest, using native species. It must have grown sufficiently such that bare ground is no longer evident and a new forest and/or appropriate ground cover is clearly seen by the average viewer. An interim stage of partial visual recovery of a modified landscape as it progresses towards full Class 1 Landscape Integrity (no alteration evident).

VEG applies to land reclamation, landform construction, re-contouring and restoration, and to surficial activities including roads, timber harvesting and other forestry related activities. Following surface disturbance and reclamation, Timing for achieving VEG will vary with the landform slope, contouring, angle of observation, and re-vegetation procedures that are implemented. For example, natural contouring and re-establishment of forest in natural patterns can encourage the achievement of VEG and, ultimately, Class 1 Landscape Integrity faster than less natural geometric forms and vegetation patterns. Greater planting density and size of planting stock will encourage more rapid VEG. Until VEG is achieved, the disturbed area is called nonVEG.

VEG is an important consideration in the Inventory, Planning, Design, and Implementation phases of VLS. VEG can also be a significant factor in the Trade-off phase, as faster achievement of VEG will allow additional activities and the economic returns from them to occur sooner. Portraying the time-lines of visual change from recently altered, interim VEG, and final recovery assists public review of a modification plan during the Consultation Phase.

2.3.4. Design Procedures

Landscape Design procedures are used to help develop and test management options that can meet the integrity management objectives of the Landscape Plan. There are six procedures, including the Predicted Landscape Integrity (PLI) Report. Visualization techniques are used to facilitate interpretation and communication. Resource-specific design practices are provided in Sec. 2.3.5. For consistency Integrity is measured in same terms as it was in the Inventory and Design Phases. For review:

Landscape Integrity Classes

1 Very High	No alteration; or no alteration evident, very subordinate, very high landscape conformity. (0%-1.5% alteration in Landscape Unit in perspective view)
2 High	Minimal alteration evident, subordinate, well-designed, high landscape conformity. (1.6%-7% alteration in Landscape Unit in perspective view)
3 Moderate	Moderate alteration evident, dominant, moderate landscape conformity. (7.1%-18% alteration in Landscape Unit in perspective view)
4 Low	Intensive alteration evident, very dominant, low landscape conformity. (18.1%- 30% alteration in Landscape Unit in perspective view)
5 Very Low	Very intensive alteration evident, extremely dominant, very low landscape conformity. (>30% alteration in Landscape Unit in perspective view)

Three variables are applied to assess each design option when assessing a design. Quantification is determined more precisely in this phase. Consider existing nonVEG and proposed visible disturbance. For review, Integrity is measured by:

Definition	Landscape Integrity provides the reference definitions (above)
Design Quality	Landscape Design procedures are implemented to meet Integrity Objectives
Quantification	Extent of individual and/or cumulative Landscape Unit(s) in an altered (disturbed) Integrity Class, measured in perspective, planimetric, and/or linearly, as percent of the Landscape Unit. Use perspective percent of LU as a measure of Integrity Class

The Design procedures are:

1. Design Allowance

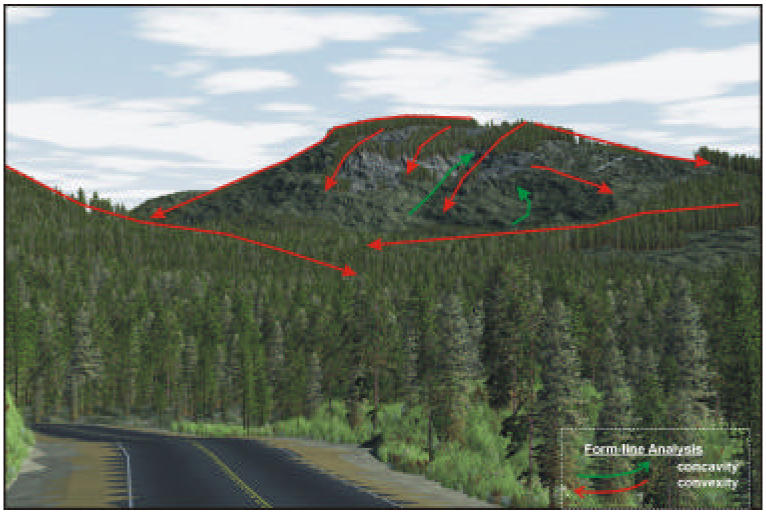
- Compare the ELI of the Landscape Unit with the OLI to determine if the LU can accept further alteration at this time.
- If the ELI has a lower integrity class than the OLI, further activity is rejected or deferred pending OLI achievement through restoration / rehabilitation / or visually effective growth (VEG).
- If the ELI = OLI: the ELI and OLI are balanced, and further activity may be accepted. If the ELI has a higher integrity class than the OLI, the OLI is under-implemented, and further activity can occur in the Landscape Unit.

2. Design Integrity

- Select viewpoints along roads or waterways for simulations. Some viewpoints are identified in the Landscape Inventory. Add additional viewpoints as necessary to obtain the "best-case" viewing opportunity or the "worst-case" view of the project.
- Select a visualization technique. A variety of techniques may be employed, such as GIS-based computer graphics, hand-drawn graphics, and photo-enhancement.
- Simulate the initial plan as it would be normally seen from the viewpoints
- Conduct a ***form and line analysis*** to locate conflicts in shape, pattern and scale
- Predict the integrity class that the design is capable of achieving in terms of description, design quality and design quantification. Include existing nonVEG areas; exclude VEG areas.
- Compare the predicted integrity with the OLI to determine if it is acceptable or needs design adjustment.

- Re-design if necessary.
- Prepare the PLI Report with simulations and photos of existing conditions.

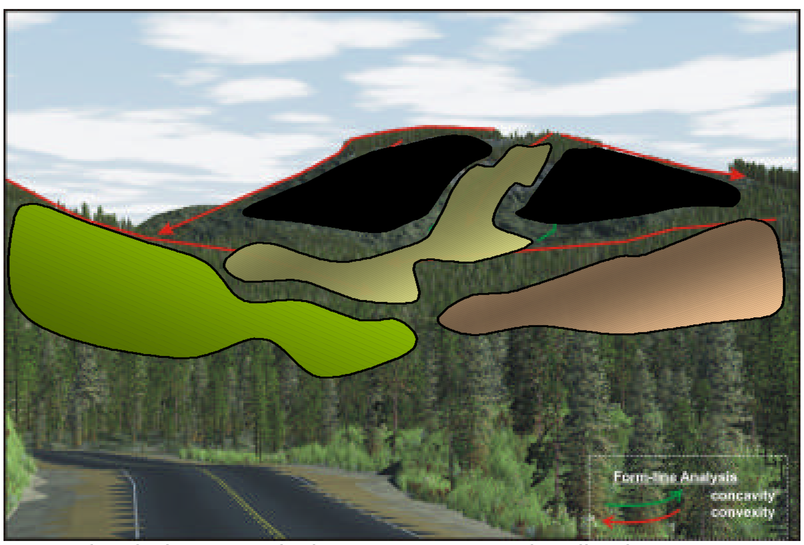
3. Form-line and Shape Analysis



Example of Form-line Analysis on a computer visualization

Form-line and Shape Analysis of 2-D and 3-D elements in the landscape provides key clues for design. Form and line will change somewhat depending how the landscape is seen. The shapes of existing forest patterns, locations of water features and environmentally sensitive areas all are related to the structure of the landscape. Identify the 2-d and 3-d elements will guide design. The direction of arrows indicates the direction of influence that should be considered when design interacts with the form-lines:

- yield upwards with up (green) arrows (push up into concavities or draws)
- yield downwards with down (red) arrows (push down convexities or ridges).



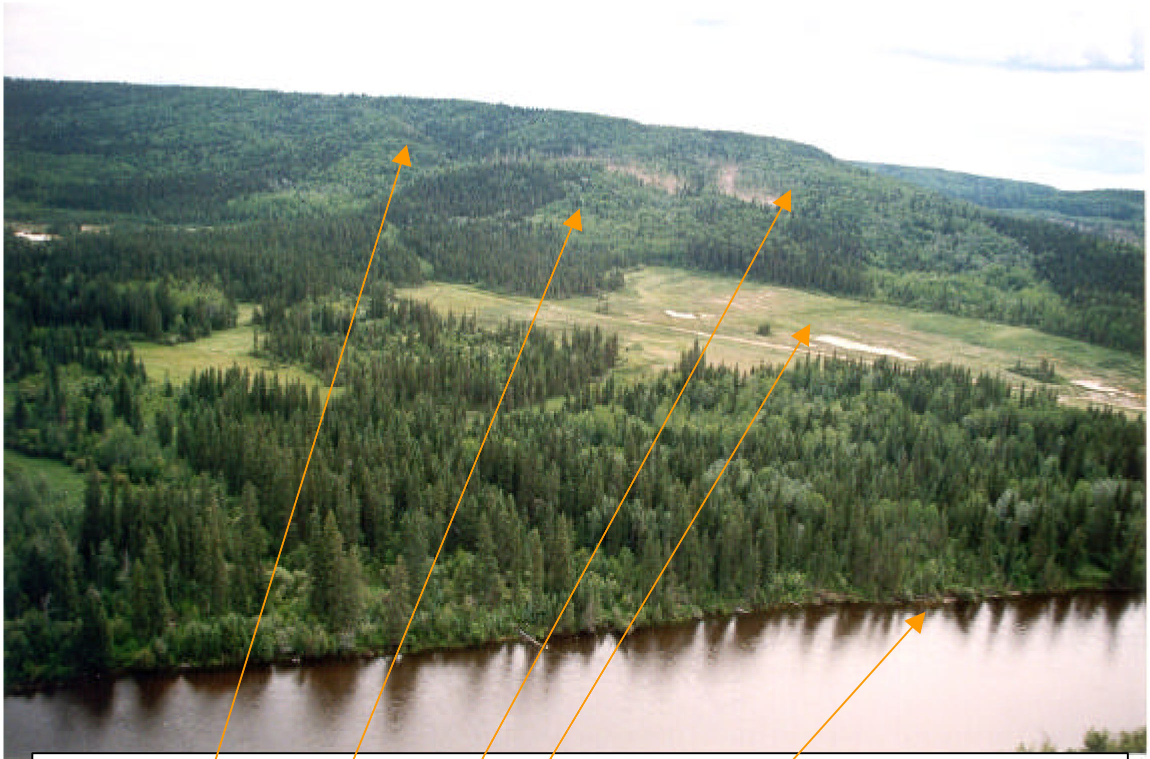
Example of Shape Analysis on a computer visualization

Design an interlocking total pattern of shapes when preparing a landscape design. Shapes can guide land-use activity. Consider the 3-dimensional form of each component such as hills, ridges, and valleys. Include areas of protection and retention as separate shapes. Treatments within units and amongst units will vary to achieve the OLI.

4. Total Pattern of Shapes

Emulate natural patterns, such as forest type lines, convexities and concavities.

Alteration should repeat form and line. Consider the overall form-lines and patterns in the landscape unit.



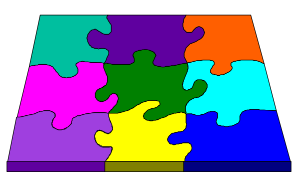
Ridgeline intact

Pattern of small openings is well positioned

Minor landform
With vegetation pattern
Offer clues of shape

Irregular opening and
Variable edge
Observe hydrology in pattern

Screen along shore or roadside may be desired to protect natural experience and should be substantial. Breaks in screening may be desirable to provide views and break monotony. Design complete pattern of openings.

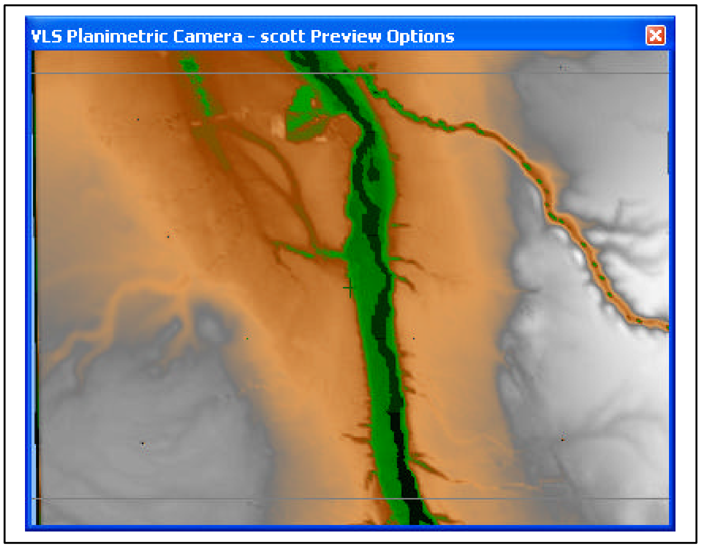


5. Design Visualization

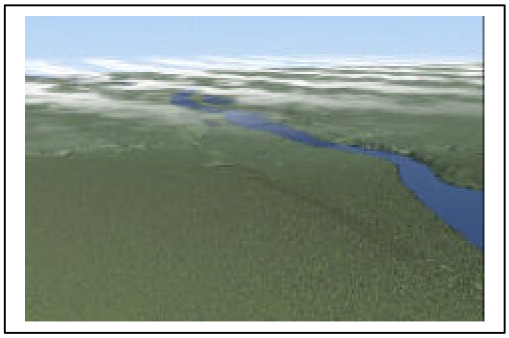
Computer visualization provides understanding of the visual effect of land-use alterations in advance of their implementation. The advance look is highly beneficial to the planner to avoid undesirable visual impact by testing scenarios far ahead of the decision and implementation, when changes become expensive if not impossible. Visualization is an easily understood medium for interpretation of plans, even for the casual observer. Expectations of users can be tested with simulations for their degree of congruency with the plans. Simulations must be accurate to the degree that the data from which they were created supports, and realistic to the degree that the simulation will create a valid response. Observers must be informed of the limits of the data and simulation technique so as not to misconstrue the perceived reality with the actual result.

Note: the simulations that follow are for demonstration purposes only and do not represent actual, proposed, or suggested development in the area.

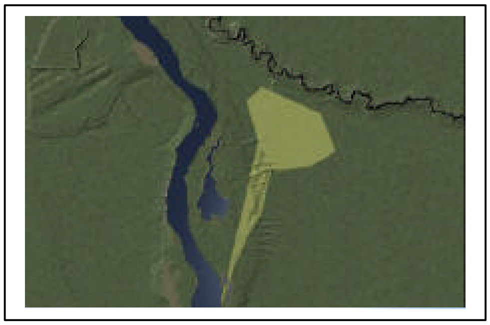
Computer visualization will provide the opportunity to test the design alternatives and present the results for review. Commence with a terrain model, such as the one built for the visibility study. This was produced in Visual Nature Studio from the Alberta Base Features digital elevation model (DEM) in arc ASCII format. The example is of the Athabasca River near Supertest Hill just north of the small green cross which is the camera target in the centre of the image. The first image is a screen capture of the base model:

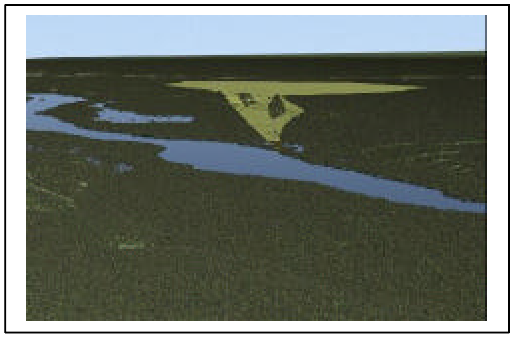


Assign existing vegetation by tree composition, height and density per forest cover information, or generally, following "rules of nature" which varies coverage according to slope, aspect, elevation and other terrain indicators. Custom images of local trees can be added to the model. Fill the rivers and lakes with water, add clouds and atmosphere. Locate actual viewpoints. Aerial oblique views are useful for orientation and to reveal hidden areas (see following images).



New topographic structures such as containment dikes can be added and the surface re-gridded to the new elevations (no example provided). Landscape Unit polygons, roads, development polygons are imported and draped onto the terrain. Alternatively, project design elements can be digitized directly in the model in plan or perspective view.



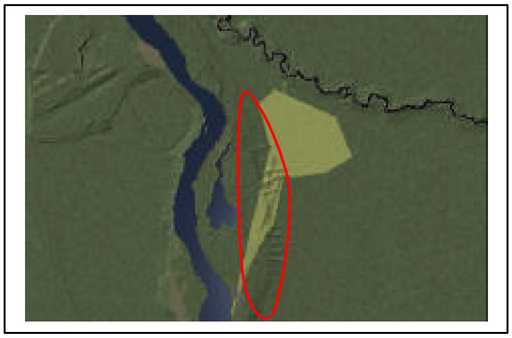


Aerial key map (on left above), aerial oblique provide orientation (right).

Commencing with a bare site with road (on left above), leave patches can be added (right).

Re-vegetation progress over time can be simulated (6m height on left above; 10m on right). Design alternatives can be quickly checked and adjusted to meet the OLI. Percent alteration can be determined in the simulations by measuring the perspective area of the alteration together with existing nonVEG if any in the picture, and comparing that to the perspective area of the landscape unit in view in the picture.

A wide angle or panoramic simulation (above left) may be necessary to capture the full width of the landscape unit as it is seen from a particular viewpoint, and to judge the adequacy of the design in meeting the OLI. In the example, the bared area is 6% of the landscape unit as digitized[25] in perspective view measured edge-to-edge in the simulation. This would equate to the lower end of Integrity Class 2 (High), almost Class 3 (Moderate). A rendered aerial "key" map is produced (above right) to verify project location and visible area (shown in red) in the model. Include the shoreline trees in the measurement. The aerial view also reveals a substantially greater area of development not seen from the viewpoint. Simulations can be animated, such as for a moving camera, a moving target, or change over time.

6. Predicted Landscape Integrity (PLI) Report

The PLI Report provides a concise package of simulations, form and line analysis, and results leading to a design that is capable of meeting the OLI in the sort or longer term. It also describes the stages and timing of the proposal and activities that will occur, such as restoration and reclamation.

The PLI Report form, presented on the following 2 pages, can also be used to monitor the Achieved Integrity (ALI) upon completion of the development and during the stages of restoration.

[25] Digitized on the computer monitor using Didger 2 from Golden Software, Inc.

Predicted Landscape Integrity Report

Rating Viewpoint(s): | **Map #(s):** | **Photos:**

Landscape Integrity Rating
ELI: Existing Landscape Integrity
OLI: Objective Landscape Integrity
PLI: Predicted Landscape Integrity
ALI: Achieved Landscape Integrity

Landscape Unit Integrity Rating – add values from Inventory/Planning/Implementation				
LU#	ELI	OLI	PLI	ALI

Conducted by: **Date:**

Assess the design for its ability to meet the OLI. Determine the PLI rating and place in the box above. Attach written comments, photographs and visualizations to the report. If several stages of activity are proposed to achieve the OLI, describe those actions and their timing. A single factor or few factors may influence the predicted Integrity Class more strongly. If so, make note of this in the comments.

Landscape Integrity Classes

1 Very High	No alteration; or no alteration evident, very subordinate, very high landscape conformity. (0%-1.5% alteration in Landscape Unit in perspective view)
2 High	Minimal alteration evident, subordinate, well-designed, high landscape conformity. (1.6%-7% alteration in Landscape Unit in perspective view)
3 Moderate	Moderate alteration evident, dominant, moderate landscape conformity. (7.1%-18% alteration in Landscape Unit in perspective view)
4 Low	Intensive alteration evident, very dominant, low landscape conformity. (18.1%- 30% alteration in Landscape Unit in perspective view)
5 Very Low	Very intensive alteration evident, extremely dominant, very low landscape conformity. (>30% alteration in Landscape Unit in perspective view)

Three variables are applied to assess each design option and the PLI that will be achieved. Quantification is determined more precisely in this phase. Exclude areas of previous disturbance with visually-effective green-up (VEG). Include current nonVEG disturbance in calculations.

Definition	Landscape Integrity provides the reference definitions (above)
Design Quality	Landscape Design procedures are implemented to meet Integrity Objectives
Quantification	Extent of individual and/or cumulative Landscape Unit(s) in an altered Integrity Class measured in perspective (camera) view, usually as percent of the visible landscape unit. May also be further expressed as planimetric and/or linear percent.

PLI - by Definition
PLI - by Design Quality
PLI - by Quantification (% alteration of LU in perspective view)
Overall PLI
Timing and Actions to Mitigate Visual Impacts

Integrity modifying factors:
Cumulative effect of current alteration in locality/corridor: ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **n/a** ✓
Perceived ecological integrity in locality/corridor: ☐ **High** ☐ **Moderate** ☐ **Low** ☐ **n/a** ✓
Locality influence: ☐ **Urban** ☐ **Urban Fringe** ☐ **Rural, Developed** ☐ **Rural, Natural** ☐ **Industrial** ✓
☐ **Recreational, Developed** ☐ **Recreational, Natural** ☐ **Backcountry** ☐ **Wilderness**

Predicted Landscape Integrity Report - Page 2

Use the checklist to further define and assess the project:

Perspective View Disturbance (Percent of LU perspective area disturbed/nonVEG)			
Type			
Extent : existing/new			
Frequency			
Duration/recovery time			
PLI			
Planimetric Areal Disturbance (Percent of LU planimetric area disturbed/nonVEG)			
Type			
Extent : existing/new			
Frequency			
Duration/recovery time			
PLI			
Linear Disturbance (Percent of LU lineal area disturbed/nonVEG)			
Type			
Extent : existing/new			
Frequency			
Duration/recovery time			
PLI			
Infrastructure Facility			
Type			
Size			
Height			
Emission			
Duration			
Restoration/ recovery time			
Risk			
Cumulative Impact			
Observability			
PLI			
View Base	**Highway**	**River**	**Secondary Roads**
PLI:			
Mitigation Plan			
Mitigation Need			
Mitigation Potential			
Mitigation Term			
Ecosystem Response/desirability			
Social Response/desirability			
Cost to implement			
Cost(s) if foregone (Social-Economic-Environmental) Adjacency delays			

2.3.5 Design Practices

Design practices provide a range of considerations for resource development and restoration. Practices will vary with the feature in view, such as river escarpments or roadsides, and the viewing opportunities, such as from elevated viewpoints or recreational attractions, and the type of land-use activity.

1. River Escarpments

16-3 Athabasca River escarpment feature

4-13 Athabasca escarpment from Supertest Hill

15-21 Clearwater River escarpment

6-22 Clearwater River escarpment seen from highway

The river escarpments within the generally flat or rolling characteristic terrain invite recreational use and interest. Main highways create heightened observability of the escarpments, particularly at river crossings and at elevated viewpoints (e.g. Supertest Hill; Highway 63 Bridge).

General caution is advisable within the escarpment and valley-bottom areas. Avoid visible landform disturbance within escarpment break that fails to meet the OLI.

Match landscape vegetation patterns when removing/re-establishing vegetation. Maintain forest canopy, as through partial cutting with leave trees. Avoid infrastructure in visible zone, where possible.

2. Elevated Viewpoints

9-23 View south from Supertest Hill

6-5 View from Stony Mountain road

5-6 View south, Highway 63

3-18 View northeast from bridge across Athabasca

Elevated viewpoints increase Observability and Risk. Use over-ride mechanism to raise risk rating for landscape within near and mid-ground view. Design overall effect of land-use.

3. Prominent Hills

Prominent landforms with heights 300 metres or greater, such as Stony Mountain, Birch Mountains and Fort Hills attract attention over long distances. Design comprehensive plan with form-line analysis. Pay attention to skyline integrity when planning land-use.

6-12 Stony Mountain from Highway 63

3-11 View west to Athabasca River, Birch Mts. beyond

4. Land-Cover Alteration

Well-blended recent forest opening

10-3 Opening shape fair, river screen is thin

Observe and integrate with existing patterns (conifer/deciduous types). Feather edges, consider Risk elements, namely existing patterns, edges. Link alteration to existing edges such as agriculture, natural openings. Consider scale of alteration as it relates to existing patterns.

5. Land-Cover Retention

A varied opening near the Clearwater River

A recent opening with retention strips along Highway 63

Use natural form and shape when planning forest cover removal or landform/vegetation restoration. Work with, not against the landform and vegetation patterns. Vary the forest edge by thinning outward or leaving trees inward. Leave patches of trees within the entire unit as series of interlocking patterns. The visual results of timber harvesting in visually sensitive zones benefit from retention of cover. On flat lands, alternating strips can be appropriate. On steeper landscapes seen from viewing locations, angle strips away from direct line of sight, or use variable retention with natural-appearing clumps of retained trees. Amount of retention required varies with slope/view angle, proximity, height and form of remaining trees.

6. Landform Reconstruction

Re-vegetated containment structure

Vary skyline to avoid exaggerated horizontal effect. Soften terracing effect. Integrate landform and vegetation patterns. Introduce water elements. Consider view exposure for interpretation and public monitoring opportunities. Consider view restriction such as roadside berming to meet OLI.

Terraced structure

landform modification on progress

Landforms and water forms

Development distanced from shore of river

7. Landcover Restoration

Example: afforestation in Scotland

Conduct form-line and shape analysis. Design form-line pattern of complete landscape design. Identify minor landforms that can receive distinct treatment. Respond to form-lines with vegetation pattern (e.g. merge up draws, down ridges).

2-26 Planting pattern near Syncrude visitor area

2-33 Planting pattern near Bison viewpoint

Establish natural patterns of vegetation based on Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region. Avoid straight line in planting patterns, interlock vegetation type patterns.

8. Roadside Management

A small opening off Highway 63 has benefit of roadside screen

Limit the number of road entries and exploration lines off the main highway. Use dog-legs (oblique angles and bends) to prevent line-of sight exposure. Maintain sufficient buffer width depending on vegetation density to screen land-clearing and timber harvesting.

Create views and interest along travel corridors by opening up portions of the roadside vegetation where there will be some distant viewing opportunities created. Where exposed, leave clean.

9. Roadside Infrastructure

Northland Mill adjacent to Highway 63 and Athabasca River

Flat terrain allows close proximity of structures with view corridors if buffers are planned and maintained. Plan through simulations to check structure visibility.

10. Riverside Infrastructure

Structure near the Athabasca River

Locate structures outside of prime visibility zone along the highway and rivers to meet the OLI. Where unavoidable, major facilities should be separated to avoid over-concentration and cumulative effect. Where in view, consider colour and tonal qualities for contrast reduction.

11. River Experience

12-5 Sawmill along the Athabasca River

14-3 Land-use alteration influences river experience

Plan cumulative river experience to achieve OLI. Keep landform modification beyond escarpment break. Maintain skyline forest cover. Restore skyline forest cover.

12. Oil Extraction Infrastructure

2-37 Syncrude plant as seen from Bison Viewpoint

13-23 Suncor plant along Athabasca River

Plan in conjunction with roadside and riverside buffer management. Keep visible structures away from highways and major waterways to meet OLI. Test structure heights with simulations. Plan in awareness of the cumulative influence as seen along travel corridors.

13. Gas Extraction Infrastructure

Jacos plant near Highway 63 (aerial view)

Highway buffer near Jacos plant

Plan in conjunction with roadside buffer management. Keep visible structures away from highways and major waterways where possible to meet OLI. Test structure heights with simulations. Plan in awareness of the cumulative influence as seen along travel corridors.

14. Other Infrastructure

Hydro lines along Highway 63

Ski hill pump house on Clearwater River

15-24 Cable crossing on Clearwater River

19-16 Pipeline crossing, Clearwater River

8-8 Pipeline along Highway 63

16-5 Highway Bridge on Athabasca River

All land-use activities require planning, observation and monitoring of their effect on, and achievement of, the OLI management objectives.

15. Recreation

Recreational activities bring year-round use and attention to many parts of the region. Plan in awareness of user concentrations and expectations.

20-1 Recreationists on the Clearwater River

23-9 Skiers at Vista Ridge

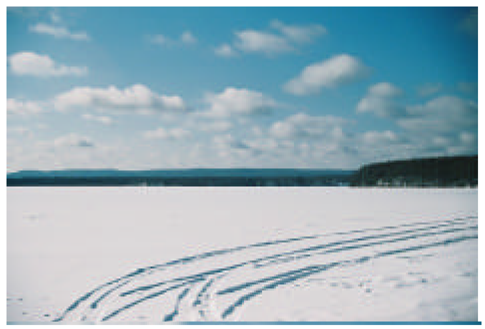
16. History and Culture

Historical and cultural features bring attention and interest. Plan in awareness of these features.

18-18 Bitumount historical site

22-10 Unused River boats

22-4 Clearwater Lodge



22-15 Gregoire Lake

Bison on re-vegetated landform

12-1 Forest fire sign along Athabasca

2.4 Implementation

Neither the visual landscape nor the VLS process for its management is static. The mosaic of Landscape Integrity Classes within the Sub-region will change, temporally and spatially, and perhaps by changes in expectations. Those changes must be tracked and commitments monitored on an on-going basis. The time horizon is critical to the achievement of the OLI and to the resulting supply of Landscape Integrity. Integrity will always tend to revert back to natural, or natural-appearing, over time, through visually effective green-up or through successful intervention (by design, implementation, and/or rehabilitation).

1. Objectives

The purpose of the Implementation Phase is to observe how well the land-use activity meets the OLI, and to provide a monitoring or check-off mechanism to ensure procedures were followed to meet the OLI. It is also the phase of active operations and therefore provides the opportunity for intervention and improvement if development is not as predicted in the Design Phase

2. Process

Review the PLI Report prepared for the project in the Design phase. Evaluate the Achieved Landscape Integrity (ALI) based on the same 3 criteria (verbal definition, design, and numerical assessment) as used to evaluate the PLI. Complete the ALI Report (provided on the following 2 pages). Document the achieved conditions with photography.

The time to achieve the desired levels of Landscape Integrity will vary greatly with the industrial process, whether it involves landform alteration or just landcover alteration.

Some processes, such as oil sands mining development, can be considered “permanent” where they remain strongly evident through several 20-year planning windows. Others are temporary, such as timber harvesting, and may have the capacity to revert to a higher Integrity Class within a single 20-year planning window.

The changes to Integrity resulting from implementation should be entered as updates to the inventory of current conditions for each Landscape Unit. Note the influence on cumulative conditions in relation to neighbouring development plans to ensure the OLI can still be met in those units.

3. Means

Monitor land-use activity as it takes place to ensure the OLI is being met. Some actions may be changeable or correctable as they occur and the equipment is available, such as maintaining satisfactory ridgeline cover as operations progress from behind, or modifying the horizontal effect of a containment dyke as it is being constructed. Monitor from the viewpoints. Use the ALI Report form to monitor achievement of the OLI upon completion.

4. Achieved Landscape Integrity (ALI) Report

Complete the ALI Report which follows to sign-off the completed project or to describe further actions necessary to achieve the OLI.

Achieved Landscape Integrity Report

Rating Viewpoint(s): ______ **Map #(s):** ______ **Photos:** ______

<u>Landscape Integrity Rating</u>
ELI: Existing Landscape Integrity
OLI: Objective Landscape Integrity
PLI: Predicted Landscape Integrity
ALI: Achieved Landscape Integrity

Landscape Unit Integrity Rating – add values from Inventory/Planning/Implementation

LU#	ELI	OLI	PLI	ALI

Conducted by: ______ **Date:** ______

Assess the results for meeting the OLI. Determine the ALI rating and place in the box above. Attach written comments, photographs and visualizations to the report. If stages of activity are still to be conducted to achieve the OLI, describe those actions and their timing. A single factor or few factors may influence the ALI more strongly. If so, make note of this in the comments.

Landscape Integrity Classes

1 Very High	No alteration; or no alteration evident, very subordinate, very high landscape conformity. (0%-1.5% alteration in Landscape Unit in perspective view)
2 High	Minimal alteration evident, subordinate, well-designed, high landscape conformity. (1.6%-7% alteration in Landscape Unit in perspective view)
3 Moderate	Moderate alteration evident, dominant, moderate landscape conformity. (7.1%-18% alteration in Landscape Unit in perspective view)
4 Low	Intensive alteration evident, very dominant, low landscape conformity. (18.1%- 30% alteration in Landscape Unit in perspective view)
5 Very Low	Very intensive alteration evident, extremely dominant, very low landscape conformity. (>30% alteration in Landscape Unit in perspective view)

Three variables are applied to assess the ALI that was achieved. Quantification is determined more precisely in this phase. Exclude areas of previous disturbance with visually-effective green-up (VEG). Include current nonVEG disturbance in calculations.

Definition	Landscape Integrity provides the reference definitions (above)
Design Quality	Landscape Design procedures are implemented to meet Integrity Objectives
Quantification	Extent of individual and/or cumulative Landscape Unit(s) in an altered Integrity Class, measured in perspective (camera) view, usually as percent of the visible landscape unit. May also be further expressed as planimetric and/or linear percent.

ALI - by Definition
ALI - by Design Quality
ALI - by Quantification (% alteration of LU in perspective view)
Overall ALI
Timing and Actions still required to Mitigate Visual Impacts

Integrity modifying factors:
Cumulative effect of current alteration in locality/corridor: ☐ High ☐ Moderate ☐ Low ☐ n/a ✓
Perceived ecological integrity in locality/corridor: ☐ High ☐ Moderate ☐ Low ☐ n/a ✓
Locality influence: ☐ Urban ☐ Urban Fringe ☐ Rural, Developed ☐ Rural, Natural ☐ Industrial ✓
☐ Recreational, Developed ☐ Recreational, Natural ☐ Backcountry ☐ Wilderness

Achieved Landscape Integrity Report - Page 2

Use the checklist to further define and assess the project results:

Perspective View Disturbance (Percent of LU perspective area disturbed/nonVEG)			
Type			
Extent : existing/new			
Frequency			
Duration/recovery time			
ALI			
Planimetric Areal Disturbance (Percent of LU planimetric area disturbed/nonVEG)			
Type			
Extent : existing/new			
Frequency			
Duration/recovery time			
ALI			
Linear Disturbance (Percent of LU lineal area disturbed/nonVEG)			
Type			
Extent : existing/new			
Frequency			
Duration/recovery time			
ALI			
Infrastructure Facility			
Type			
Size			
Height			
Emission			
Duration			
Restoration/ recovery time			
Risk			
Cumulative Impact			
Observability			
ALI			
View Base	**Highway**	**River**	**Secondary Roads**
ALI:			
Mitigation Plan			
Mitigation Need			
Mitigation Potential			
Mitigation Term			
Ecosystem Response/desirability			
Social Response/desirability			
Cost to implement			

2.5 Trade-off

Trade-off is the phase during which the planned OLIs for the region are examined in the context of the full range of economic, social and environmental interests and expectations. The process should be conducted as a comprehensive process once all values, goals and indicators are identified through all of the CEMA initiatives. As such, only some general thoughts on how trade-off might be structured and a description of the potential VLS input into the process are provided in this section.

1. Objectives

The objectives for the Trade-off phase are to:

- Improve the quality of inter-dependant and integrated decision processes
- Provide a multiple attribute key value utility
- Anticipate consequences of management objectives
- Formalize a trade-off process in regional planning

Some factors may be easily quantifiable, such as number of hectares of commercial forest or volume of oil-sands retained within a roadside or riverside buffer zone to achieve a restrictive OLI. Others are not so easily quantified, such as changing the quality of a view from pristine, to human altered, or the quality of a river recreation experience as cumulative development begins to dominate. Trade-off has, as a key component, an assessment of risk and uncertainty with regard to environmental, economic, and social impacts of achieving the OLIs.

2. Process

The trade-off process identifies fundamental objectives and underlying concerns. In one approach[26], value-structuring based on multiple-attribute utility theory is used to identify and measure stakeholder values, and consequences of options, leading to identification of the most preferred options. “A primary goal is to improve thinking and sharpen communication about critical concerns and tradeoffs in important decisions.” Five tasks were identified for conducting a trade-off process:

1. **Frame the decision.**
   What are the key contextual elements of the decision situation, and what is a reasonable goal of the consultation process?
2. **Define key objectives.**
   How do people think they will be affected by the proposed action, and what values matter the most to stakeholders?
3. **Establish alternatives.**
   In light of the relevant constraints, what are alternative actions that might be undertaken?
4. **Identify consequences.**
   What are the most important impacts that could affect stated objectives, and how certain is their occurrence?
5. **Clarify trade-offs.**
   What are the important conflicts across desired objectives, and how can this knowledge be used to create new and better alternatives?

[26] Gregory, Robin. Environment June, 2000, Vol. 42, Issue 5.*USING STAKEHOLDER VALUES TO MAKE SMARTER ENVIRONMENTAL DECISIONS.*

3. Means

Technical information is required both to predict the magnitude of impacts and to inform the trade-offs. It must be understood and communicated in a fashion that is readily accessible to the stakeholders. Stakeholders' values information must be distinguished from factual information, which comes from science or community experts. Competing objectives and interests must be balanced. Informed choices must be facilitated.

The products of VLS Landscape Inventory (Phase 1), Planning (Phase 2), and Design (Phase 3) provide the "hard data" to take to the trade-off table. The inventory has recorded the extent, character, and vulnerability of aesthetic resources. It has purposefully not tried to measure the more intrinsic values of preference and expectations for the landscape that must be determined in a public process.

Management objectives were set in the Planning Phase, Steps 2-5. The OLIs resulting from the planning process are the guides for visual quality in the region overall and for each landscape unit. These are measurable objectives, by definition, design quality and numerical limits of change. They have areal extents and provide cumulative limits to visible development as seen from viewing locations. The default OLIs were derived from the landscape characteristics themselves. The planned Oil's were derived from regional goals for scenic values and locally natural landscape character. Neither has been subjected to cost-benefit or other trade-off analysis, but assist the process by providing quantifiable measures at the trade-off table. When preparing a trade-off analysis, bring the current regional supply of Landscape Integrity (ELI) and the regional targets for Integrity (OLI) to the table.

The design of land-use activities to meet the OLI is conducted in the Design Phase. The Design process works with the broad array of development types, rates, extents, shapes and patterns, and restoration procedures. Visual simulations of proposed land-use development are prepared to predict the visual results, enable the measurement of the proposed changes in perspective view, and provide hard data for comparison of alternatives at the trade-off table.

2.6 Consultation

Consultation is a methodology for acquiring public input into the VLS. It should be conducted once all aspects of the regional plan are completed, and when all goals and indicators can be discussed together. Consultation is a key part of the trade-off process outlined in the previous section. VLS Inventory (seen area, its values, and vulnerabilities), Planning (measurable OLIs), and Design (visualization of development alternatives) all provide the hard data to discuss in relation to expectations and perceptions.

The VLS has purposefully not tried to measure the more intrinsic values of preference and expectations for the landscape. These must be determined in the public process. The Consultation Phase was not developed as it was not part of the VLS contract.

Glossary

Achieved Landscape Integrity (ALI)

The Integrity condition resulting after completion of a land-use project, documented in the ALI Report. Compared to the OLI and PLI to determine success of implementation of a land-use project and to identify further actions.

Attraction (A)

An Inventory element that is a measure of the prominence, features and other characteristics of each Landscape Unit.

Consultation Phase

Phase 6 of the VLS providing a methodology for acquiring public input .

Design Phase

Phase 3 of the VLS in which resource development can be designed achieve the indicator targets of Landscape Integrity. An ecosystem-based land-use planning approach that integrates the physical, visual and cultural landscape.

Design Assessment

A procedure in the Design Phase for testing the adequacy of a land-use design for meeting the Landscape Integrity objectives; involves completing a PLI Report.

Elements

The principal components of a Landscape Unit recorded and evaluated in the Inventory, each with a set of component factors.

Existing Landscape Integrity (ELI)

The Integrity condition(s) present at the time of inventory (Phase 1), documented on Landscape Unit rating forms and on the inventory maps. The supply of visual conditions compared to the OLI and PLI.

Integration

Procedures linking 3 phases of the VLS: Planning, Trade-off and Consultation in which visual landscape goals and targets are examined in the context of the full range of values, expectations, costs, and benefits influencing land and resource management decisions in the Sub-region.

Integrity (I)

An Inventory element that is a measure of the visual condition of the landscape, compared to the natural or natural-appearing landscape. The state of naturalness, or the state of disturbance caused by human activities or alteration. The same Landscape Integrity terminology is applied in Inventory (ELI), Planning (OLI), Design (PLI), and Implementation (ALI). Landscape Integrity is also an important consideration in the Trade-off Phase and facilitates discussion and familiarization in the Consultation Phase. Landscape Integrity is used as a substitute indicator when inventorying, planning and monitoring the CHR aesthetic-sustainability indicators of "scenic value" and "landscape".

Inventory Phase

Phase 1 of the VLS where mapping, photography and evaluation exercise by which the basic Landscape Units (LUs) are delineated and rated to give guidance for planning and management of landscape resources.

Implementation Phase

Phase 4 of the VLS where operations and restoration activities are implemented and monitored to ensure the target landscape integrity is achieved.

Landscape

VLS Definition: V*iewed terrain with its distinguishing characteristics and features; a scene; panorama; scenery.*

Oxford English Dictionary Definitions:

- *a word introduced as a technical term for painters for a picture representing natural inland scenery, as distinguished from a sea picture, a portrait, etc.*
- *a tract of land with its distinguishing characteristics and features, esp. considered as a product of modifying or shaping agents (usually natural).*

Additional description from references cited in the Oxford English Dictionary:

"Geography cannot dispense with geomorphology, for a real understanding of the character and development of the physical landscape is an indispensable preliminary to the study of the cultural landscape and of regions." 1937 Wooldridge & Morgan Physical Basis Geogr. P. ix.

Landscape Character

The state or degree of naturalness in a landscape; a CHR indicator relating to the goal of sustaining the aesthetic (landscape) resources;
synonymous with Integrity – the degree of deviation from the natural or natural-appearing landscape. Landscape Integrity is used as a substitute indicator for landscape character and scenic values.

Landscape Plan

A comprehensive regional plan that establishes measurable objectives for Landscape Integrity to guide the specific and cumulative effects of land-use while sustaining aesthetic resources.

Landscape Unit (LU)

The principal unit of delineation defined in the Inventory; a more or less distinct portion of the landscape, determined by homogeneous biophysical and viewing characteristics. A piece of viewed terrain with its distinguishing characteristics and features; on its own and/or within a scene, panorama; scenery.

Natural

Existing in, formed by, nature; consisting of objects of this kind; not artificially made, formed or constructed; not made, manufactured, or obtained by artificial process; closely imitating nature; life-like; of vegetation – growing of itself; self-

*sown or planted; from seed of those already established; not introduced artificially; of land – not cultivated. (*Oxford English Dictionary Definitions)

Natural-Appearing

VLS Definition:
Closely imitating nature (also an OED definition for natural); resulting from human activities, yet appear natural, including landform construction and planned vegetation growth and succession as well as inadvertent plant succession through fire suppression. Seen as natural by the average viewer.

Non-Visually Effective Green-up (nonVEG)

The visual condition of a disturbed area that has been recently altered and has not been revegetated and grown sufficiently such that bare ground is no longer evident and a new forest and/or appropriate vegetative cover is clearly seen by the average viewer.

Observability (O)

An Inventory element which is a weighting and rating of the viewing opportunities towards each Landscape Unit (LU), considering the factors of distance, orientation, frequency, and duration of the viewing experiences.

Objective Landscape Integrity (OLI)

The planned Integrity conditions derived regionally and for each Landscape Unit providing the guidance for land-use design and implementation. Basis for evaluating PLI and ALI.

Planning Phase

Phase 2 of the VLS where interpretation is made of the data gathered during the Visual Landscape Inventory and where management decisions are made as to the target indicators of Landscape Integrity (OLIs) to be maintained or altered within a the comprehensive Landscape Plan.

Predicted Landscape Integrity (PLI)

The predicted Integrity condition, using visualization techniques, that will result after completion of a land-use design options, documented in the PLI Report and measured against the OLI.

Prospect

Oxford English Dictionary Definitions:
An extensive or commanding sight or view; the view of a landscape afforded by any position; that which is looked at or seen from any place or point of view; a spectacle, a scene; the visible scene or landscape.

Risk (R)

An Inventory element which indicates the predisposition of a Landscape Unit for revealing, heightening exposure, or blending land-use alteration based on inherent characteristics within the unit.

Scenery

Oxford English Dictionary Definitions:
The general appearance of a place and its natural features, regarded from the picturesque point of view; the aggregate of picturesque features in a landscape; a landscape or view; a picturesque scene.

Scenic

Of or belonging to natural scenery; abounding in fine scenery, affording landscape views (**Oxford English Dictionary Definitions).**

Scenic Values

Attributes, characteristics and features of landscapes that provide varying psychological and physiological responses from, and benefits to, humans. A CHR indicator relating to the goal of sustaining the aesthetic (landscape) resources. Landscape Integrity is used as a substitute indicator for scenic values and landscape character.

Significance (S)

An Inventory element which is a measure of the importance of a Landscape Unit, derived in a matrix as the net influence of what is seen in the landscape (Landscape Attraction) and how it is seen (Landscape Observability).

Trade-off Phase

Phase 5 of the VLS where the alternative limits of change in resource development for achieving Landscape Integrity are examined for their influence on a range of interests, including economic, social and environmental influences.

View

Oxford English Dictionary Definitions: Visual aspect or appearance; aspect as affected by position; a sight or prospect of some landscape or extended scene; an extent of area covered by the eye from one point.

Viewshed

VLS Definition: *Area of land seen from a single viewpoint or from a series of viewpoints such as along a highway or waterway.*

Visual Landscape System (VLS)

A multiple phase approach for the identification, planning, and management of visual resources in the context of a comprehensive, integrated, ecosystem-based approach to the management of public land and resources.

Visually Effective Green-up (VEG)

VEG is achieved when an area is re-vegetated with an ecologically-appropriate mixed-wood boreal forest, using native species, and has grown sufficiently such that bare ground is no longer evident and a new forest and/or appropriate vegetative cover is clearly seen by the average viewer.

Author Information

A professional forester, Ken Fairhurst has been playing a central role in the advancement of Visual Resource Management since 1980. Between 1980 and 1983, and again from 1985 to 1996, Ken managed the visual landscape program for the Vancouver Forest Region of the British Columbia Ministry of Forests. In 1984, Ken opened a consulting practice in urban forestry, outdoor recreation and forest landscape management. One of his projects led him to Alberta to conduct visual assessments in the Hidden Creek area along the east slopes of Rocky Mountains. In 1984/85, Ken was responsible for building the first visual landscape program for the Alberta Forest Service, and preparing the initial drafts of the Forest Landscape Management Strategies for Alberta. In 1985, Ken returned to British Columbia, where he continued the process of building and expanding the Visual Resource Management system throughout the Ministry of Forests' Vancouver Forest Region, while contributing to the development of the province-wide landscape program.

In 1996, Ken re-opened his consulting company, RDI Resource Design Inc, to further specialize in resource planning and visualization. Through RDI, Ken has remained at the forefront of Visual Resource Management by developing and teaching academic courses (BCIT), producing a great many large and small scale landscape design projects for industrial and governmental clients in Canada and the USA, conducting research with significant social, environmental and economic benefits, and presenting his findings at international conferences. Recent significant projects include the design of a total resource plan having positive research implications on long term timber supply in coastal British Columbia (BC Ministry of Forests), analysis of visual quality for silviculture treatment options in a major urban watershed (Greater Vancouver Regional District), development of visually-effective erosion control options in California (Pacific Lumber), prediction of the visual effects of fire hazard abatement treatments in Arizona (USDA Forest Service), and design simulation of landform reconstruction in the oil mining sector in Alberta (Suncor Energy).

RDI is proud to have been selected to develop the Visual Landscape System – a landmark process and a template for comprehensive Visual Resource Management throughout Alberta. Aspects of the VLS will be the subject of further research by Ken Fairhurst as he pursues his Ph.D. in Forestry at the University of British Columbia. He will continue his active role at RDI during his studies.

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