VISUAL IMPACT ASSESSMENT

HANDBOOK

BRITISH COLUMBIA

FOREST AND RANGE PRACTICES ACT

May 2022

FOREWORD

This handbook replaces the *Visual Impact Assessment Guidebook* released in 2001 under the *Forest Practices Code of British Columbia Act* (Forest Practices Code).

The *Forest and Range Practices Act* (FRPA) governs forest and range management activities on public lands in British Columbia for 11 identified resource values, including visual quality. Under the forest stewardship planning framework, forest stewardship plans (FSPs) must specify intended results or strategies to meet objectives set by the provincial government for visual quality and established visual quality objectives (VQOs). The Forest Planning and Practices Regulation (FPPR) requires holders of FSPs to ensure that the intended results specified in the plans are achieved or that identified strategies are carried out.

Some level of visual assessment is required for a licensee to know if the results or strategies prescribed in the FSP are consistent with the legally established VQOs for an area. Forest professionals registered with the Association of BC Forest Professionals (ABCFP) adhere to ethical and professional standards set by the ABCFP. Exercising due diligence, ABCFP registrants work with constant and careful attention, having regard for applicable standards, policies, plans, and practices established by the government or the ABCFP. ABCFP registrants also maintain sufficient knowledge, skill, and ability, and practice only in areas where training and ability ensure competence.

The role of this handbook is to lay out best practices for completing visual impact assessments (VIAs) in a consistent and defensible manner. VIAs provide a way to estimate, in perspective view, the potential visual effect of proposed forest operations on landforms designated as scenic areas and are carried out from "significant public viewpoints." These assessments are used to confirm whether visual quality objectives will be achieved. Agreement holders are not required to follow all details of the handbook in all situations, but rather to use it as a template to apply to their own unique situations when carrying out visual assessment work.

Agreement holders are also encouraged to engage with Indigenous Peoples as early as possible in the planning and development stages of timber harvesting. While this handbook includes reminders about engaging with Indigenous Peoples during the selection of significant viewpoints and when developing design options, it does not address legal obligations pertaining to consultation with Indigenous Peoples. Guidance about consultation with Indigenous Peoples is available from other sources such as Consulting with First Nations.

The VIA process generally consists of identifying the VQO for an area, selecting significant public viewpoints, simulating proposed cutblock and road designs in perspective view, and evaluating the results against regulatory and research standards. Using simulations and reference photographs, proposed operations are assessed on a landform using two independent measures:

1. An ocular assessment using VQO descriptions as defined in FPPR Section 1.1, and
2. A numerical and design assessment using standards and criteria derived through research.

Determining if a VQO has been achieved is reliant on comparing the ocular assessment (using VQO definitions) with the numerical assessment and comparing these to the parameters of the established VQO for the area. The VIA is a self-diagnostic tool. If the results of the assessment conclude that the VQO will not be achieved, then it will be necessary to adjust the design and simulations until they indicate that the VQO will be met. A VIA should be completed by a competent forest professional who is responsible and accountable for the professional work.

All references to legislation and regulations contained in this handbook are current as of the date of publication. Since legislation, regulations, and scientific information can change over time, it is recommended that information sources in addition to this handbook be used to ensure the best and most up-to-date information is being used in the VIA process.

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1.0 INTRODUCTION AND PURPOSE

Scenery management provides visible stewardship that the public sees and uses in part to judge resource management activities. If scenery management is designed so that it “fits” within the natural landscape as much as possible, then there is an increased likelihood that the public will look positively upon those activities (Figure 1). This is part of the social licence that is earned from the public.

In planning and carrying out primary forest activities in scenic areas with visual quality objectives (VQOs), there is a need to assess the proposed visual impacts of these activities. A visual impact assessment (VIA) is not just a visual simulation – it is an iterative process that involves selecting viewpoints, taking photographs, developing design options, simulating proposed cutblocks and roads, and evaluating the simulations to determine if the VQO(s) will be met. Where proposals do not meet the objective(s), cutblocks may have to be redesigned and re-simulated to ensure that the objective(s) will be achieved.

DEFINITION:

Visual impact assessment (VIA):

A set of procedures and criteria that are applied to a proposed landscape alteration(s) to estimate the level of visual impact and determine consistency with visual quality objectives.

The purpose of this handbook is to provide guidance on:

- The role of VIAs in the forest planning and practices process,
- Recommended procedures for completing an assessment,
- Evaluation criteria used to assess whether proposed timber harvesting and road construction operations will be consistent with the VQO(s), and
- Products that should be incorporated into a VIA package.

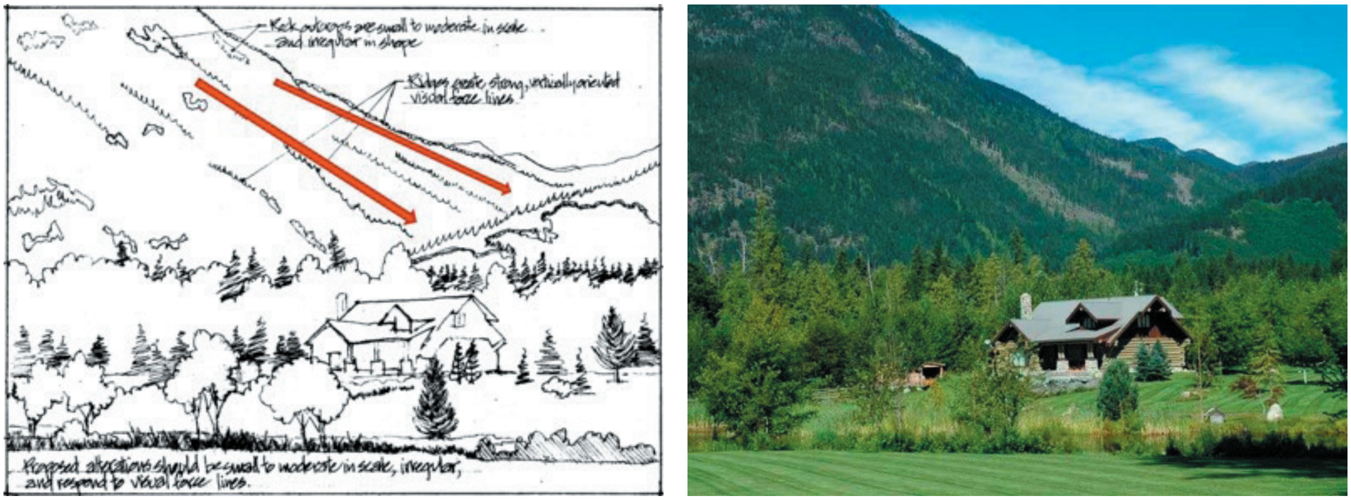

Figure1. (a) **Pre-harvest sketch of key landscape features and** ***(b)*** **post-harvest photo of well-designed openings.**

2.0 VISUAL IMPACT ASSESSMENTS IN THE CONTEXT OF FRPA

The first visual impact assessment (VIA) procedures were introduced in British Columbia in the early 1990s to document the impact proposed forest harvesting would have on visually sensitive landscapes.

In 1995, the *Forest Practices Code of British Columbia Act* (Forest Practices Code) came into effect, enabling the designation of "scenic areas," the establishment of visual quality objectives (VQOs), and the requirement for VIAs.

With the enactment of the *Forest and Range Practices Act* (FRPA) in 2004, visual quality was recognized as one of 11 resource values to be managed under the forest stewardship planning framework. The concepts of "scenic areas" and "visual quality objectives" were continued in legislation. Known scenic areas under the Forest Practices Code were grand parented into FRPA, as were existing VQOs. Scenic areas without VQOs were either provided with an objective set by government (OSBG) under the Forest Planning and Practices Regulation (FPPR), or Government Actions Regulation (GAR) orders were written to establish VQOs.

REQUIREMENTS

Under FRPA, the requirements for managing visual quality are specified in regulation and associated with the preparation of a forest stewardship plan (FSP) or woodlot licence plan (WLP).

The preparation of a WLP is governed by the Woodlot Licence Planning and Practices Regulation (WLPPR). Section 8 (1) (i) of the WLPPR requires woodlot licence plans to include information and maps that describe or identify scenic areas, while section 59 of the WLPPR requires WLP holders to carry out primary forest activities in the plan area that are consistent with the visual quality objective, if a VQO applies to the WLP area.

A licensee preparing an FSP must identify within each forest development unit those scenic areas that were in effect four months before the plan was submitted to the district manager for approval – FPPR Section 14(2) & (3) (e). Also, an FSP must specify intended results or strategies in relation to the OSBG for visual quality or the established VQOs – FRPA Section 5(1)(b)(i) & (ii). The specified results or strategies must be consistent with the OSBG for visual quality and established VQOs – FRPA Section 5 (1.1). The holder of an FSP must ensure that the intended results specified in the plan are achieved and that the strategies in the plan are carried out – FRPA Section 21(1).

DUE DILIGENCE: WHY IS A VISUAL IMPACT ASSESSMENT (VIA) NEEDED?

The provincial government has established VQOs across the province and defined what the results must look like in FPPR Section 1.1. FRPA is a results-based framework and FSP holders are required to specify results or strategies that are consistent with the established objectives for visual quality.

The VIA process is designed to document how proposed primary forest activities will be consistent with established VQOs. This is not required under legislation, but rather considered a key part of both the FSP holder's and the forest professional's due diligence when planning primary forest activities in scenic areas with established VQOs. Th handbook describes recommended procedures and standards for completing VIA work.

STANDARD OF CARE

How much detail is enough when completing a VIA? The answer depends on several factors, including viewing sensitivity, established VQO(s), and known or predicted public concerns. For example, a Retention VQO near a community where concern for visual quality has been publicly expressed suggests that a detailed VIA and a high standard of care should be applied. In comparison, a Modification VQO on a background ridge along a highway suggests a more basic VIA will be sufficient. For further reference, see section 4.0 of the handbook for the recommended contents of a standard VIA package.

3.0 VISUAL IMPACT ASSESSMENT PROCEDURES

This section describes the steps and procedures for completing a visual impact assessment (VIA) and identifies the various products that should be included in a VIA package. Each step refers to parts of the VIA summary form found in Appendix 1. This form, or one with similar content, is intended to be filled out for each viewpoint included in the VIA.

The VIA procedures are best applied to timber harvest proposals located in the middle ground and background of view. The assessment criteria described in this document have not been calibrated to assess foreground views of alterations generally less than 1 km from the viewpoint. This does not mean that such areas are not visually sensitive, but rather that some additional interpretation may be required to assess consistency with VQOs. In these situations, it is advisable to contact the appropriate natural resource district office for advice.

The procedures in this handbook involve five steps: step 1 is identifying the VQO applicable to the proposed operation and determining potential viewpoints; step 2 is conducting fieldwork and taking photographs; step 3 is developing cutblock design options and completing visual simulations showing the results; step 4 is assessing the simulation output relative to the VQO and determining the VIA rating; and step 5 is documenting the results. Figure 2 shows the five-step VIA process.

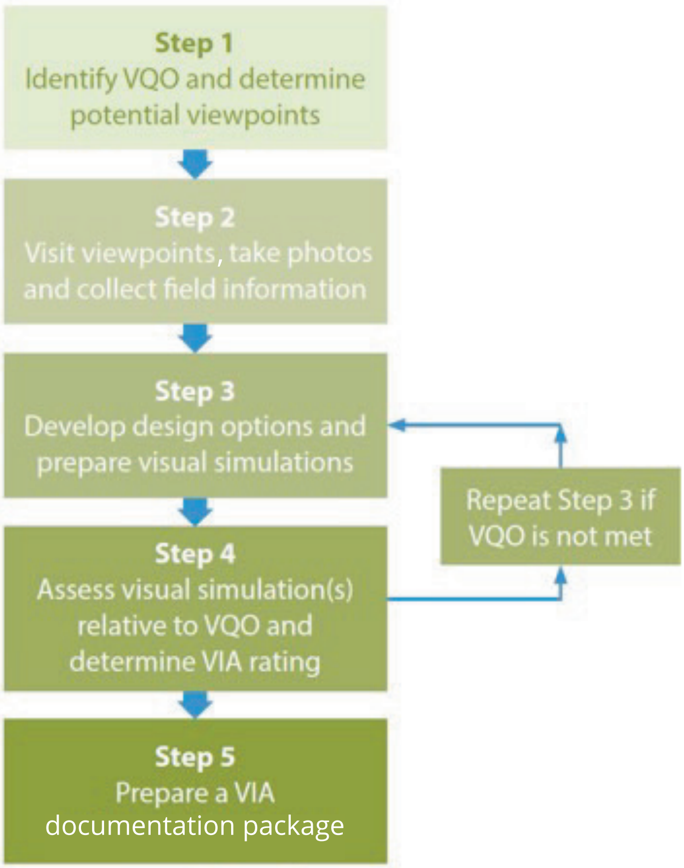

Figure 2. **Five-step visual impact assessment process.**

A VIA is best conducted from viewpoints that represent a full range of public viewing opportunities. Both the proposed timber harvesting and all existing alterations that have not achieved *visually effective green-up* must be considered in the VIA.

The following pages describe the typical procedures and sequence of events for each step of the VIA process.

3.1 IDENTIFY VQO(S) AND DETERMINE POTENTIAL VIEWPOINTS

The purpose of this step is to prepare for field work by gathering maps and visual information and recording this information on the VIA summary form. It is also a good time to contact natural resource district staff to discuss any assessment uncertainties.

3.1.1 IDENTIFY VQO(S) AND PREPARE FIELD MAP (OFFICE)

Spatial information for scenic areas and established VQOs is available in the BC Geographic Warehouse (BCGW). Determine the VQO(s) for the area of interest by downloading visual landscape inventory (VLI) data from the BCGW through DataBC or by viewing the data using one of the ministry's online viewers (Figure 3).

VLI data, including VQOs, can be viewed by anyone using the Visual Inventory Viewer or iMapBC. The customized Visual Inventory Viewer is the simplest tool to use and is available at: http://maps.gov.bc.ca/ess/hm/visinv/.

Situations may arise where proposals are visually sensitive but do not have an established VQO. Professional judgement may be required to manage the visual resource value, even if the VLI does not fully capture the visual sensitivity of the view.

BEST PRACTICE:

A standard VIA, as outlined in this handbook, assesses each view using two independent measures:

1. Which category of alteration will be achieved based on the VQO definitions (discussed under 3.4.1)?
2. Which category of alteration does the numerical assessment predict (discussed under 3.4.2)? This measure includes consideration of visual design.

The final rating compares the above two measures to determine consistency with VQO(s). Note that the VQO definitions found in regulation are the key criteria in determining consistency while the numerical assessment provides supporting information. If this final combined rating is not consistent with the established VQO(s), the proposal(s) may need to be redesigned, re-simulated, and re-assessed.

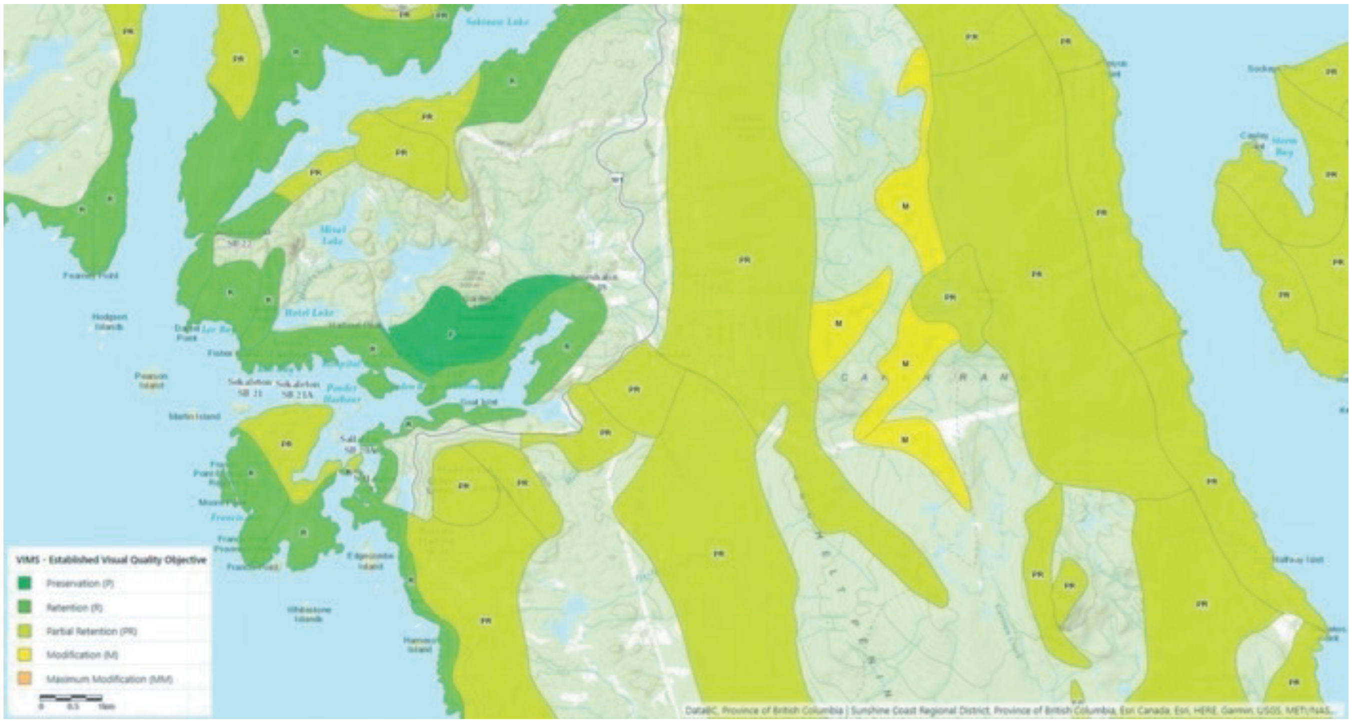

Figure 3. **Clip of visual inventory showing scenic areas with colour-themed VQOs.**

If you wish to download visual landscape inventory (VLI) data, including VQOs, there are two approaches:

1. Through the Recreation Resources Inventory Online Application: http://apps.gov.bc.ca/pub/rec
2. Through the DataBC Data Catalogue: https://data.gov.bc.ca Type “VLI” in the search box and follow the links leading to the download page. You can download files in various formats, including ArcView Shape by area of interest (AOI) or map sheet number.

Once you have determined the VQO(s), prepare spatial data for use with mobile devices in the field or for hardcopy maps. Data should include contours, the location of the proposed alteration(s), the visual sensitivity unit boundaries, highways, waterways, and potential viewpoints. This information will help position the proposed alteration(s) for further analysis and 3D modeling.

In some cases, the VLI may not capture a visually sensitive area. In the event a proposal is visually sensitive, is not part of the VLI, and does not have an established VQO, then it is advisable to contact the natural resource district office, which may have visual mapping or information that may not yet be represented within the BC Geographic Warehouse. It is important to confirm current information with the local natural resource district office before proceeding with the VIA.

3.1.2 SELECT POTENTIAL VIEWPOINTS

Examples of viewpoints may include, but are not limited to:

- Stretches of highway or other public roads,
- Roadside rest stops,
- Recreation sites or campgrounds,
- Groups of homes,
- Regionally significant trail corridors,
- Lakes or marine areas,
- Settlements, or
- Tourism related commercial enterprises.

BEST PRACTICE: ENGAGEMENT WITH INDIGENOUS PEOPLES WHEN IDENTIFYING VIEWPOINTS

In addition to assessing anticipated visible alterations from each significant public viewpoint(s), it is important to identify and consider viewpoint locations of importance to Indigenous Peoples.

When engaging with Indigenous Peoples for the purpose of identifying viewpoints, note that while some viewpoints may be near the planned alteration, some viewpoints may be located farther away, in another territory, or within an area of overlapping territories, necessitating contact with more than one Indigenous community.

With proposed roads and cutblocks located on maps and imagery, the surrounding landscape context can be understood, and tentative locations can be identified from which the proposal may be most visible. Map the proposed cutblocks to understand the surrounding landscape context and identify potential viewpoints. This pre-selection provides an opportunity to tentatively select the location(s) from which each proposal may be most visible.

DEFINITION:

Significant public viewpoint:

A place or location on the land or water that is accessible to the public and provides a direct viewing opportunity to the alteration and landform being assessed, including but not limited to travel routes, settlements, public use areas, tourism facilities, and parks.

BEST PRACTICE:

- Visible alterations must be assessed from each significant public viewpoint(s) included in the VIA.
- It is important to review the location(s) offering the best or most direct view of the alteration. The "best" view is helpful for showing the maximum visibility of the proposed harvesting and in designing the proposed harvesting to be consistent with VQOs. This may not necessarily be a viewpoint that provides a stationary or stopping location.
- Visual landscape inventory (VLI) viewpoints are used to derive visual sensitivity unit boundaries and rate the visual sensitivity of those units. As the viewpoints have been identified specifically for the VLI, they may not represent the full range of views applicable to a VIA.

FILL IN THE VIA SUMMARY FORM

Appendix 1 provides a recommended VIA summary form for use when completing a VIA. One form is completed for each viewpoint selected.

The first section of the form records general information about the proposed alteration(s). When completing this part, identify the licence number, cutting permit number, and cutblock number(s) to clearly identify the opening(s) being assessed. The block location is the locale/landform where the block(s) occur (e.g., Pine Mountain).

DEFINITION:

Visual sensitivity class (VSC):

A component of the visual landscape inventory (VLI) that rates the sensitivity of the landscape to visual alteration based on biophysical characteristics, as well as viewing and viewer-related factors.

In the second section of the form, record the VQO data. Identify the VLI polygon number, the VQO(s) associated with the polygon, the visual sensitivity class (VSC), visual absorption capability (VAC), the date when the VQO was established, and the mechanism used to establish the VQO (e.g., FRPA Section 181, GAR Section 7.2, GAR Section 17, or FPPR Section 9.2). You can learn how the VQO was established by viewing the rationale field for the VLI polygon.

3.2 VISIT VIEWPOINTS AND TAKE PHOTOGRAPHS (FIELD)

In the field, visit your pre-selected viewpoint(s) and add or delete from them as required to ensure all possible view angles have been covered. Familiarize yourself with the landscape and the proposed alteration(s) by travelling throughout the study area as much as possible, taking note of special features, road stops, traffic pull-offs, and traffic conditions. At each viewpoint, take photos and record the following: viewpoint GPS coordinates, elevation, viewing direction, and distance to the alteration. Record the camera focal length used in millimetres (DSLR [digital single lens reflex] cameras may record this information automatically in the image properties). This data will be required to produce an accurate simulation of the landscape.

3.2.1 SELECT FINAL VIEWPOINT(S)

Conduct the assessment using the means of travel most often used by the typical visitor or traveler (e.g., vehicle, boat, on foot, or any combination thereof). Estimate the location and visibility of the proposed alteration(s) and locate the viewpoints pre-identified in the office to confirm if they provide the best views for the assessment. Identify and number the final viewpoints selected on the topographic base map or directly into a portable GPS device.

VIEWING DURATION

Viewing duration is an important consideration in VIAs. It is accepted that stationary viewing locations where viewing duration is high (e.g., highway rest stops, campsites, etc.) should be included in the VIA ([Fig.4(a)]).

However, there will be situations along highways where no stopping locations exist, but where straight stretches and enclosed roadways provide prolonged views of the development ([Figure 4(b)]). It is important to know that the viewing public can perceive and react to a visual landscape within a matter of seconds. The cone of vision of the moving viewer narrows with increasing speed, so the static viewer can absorb the entire view at leisure, while the highway traveler, moving for example at 90 km/hour, has a cone of vision limited to 50 degrees or less (Design of Forest Landscapes, 1991).

A glimpse view means to catch sight of an alteration briefly or momentarily. Examples include a quick pan of the landscape as you drive a corner or a lateral view through the trees at the side of the road ([Figure 4(c)]). If there are two or three open views and one glimpse view, the glimpse view will normally be the least important. However, there may be situations where glimpse views provide the key views and therefore become more important.

Figure 4. **Examples of viewpoints showing:** ***(a)*** **stationary view,** ***(b)*** **extended moving view along highway, and** ***(c)*** **partial foreground screening creating a series of glimpse views while driving.**

FILL IN THE VIA SUMMARY FORM

On the VIA summary form (Appendix 1), record information about the viewpoint location and number, GPS coordinates, elevation, viewing direction, distance to the alteration(s), and photography parameters. Alternatively, this data may be captured using a digital device and mapping software.

Viewpoint Number (top right corner of VIA summary form)

It may be necessary to complete an assessment from several viewpoints. If this is the case, record the viewpoint number out of the total number of viewpoints used for the assessment (e.g., 1 of 4, 2 of 4, etc.) in the top right corner of the form.

VIEWPOINT COORDINATES

Identify the viewpoint location using a GPS unit and record the position using longitude and latitude coordinates (i.e., degrees, minutes, and decimal seconds) and elevation (m).

Viewing Direction

Record the viewing direction using a compass bearing (0-360°) from the viewpoint to the center of the landform being assessed.

Viewing Distance

Measure the distance from each viewpoint to the center of the landform that contains the alteration(s). This can be done with a scale ruler on a hardcopy map or using GIS, Google Earth, or the iMapBC measuring tool.

Viewpoint Type

Record the viewpoint type on the VIA summary form. Comparing viewpoint types may be useful when considering the degree of risk in achieving VQOs from various viewpoints. Viewpoints with direct views and high viewing duration may require greater caution when designing cutblocks. Note that viewpoint types are roughly related to viewing duration and viewing angle:

1. Glimpse view, less than 10 seconds,
2. Sustained side view,
3. Sustained focal view or traveling toward the alteration for more than one minute,
4. Viewpoint at a rest stop, campsite, or other static short-term view location, and
5. Viewpoint at the location of a community, commercial tourist-related enterprise, or other static long-term view site.

Viewpoint Description

Describe the viewpoint in a local context (e.g., highway rest stop, boat launch, road junction, etc.).

3.2.2 TAKE PHOTOGRAPHS

Pre-harvest photographs are important for several reasons. In VIAs, the photos may be used to:

- Document the existing visual condition of the pre-harvest landscape,
- Assist with landform delineation and character assessment,
- Help interpret visual simulations, and
- Provide a reference to ensure visual simulation models are reasonably accurate. When done correctly, a visual simulation will drape over the photography seamlessly and vice versa. If there are distortions or issues with the model, these will be apparent.

At each viewpoint, it is helpful to take two sets of photos: one set at a standard focal length (human eye equivalency is 57 mm); the second set zoomed in to capture landform detail. The latter may help during the design phase. It is important to photograph the full landform where the alteration is proposed. A series of overlapping photographs (25% overlap minimum) may be required to capture the entire scene. The photographs will later be stitched together to provide a broad panorama.

Refer to Appendix 2 for a more detailed description of photography and presentation criteria.

BEST PRACTICE:

- The weather should be clear (90% cloud free) and the scene well illuminated for optimal photography. Illumination is strongest in the summer months. East-facing units are best viewed in the morning and west-facing units are best viewed in the afternoon. Side lighting is beneficial for accentuating terrain detail. Try to avoid cloud shadows on landforms. Plan your day accordingly.
- When taking overlapping photographs, go from left to right while staying level and do not modify camera settings between shots. Panoramas are best taken using a tripod.
- Panoramas can be taken either horizontally or vertically if dealing with large landforms. If necessary, use the vertical format to capture the full extent of the landform.
- Field workers should wear bright safety vests and use traffic cones when working along roadways.

Photo ID Numbers

Identify and record the digital photograph numbers taken at the viewpoint location for future reference.

3.3 DEVELOP DESIGN OPTIONS AND PREPARE SIMULATIONS

The purpose of this step is to assemble photography, delineate the landform to be used for the assessment, develop cutblock design options, and prepare simulations of cutblocks and roads.

3.3.1 PREPARE PHOTOGRAPHY

Following your field visit, catalogue the photograph(s) taken from each viewpoint. Where multiple overlapping images were taken to capture the entire scene from a given viewpoint, the photographs need to be stitched together digitally to provide the broad panorama and landscape context necessary to carry out the steps described below. Many digital cameras come with panorama stitching software (e.g., Canon Photo Stitch). In this case, you would import the images into the software and stitch the photos together. If your camera does not come with digital stitching software, there are several products available on the market.

BEST PRACTICE:

- Stitching photos into a panorama is most easily done using digital images. Stitching software may be included with your digital camera, or you may use one of many specialized software programs on the market.

3.3.2 DELINEATE THE LANDFORM

Once you have selected and (if necessary) stitched your photographs from each viewpoint, you can use them in combination with a topographic map or GIS to determine and delineate the landform that will be assessed. The photographs are important references, not only for identifying features in the landscape, but also for checking the accuracy of visual simulations that are produced.

It is important to understand what a landform is in relation to the broader landscape; how it differs from the visual sensitivity units (VSUs) found on VLI mapping; and how to delineate a landform in preparation for the scale of alteration calculation that is explained in section 3.4 of this handbook. Refer to Appendix 3 for detailed guidance on defining landforms.

Although similar, by definition, there are key differences between **landform**, **landscape,** and **visual sensitivity unit (VSU)** in terms of how they are captured and used.

A *landform* (Figure 5) is a sub-unit of the broader *landscape* that can be seen from **one** specific viewpoint. A proposed alteration is always assessed and measured against the landform on which it occurs.

DEFINITIONS:

Landscape:

The entire scene viewed at one time from one place.

Landform:

A distinct topographic feature that is a sub-unit of the broader landscape, three dimensional in form, and delineated from a significant public viewpoint in perspective view. A landform is generally defined by ridges, drainage channels, valleys, shorelines, and skylines.

Visual sensitivity unit (VSU):

A distinct topographic unit as viewed from one or more viewpoints and delineated based on the homogeneity of the landscape and biophysical elements. It is equivalent to a polygon in a visual landscape inventory.

Figure 5. **A landform (in red outline) is a sub-unit of the broader landscape.**

A visual sensitivity unit (VSU) is the result of mapping the visible landscape from one or a succession of viewpoints, along a highway for example, as part of a visual landscape inventory. While moving along, if the visible landscape remains homogeneous and presents similar biophysical features, the mapping can result in one very large unit. In steeper well-defined topography, a landform can sometimes match a VSU on a map, but usually the VSU will be larger than a landform and contain more than one homogeneous landform (Figure 6).

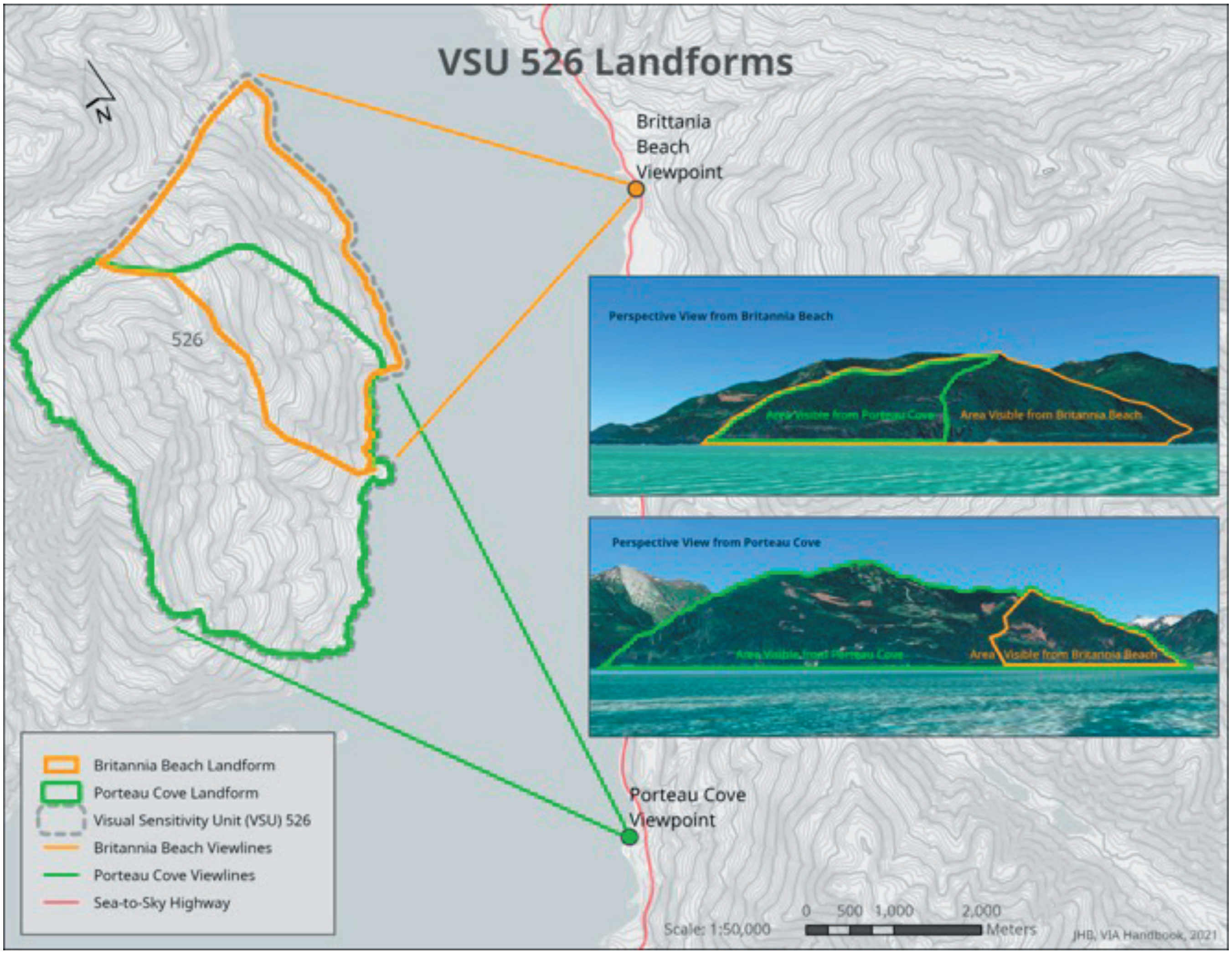

Figure 6. **A VSU may contain multiple landform units.**

While not common, circumstances do exist across the province where a single landform may have multiple VQOs (Figure 7). An example of this situation is when the lower portion of a landform is classified as Modification and the upper portion is classified as Partial Retention, or vice versa. This situation occurs in the Kootenay Boundary Land Use Plan area, where VQOs were assigned based largely on distance zones.

If two different VQOs occur on the same landform, the proposed alterations will have to be designed to meet each objective. FRPA requires that results be assessed against the established VQOs. To deal with this scenario, one should map the boundaries of the VQO polygons onto the landform in perspective view (e.g., on a photograph or simulation). Google Earth is a helpful tool for this task. Use the landform and VQO boundaries to define landform sub-units, and then carry on with the assessment as per this handbook.

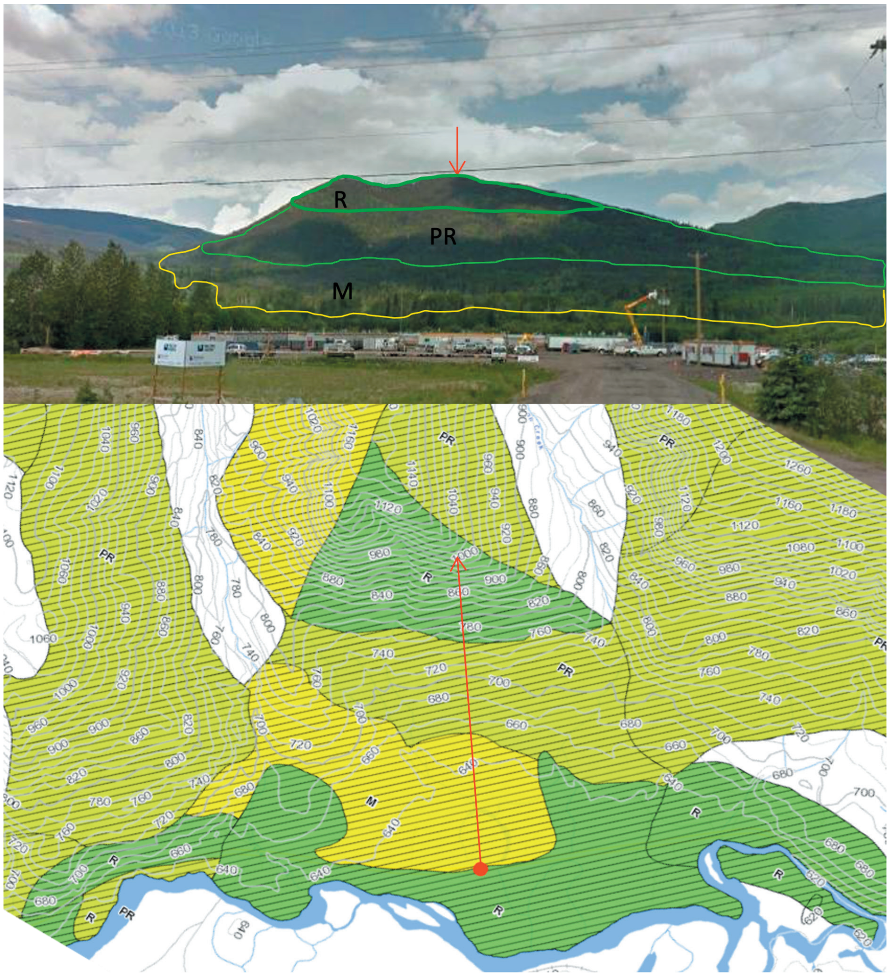

Figure 7. **Photo and map showing a landform with multiple VQOs.**

3.3.3 DEVELOP DESIGN OPTIONS

Once you have compiled your photographs and delineated the landform that you will be working on, the next step in the process is to develop some design options to be consistent with the VQO(s).

- Complete a visual force analysis on the photograph or digital terrain model (perspective view) and on the topographic base map (plan view). Refer to Appendix 4 for more in-depth information about this technique.
- Complete a land feature analysis on a photograph and the topographic base map (plan view). Refer to Appendix 4 for more in-depth information about this analysis.
- Using the results of the visual force and land feature analyses, develop one or more design options in perspective view, exhibiting elements of good visual design. Development of more than one design option for each proposed operation may make the design and assessment process more efficient and cost effective. Refer to the *Visual Landscape Design Training Manual* for more in-depth information about design strategies, procedures, and techniques.

Refer to Appendix 5 for guidelines for designing roads and cutblocks at the landform level, based on internationally recognized visual landscape design concepts and principles. In addition, there may be special design considerations that result from engagement with Indigenous Peoples. The location and design of roads and cutblocks to align with feedback from Indigenous Peoples should be incorporated at this stage in the design process.

3.3.4 DEVELOP VISUAL SIMULATION(S)

Create a visual simulation from each viewpoint visited in the field to determine what the proposed opening(s) and road(s) will look like on the landform.

DEFINITION:

Visual simulation:

"pictures of real places seen from a particular perspective which can be manipulated...to show features of importance, or future conditions based on land management decisions." (Sheppard, Lewis et al. 2004)

Visual simulations can be generated through a variety of methods.

- **Simple GIS mode**l – Digital elevation models (DEMs) with overlaid (two-dimensional) spatial data (e.g., the alteration and the VQO polygon) can provide preliminary and contextual imagery (Figure 8).

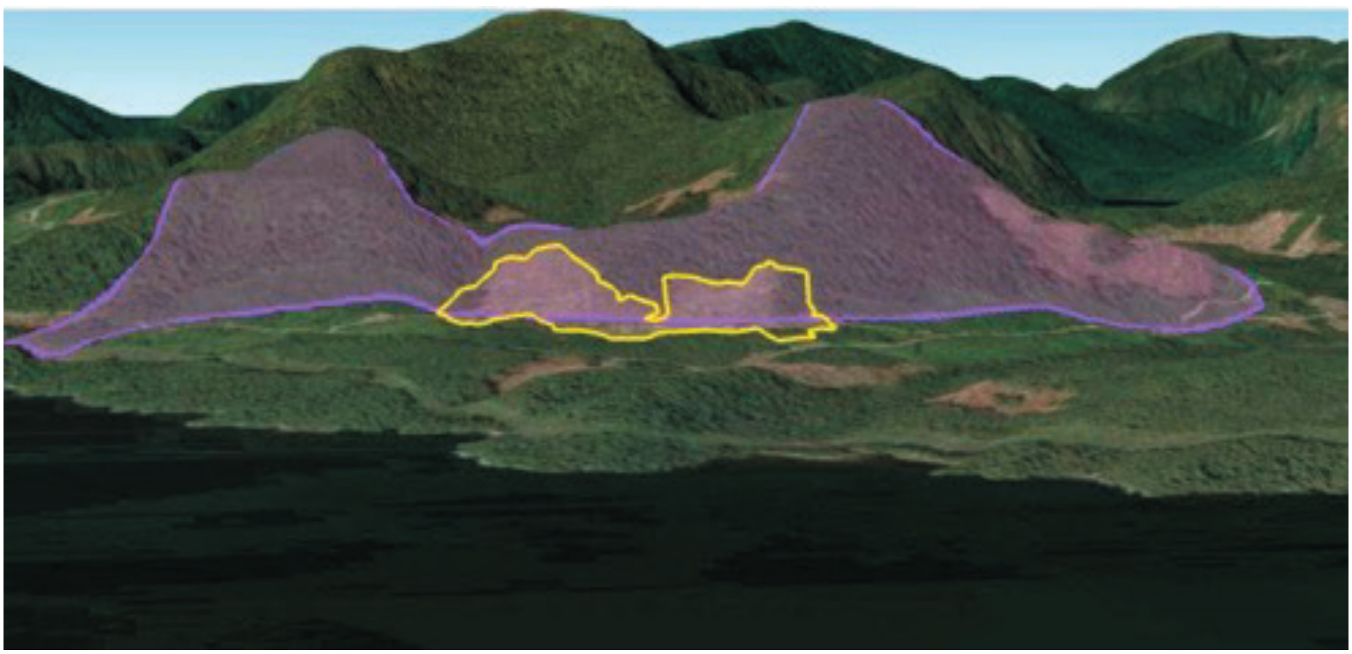

Figure 8. **Simulated aerial view created from a DEM with overlaid spatial data (Google Earth Pro image).**

- **Near photo realism 3D** – Detailed surface models with canopy height models (CHMs) that can be manipulated and draped on the surface model can provide additional detail (Figure 9).

Figure 9. **Simulated view of forest alterations based on a DEM with added vegetation cover (VNS 3 image).**

- **Image manipulation** – Photographic images can be retouched to show proposed alterations. A DEM generated from the same viewpoint is commonly overlaid on the photo to accurately place alterations (Figure 10).

Figure 10. **Photo rendering that simulates proposed forest alterations (Adobe Photoshop Image).**

While evolving software technology is allowing for more realistic simulations to be produced, spatial data capture technology is also rapidly advancing. Recent advances in light detection and ranging (LiDAR) technology allows high-resolution spatial data to be collected and used for various forestry applications, including building very accurate DEMs and CHMs. Simulations built upon this data can improve predictability and confidence that proposed harvest operations will turn out as planned. When rendered in a realistic way, these simulations can also be very powerful communication tools.

- **LiDAR-based modeling** – LiDAR data is used to build detailed elevation models overlaid by vegetation cover, often based on modeling of individual tree characteristics (Figure 11).

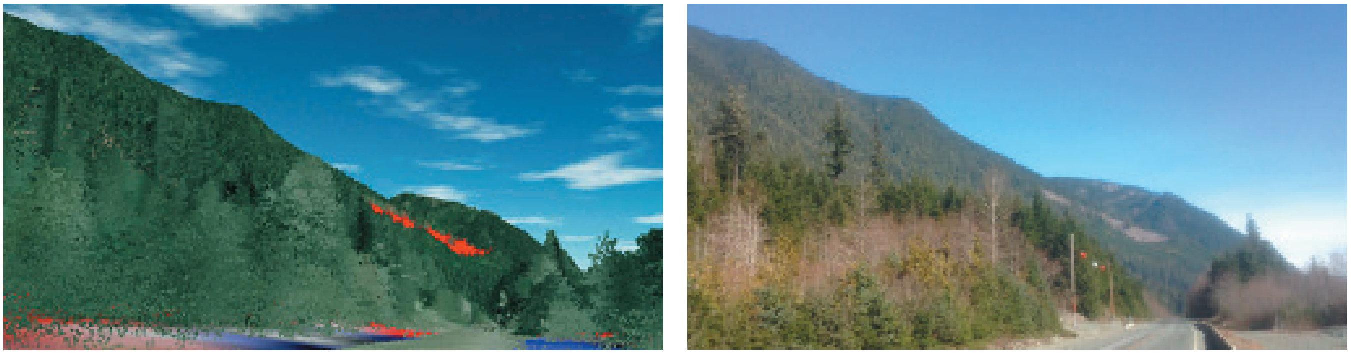

Figure 11. (a) **LiDAR-based simulation of pre-harvest proposal (Global Mapper image) and *(b)* post-harvest photograph from same viewpoint.**

In landscapes of high public concern, a high-quality visual simulation based on one of the methods described above is strongly recommended.

Each simulation should be created using GPS coordinates for the photo location, the same simulated focal length as the reference photos, tree heights consistent with forest cover data or measured in the field and be viewed from the same compass bearing as recorded in the field.

Compare field photos to the simulation to assess the accuracy of your model by checking that:

- Viewpoint coordinates are correct,
- View angles and directions are correct,
- Simulation focal lengths match the photograph focal lengths,
- Tree heights in the foreground and at the edge of the block are accurate,
- Leave areas are correctly positioned,
- Past alterations (e.g., non-vegetated areas) are included and accurately represented in the model,
- There is no vertical or horizontal exaggeration, and
- There are no apparent anomalies in the simulation.

All computer-based models will have accuracy limitations depending on the quality of the data used. A good simulation will overlay the pre-harvest field photo and the landscape features should match up. Once each simulation has been rendered, it will be assessed using the process and criteria set out in section 3.4 of this handbook to predict if the VQO(s) will be achieved. Refer to Appendix 7 for a detailed summary of the information that should be included with each 3D visualization.

3.4 ASSESS VISUAL SIMULATION RELATIVE TO ESTABLISHED VQO

The purpose of this step is to evaluate whether the proposed operation(s) is consistent with the established VQO(s). The Forest Planning and Practices Regulation (FPPR) Section 1.1 defines the five categories of altered forest landscapes that are to be assessed from a significant public viewpoint – preservation, retention, partial retention, modification, and maximum modification.

Under FRPA, VQOs are established under the Government Actions Regulation and are consistent with these five categories. In addition to the proposed operation, existing non-visually greened-up alterations within the landform unit must be considered. See Appendix 9 for photographic examples of the retention, partial retention, and modification categories.

Each simulation is assessed using two independent measures:

1. An ocular assessment using the FPPR definitions for categories of alteration (Section 3.4.1 below), and
2. A perspective numerical assessment using criteria derived through research (Section 3.4.2 below).

The two measures are combined to determine a final rating of VQO achievement (Section 3.5 below).

BEST PRACTICE:

The ocular assessment using the definitions from FPPR Section 1.1 is the most important measure in determining achievement of VQO(s). The numerical assessment (i.e., percent alteration measure or stems/volume measure) is a reasonable predictor of achieved visual condition if measured and applied correctly. However, the numerical assessment can be influenced by factors such as landform delineation, viewing distance, estimation of tree retention, presence of visible roads, and quality of visual design. Therefore, the numerical assessment is used as a supporting measure, while the ocular assessment is the primary determinant of consistency with VQOs.

3.4.1 OCULAR ASSESSMENT (ASSESSING THE VISUAL QUALITY CLASS DEFINITION)

Once a simulation has been generated, the visual quality class (VQC) definitions (Table 1) are used to determine the VQC achieved on the landform. When considering the definitions, use the most logical and most readily identifiable landform as the assessment unit.[1] Appendix 3 describes how to define landforms.

To carry out a proper ocular assessment, it is necessary to view the simulation(s) at a scale that represents how the landscape would be viewed in the field. This topic is addressed in Appendix 8.

Evaluate the simulation using the category of alteration definitions for each VQO as described in Table 1 below.

Table 1. **DEFINITION OF VISUAL QUALITY CLASSES (CATEGORIES OF ALTERATION)**

VISUAL QUALITY CLASS	SYMBOL	DEFINITION FROM FPPR SECTION 1.1
Preservation	P	consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is: (i) very small in scale, and (ii) not easily distinguishable from the pre-harvest landscape;
Retention	R	consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is: (i) difficult to see, (ii) small in scale, and (iii) natural in appearance;
Partial retention	PR	consisting of an altered forest landscape in which the alteration, when assessed from a significant viewpoint, is: (i) easy to see, (ii) small to medium in scale, and (iii) natural and not rectilinear or geometric in shape;
Modification	M	consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is: (i) very easy to see, and is (ii) (A) large in scale and natural in its appearance, or (B) small to medium in scale but with some angular characteristics;
Maximum modification	MM	consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, Is: (i) very easy to see, and is (ii) (A) very large in scale, (B) rectilinear and geometric in shape, or (C) both.

Note: If forest stewardship plans include VQO definitions as part of their results or strategies, they must be identical to those described in FPPR Section 1.1.

FILL IN THE VIA SUMMARY FORM

Each category of alteration (VQO) definition consists of three criteria:

1. Ease of seeing,
2. Scale (relative to landform), and
3. Shape (design).

In section 3.4.1 of the VIA summary form, circle one phrase for each criterion that best describes how the proposed alteration(s) appear(s) on the landform:

- Not easily distinguishable, difficult to see, easy to see, or very easy to see,
- Very small, small, medium, large, or very large in scale, or
- Natural in appearance, rectilinear, geometric, or angular.

The glossary in section 6 of this handbook provides definitions for each phrase used.

Table 2 below helps to define the notion of scale using percent alteration ranges. The table describes the relationship between the terms, very small, small, medium, large, and very large, and the percent alteration ranges that have been defined through research (Clearcutting and Visual Quality: A Public Perception Study, MOF, 1996).

Table 2. **RELATIONSHIP BETWEEN VQO, SCALE, AND PERCENT ALTERATION**

VQO	SCALE (FPPR S. 1.1)	MOST PROBABLE % LANDFORM ALTERATION
Preservation	Very small	0%
Retention	Small	0-1.5%
Partial retention	Small to medium	1.6-7%
Modification	Large	7.1-18%
Maximum modification	Very large	18.1-30%

Compare the words you have circled to the definitions in Table 1 and circle the VQO category on the bar chart that best describes the proposed alteration(s).

There will be situations where the criteria do not line up exactly to predict a specific VQO. For example, an alteration may be easy to see, medium in scale, and have some angular characteristics. Easy to see and medium in scale fit partial retention (PR), but the angular characteristics place the alteration in modification (M). In this case, you would circle M, but perhaps closer to the boundary with PR.

Note: It is important to include all existing non-visually effective greened-up alterations into the simulation.

3.4.2 NUMERICAL ASSESSMENT

Determine Percent Alteration and Initial Visual Quality Class

The initial numerical rating is derived by measuring the scale of alteration(s) on the landform and comparing this result with the percent alteration ranges in Table 2.

Percent alteration measurement

The scale of alteration is expressed as a percentage of the landform occupied by the alteration(s) as seen in perspective view. Percent alteration is calculated relative to an identifiable landform.

Percent alteration measurements can be carried out using software applications, such as GIS, or graphic image manipulation software such as Adobe Reader or Acrobat.

BEST PRACTICE:

- When carrying out the percent alteration assessment, the goal is to compare the alteration(s) to the total green portion of the landform. Consequently, natural non-green areas, such as alpine mountaintops and rock outcrops, are excluded from the percent alteration measurement.
- Human alterations, such as pipeline corridors, gravel pits, mines, and transmission corridors, may exist on the landform. These disturbance types are considered permanent non-green features. Their surface area, as measured in perspective view from the viewpoint, may be included in the delineated landform unit and counted as green for the purposes of percent alteration calculation, but they are not included as part of the alteration(s). Refer to Figure 12.
- Private land management, such as timber harvesting and land clearing, may also be present on the landform. Although these alterations are viewed by the public and may influence perceptions, private land management requirements are different from those on Crown land. Private land can be included as part of the landform, but any private land alterations should not be included as part of total alterations.
- There are three vegetation components in an alteration when seen in perspective view: the green forest canopy, tree trunks, and bare ground. The current definition of "altered area" considers only bare ground. Exposed tree trunks are excluded from the percent alteration measurement.

Proposed alterations visible on the landform are measured and the percent alteration is recorded. If internal tree patches are proposed for retention, the simulation should show this as accurately as possible, since this may affect the measurement of percent alteration. Measurements are made of the extent of site disturbance (e.g., roads, landings, sidecast, and mass wasting) visible on the landform but outside the openings. Other existing forest alterations on the landform that are not visually greened-up are measured and recorded.

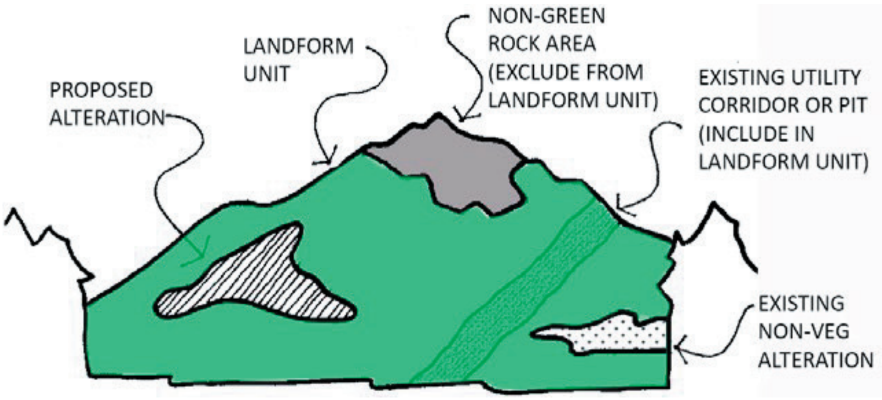

Figure 12. **Landform unit conceptual diagram.**

Step 1. Using the visual simulation output produced, identify and outline the visual unit or landform. Exclude those portions of the landform screened by vegetation as well as non-green areas such as mountain tops, rock, snow, and ice. Include any man-made alterations that have resulted in long-term removal of forest, such as utility corridors, mines, quarries, gravel pits, etc. (Figure 12). Also include private land that is part of the landform.

Step 2. Measure the visible unit or landform (e.g., middle ground landscape unit = 37.5 cm^2). The unit of measurement is not important in the calculation.

Step 3. Measure the visible ground area of existing alterations that have not yet achieved visually effective green-up (e.g., current alteration = 1.8 cm^2). Exclude any long-term, man-made alterations (utility corridors, gravel pits, etc.) from this measurement, as well as any private land alterations (e.g., timber harvesting, land clearing).

Step 4. Measure the visible ground area of the proposed alteration (e.g., 4.7 cm^2).

Step 5. Add existing non-vegetated alterations (step 3) and proposed alterations (step 4) areas together to get total area altered. Divide this total into the visual landscape unit area to get the percentage of the unit altered (e.g., [(1.8 + 4.7) ÷ 37.5] × 100 = 17.3%).

Note: Repeat the above calculation for each of the viewpoints selected for design and simulation.

Existing alterations that are not yet visually greened up

In some situations, older openings on the landform will only have partially achieved visual green-up. Since these openings may still contribute significantly to the overall visual impact, they must be accounted for in the percent alteration calculation. A partially greened-up block would be measured like any other opening and a percent alteration proportion calculated. Then an ocular assessment would be made in terms of the level of recovery achieved.

For example, in Figure 13 the yellow outlined areas are recent harvesting (4.2% of the landform) and the red outlined areas are older harvesting that has partially greened up. If the older harvesting represents 15% of the landform, and is estimated to be 70% greened up, this means 30% has not greened up. The 15% is multiplied by the 30% which means the block still contributes 4.5% to the overall alterations. Adding this partially greened up area to the new alterations (4.2% + 4.5%) will acknowledge its contribution to the overall visual impact.

Figure 13. **An example of recent harvesting (outlined in yellow) and older harvesting that has partial visually effective green-up (outlined in red).**

DEFINITION:

Visually effective green-up (VEG):

The stage at which regeneration on a harvested area is seen by the public as newly established forest. At minimum, the forest cover should block views of tree stumps, timber harvesting debris, and bare ground (Figure 14).

Figure 14. **Three photos of harvested areas showing (a) little/no VEG, (b) partial VEG, and (c) full VEG.**

FILL IN THE VIA SUMMARY FORM

The measurements from the simulation are entered in section 3.4.2 of the VIA summary form:

a. Percent of the landform altered by proposed openings,

b. Percent of the landform outside the alteration in visible access roads and site disturbance, and

c. Percent non-vegetated (non-visually greened-up) contribution of existing older openings.

The percentages are added together to get a total (X) and used in step 2 below to determine an initial visual quality class (VQC) rating.

Comparing Alteration Percent with Table 2

Table 2 (in section 3.4.1 of this handbook) lists the scale of alteration ranges that generally achieve the specified VQC. Compare the total percent alteration obtained from above with the numbers in Table 2 and enter the resulting "initial VQC "on the VIA summary form.

3.4.3 ADJUST INITIAL VQC RATING IN RESPONSE TO DESIGN

The numbers in Table 2 provide average results from public perception studies and do not explicitly account for visual landscape design, site disturbance, and tree retention. These other attributes of the scene also contribute to the overall visual impact, either negatively or positively.

The "adjusted VQC" calculated on the summary form accounts for these influences. The initial percent alteration figure measured on the simulation is adjusted upward or downward, depending on the degree of positive and negative visual influences. Three aspects of the visual impact are assessed – visual landscape design, site disturbance, and tree retention – and assigned points or "adjustment factors" according to the methodology outlined in section 3.4.3.1 below.

3.4.3.1 ASSESS VISUAL DESIGN ELEMENTS

Since the achievement of a VQO is strongly influenced by the application of visual design concepts and principles, the percent alteration number derived in section 3.4.2 is adjusted upward or downward based on the presence of visual design elements. Note: A design element with a "Good" rating has the effect of lowering the perceived visual impact, while one with a "Poor" rating has the effect of increasing the perceived impact of alterations.

Answer the following questions by providing a Good, Moderate, or Poor rating in section 3.4.3 of the VIA summary form.

1. **Does the alteration respond to visual force lines?** Completing a visual force analysis will answer this question (Figure 15). Opening boundaries should respond to topography by pushing up in hollows/concavities and dropping down on ridges/convexities. Lines of force would be rated "Good" if there is a strong response and "Poor" if there is little or no response. If visual force lines are not apparent on the landform, the rating would be neutral, or "Moderate." (See Appendix 4 for an example.)

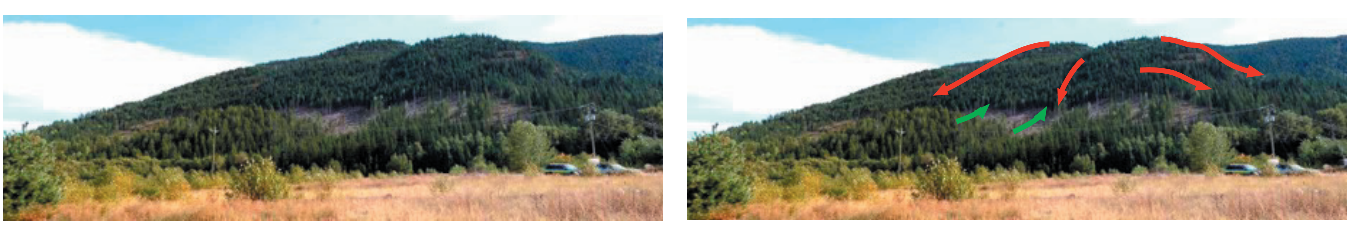

***Figure 15.* Photos showing *(a)* cutblock location on landform and *(b)* cutblock shape in relation to visual force lines.**

2. **Does the alteration borrow from the natural character of the landscape?** Does the shape of the alteration reflect the shapes found in the natural landscape (e.g., rounded curvilinear shapes on rounded landforms; spiky more jagged shapes in rugged terrain), and does the cutblock respond to natural vegetation patterns and openings in both scale and shape? For example, if the landscape is forested with small discrete rock outcrops, does the harvest proposal mimic this pattern? Figure 16 shows an example of an opening that fits into the natural landscape and a nearby opening that does not fit into the landscape.

Figure 16. **The opening on the left is irregular and borrows from natural character; while the one on the right is geometric and does not.**

3. **Have edge treatments been incorporated?** Edge treatments include two aspects – feathering to soften the transition between the alteration and the unaltered forest, and the use of irregular, wavy or interlocking boundaries (Figure 17). If both aspects are present the rating is "Good", if one aspect is present the rating is "Moderate", and if neither aspect is present the rating is "Poor".

Figure 17. **Photos showing *(a)* opening with feathered edges aided by internal tree retention and irregular boundaries, and *(b)* opening with hard edges.**

4. **How far is the alteration from the viewpoint?** The distance from the viewpoint can significantly influence public perception of an opening (Figure 18). Foreground openings are difficult to integrate because all the detail is visible. Distant openings are much easier to integrate because less detail is visible. The distance factor is rated "Poor" if less than 1 km, "Moderate" if from 1 to 8 km, and "Good" if over 8 km in distance.

Figure 18. **Photos showing *(a)* foreground opening with detailed vegetation and terrain features, and *(b)* background opening appearing as an inconspicuous shape.**

5. **What position does the alteration occupy on the landform?** If an opening occupies the center of a landform in direct view it would rate "Poor" for position. Large openings high on the landform and/or resulting in a broken skyline "fringe" would also rate "Poor" [Figure 19(a)]. Openings located lower down and to one side of a landform are often less conspicuous and are rated "Good" [Figure 19(b)]. Larger openings low down or small openings higher up are more comfortable to the eye and would rate "Moderate."

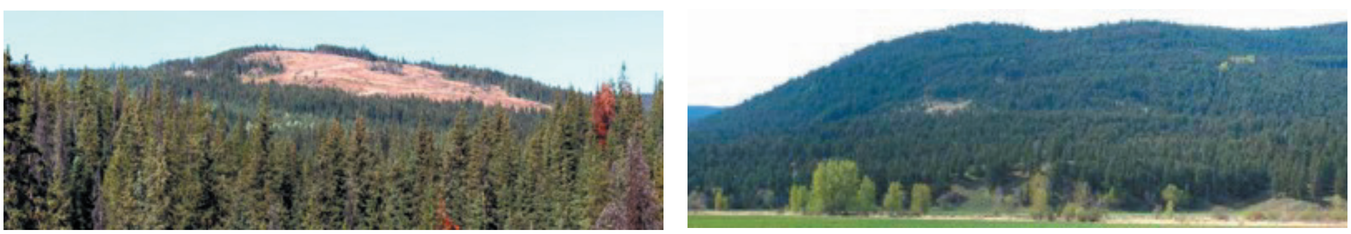

Figure 19. **Photos showing *(a)* opening that is large and high on the landform (Poor) and *(b)* opening that is small and lower on the landform (Good).**

6. **What is the number, size and spacing of alterations on the landform?** Number, size and spacing are important considerations when dealing with multiple openings on a landform. Both proposed and existing visually non-greened-up openings are included. If openings are all very similar in size and spacing, the regularity will draw viewers' attention and be rated "Poor" [Figure 20(a)]. Openings that are varied in size and spacing will tend to sit more comfortably on the landform and would be rated "Good" [Figure 20(b)]. One or two alterations, or groups of alterations that have limited variability, would be rated neutral or "Moderate." (For more information, refer to the *Visual Landscape Design Manual*, 1994, pp.14-20.)

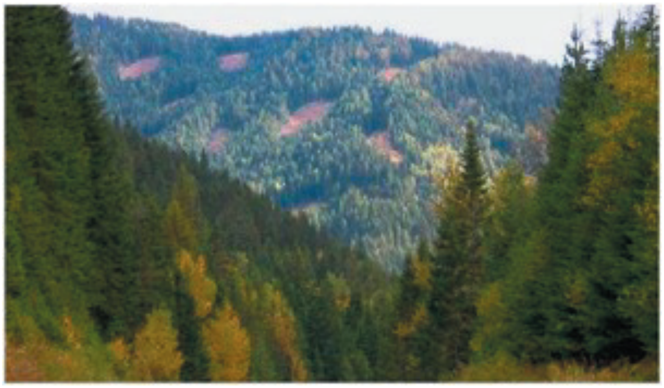

***Figure 20 (a).* As individual openings, these cutblocks are small and unobtrusive, but because of the number and similarity in size and spacing, they draw a viewer's attention as unnatural elements in the view and would be rated Poor. *Figure 20 (b).* A variety of opening sizes distributed across the landform in an irregular pattern create a more natural appearance and would be rated Good.**

Each design component is assigned a score of -1 if Good, 0 if Moderate, or +1 if Poor as shown in Table 3. The sum of the five components is entered at the bottom of section 3.4.3 of the VIA summary form.

Table 3. **VISUAL DESIGN ELEMENTS (FROM SIMULATION)**

DESIGN ELEMENTS	GOOD (-1)	MODERATE (0)	POOR (+1)
1. Response to visual force lines	Strong	Force lines not apparent	Weak or no response
2. Borrows from natural character	Fully	Partially	Isolated or not at all
3. Incorporates edge treatments	Feathering **and** irregular boundaries present	Either feathering **or** irregular boundaries present	Neither aspect present
4. Distance from the viewpoint	>8 km	>1 and <8 km	<1 km
5. Position of opening on the landform	Lower down & to one side	Small opening near center	High on the landscape or large near center
6. Number, size and spacing of alterations	Three or more openings with variable size and spacing	One or two openings, or limited variability in size and spacing	Three or more openings with similar size and spacing

3.4.3.2 ASSESS IMPACT OF ROADS, LANDINGS, AND SIDECAST

The impacts of roads, landings, sidecast, and site disturbance can negatively influence visual quality. It is important not to overlook these elements when assessing the overall visual impact of a proposed development. It is recognized that in steeper terrain there may be limited options for locating roads. However, there are a variety of mitigation strategies that can be undertaken to reduce the visual Impact of roads. Appendix 5 touches on some of these strategies and the Visual Landscape Design Training Manual (1994) contains a more extensive section on designing roads in visually sensitive areas.

Where roads or other surface disturbances are not visible, they cannot further reduce visual quality [Figure 21(a)]; the more prominent and visible these attributes are, the greater the impact [Figure 21(b)].

Figure 21. **Photos showing (a) no roads or sidecast visible and (b) roads and sidecast dominating the scene.**

Account for roads, landings, and sidecast within the opening using Table 4.

Table 4. **VISIBILITY OF ROADS, LANDINGS, AND SIDECAST (FROM SIMULATION)**

DESCRIPTION	ADJUSTMENT FACTORS
No roads or sidecast are visible	0
Roads or sidecast are visible, but subordinate in the scene	+1
Roads or sidecast are significantly visible, but small in scale	+2
Roads or sidecast dominate the scene	+3

3.4.3.3 ASSESS TREE RETENTION

If tree retention is aggregated and has been netted out of the block in the percent alteration calculation (Figure 22), it is not considered as an adjustment factor a second time. If the tree retention was not netted out in the percent alteration calculation (e.g., small, dispersed, with indefinite edges) it may be considered as a positive adjustment factor (Figure 23).

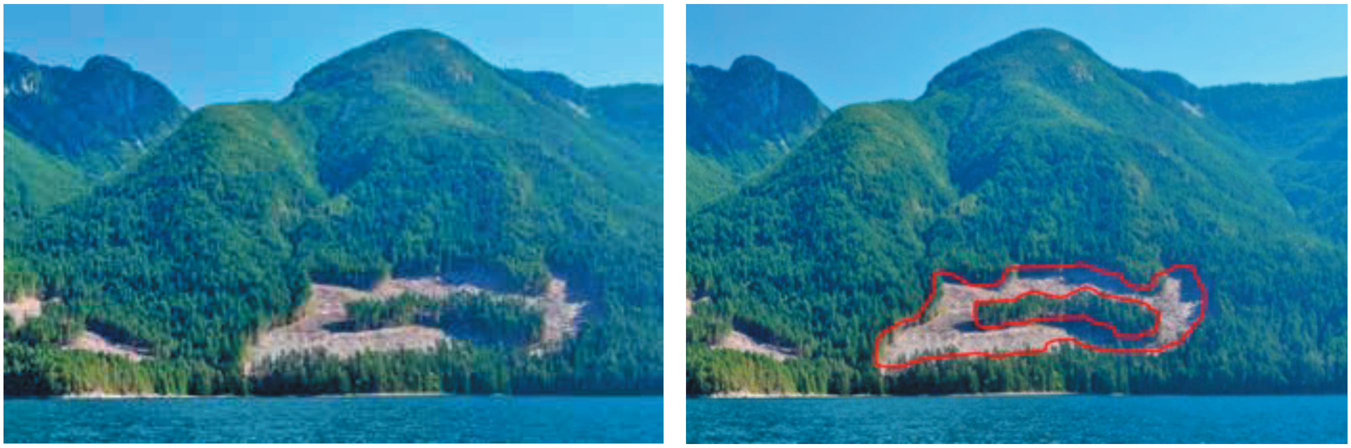

Figure 22. **Example showing aggregated retention patch removed during % alteration calculation.**

Figure 23. **Example showing dispersed retention not removed from % alteration calculation.**

Account for tree retention within the opening using Table 5.

Table 5. **TREE RETENTION (FROM SIMULATION)**

DESCRIPTION	ADJUSTMENT FACTORS
Less than 15% tree retention (rated Low)	0
Tree retention levels between 15-22% (rated Moderate)	-1
Greater than 22% tree retention (rated High)	-2

FILL IN THE VIA SUMMARY FORM

The adjustment factors from Table 5 are entered in section 3.4.3 of the VIA summary form:

a. Design elements,

b. Roads, landings, and sidecast, and

c. Tree retention.

These ratings, labeled "Adj. Factors" on the form, are summed to derive a total adjustment point score. This sum is referred to as "Y" and the percent alteration measured from the simulation is referred to as "X." The two are combined in the formula: **X*(1 + 0.14*Y)** to determine an "adjusted" percent alteration figure. This number is compared with the average percent alteration values in Table 2 to indicate the adjusted VQC.

The adjusted VQC is recorded by circling the appropriate location on the VQC scale line in section 3.4.3 of the VIA summary form. The result will usually be close to that determined using the basic VQC definition in section 3.4.1 of the VIA summary form.

3.4.4 PROCEDURES FOR PARTIAL-CUT ALTERATIONS

Partial-cut alterations are those with a fairly evenly distributed residual forest canopy that have lesser density (and coarser texture) than the unaltered forest. The visual impact of the alteration is dependent on many factors, but most importantly, the volume or number of trees retained on site, the size of residual tree crowns, and the height of the residual trees (Figure 24). The ocular assessment uses the VQC definitions, while the numerical assessment converts the partial cut to a clearcut equivalent in terms of percent alteration.

Ocular assessment (assessing the basic VQC definition)

Partial-cut alterations may be assessed for their basic VQC using the written definitions in Table 1. The evaluator's visual impression is recorded on the scale line in section 3.4.1 of the VIA summary form, following the procedure set out in section 3.4.1 of this handbook.

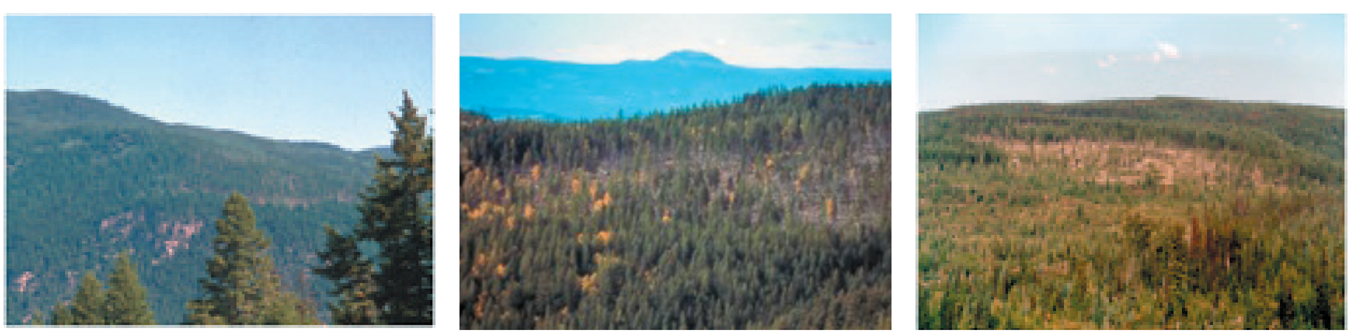

Figure 24. **Partial-cutting examples showing (l to r): *(a)* Retention VQC, *(b)* Partial Retention VQC, and *(c)* Modification VQC.**

Numerical assessment (volume removed by tree height)

Determine or estimate the proposed volume to be removed and the average tree height of the stand where the proposed alteration is located, based on information such as the compiled cruise data and silviculture prescription. Enter these in section 3.4.4 of the VIA summary form. Then use Table 6 to determine a "visual equivalent to clearcut" percent alteration number. Enter this number in section 3.4.2 (a) of the VIA summary form. Once you have entered the clearcut equivalency number on the form, adjust the initial VQC rating in response to design elements as outlined in Section 3.4.3 of this handbook.

Table 6. **VISUAL EQUIVALENT TO CLEARCUT PERCENT ALTERATION FACTORS FOR PARTIAL-CUT ALTERATIONS**

	MEAN HEIGHT (M) OF RESIDUAL TREES									
Volume removed (%)	5	10	15	20	25	30	35	40	45	50
10	0.1	0.2	0.4	0.6	0.7	0.8	1.0	1.2	1.8	2.2
20	0.3	0.4	0.7	1.0	1.2	1.4	1.8	2.2	3.3	4.4
30	0.7	0.9	1.2	1.4	2.0	2.4	3.3	4.2	5.0	6.5
40	1.2	1.4	2.0	2.4	3.4	4.3	5.2	6.1	6.7	7.8
50	1.8	2.3	3.4	4.3	5.2	6.2	6.8	7.7	8.4	9.0
60	3.5	4.3	5.0	6.2	6.7	7.7	8.4	9.2	10.0	11.5
70	4.9	5.5	6.5	7.7	8.4	9.2	10.0	11.4	12.7	14.0
80	6.0	6.6	8.3	9.2	10.0	11.0	12.0	13.2	14.4	15.5
90	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0

Note: The shading in Table 6 highlights VQC classes, with the unshaded portion representing expected achievement of retention (R), the mid-shade representing achievement of partial retention (PR), and the dark shade representing expected achievement of modification (M). Since there is a 50% confidence level in the visual equivalent to clearcut alteration numbers, results near the VQC boundaries will have considerable uncertainty attached to them.

A combination of partial cuts and clearcuts

While the interaction of clearcuts and partial cuts on the same landform can create a complex visual result, it is still necessary to determine a predicted VQC. The simplest procedure is to add the clearcut percent alteration numbers with the partial cut "visual equivalent to clearcut" numbers and enter this in section 3.4.2 of the VIA summary form. Then continue with the procedure of assessing design elements and calculating an adjusted percent alteration.

3.5 DETERMINE A FINAL VIA RATING

3.5.1 FINAL RATING

Compare the basic VQC (ocular) with the adjusted VQC based on percent alteration. Select and record (i.e., check ☑) the rating that best describes the extent to which the proposed alteration achieves or does not achieve the established VQO as shown in Table 7.

Table 7. **FINAL RATING CATEGORIES**

RATING	OCULAR AND NUMERICAL ASSESSMENT
Well Met	Definition achieved and % alteration well within VQO range
Met	Definition achieved and % alteration may be near boundary or somewhat in excess of VQO range
Inconclusive	Definition on class boundary and % alteration may be in excess of VQO range
Not Met	Definition **not** achieved and % alteration may be near boundary or within range for VQO
Clearly Not Met	Definition **not** achieved and % alteration is in excess of VQO range

In cases where there are different results from the two methods, the basic VQC (ocular) is considered the primary determining factor.

3.5.2 RATIONALE

The rationale field (section 3.5.2) on the lower right of the VIA summary form allows the evaluator to summarize key elements of the evaluation. This might include a description of landscape character, constraints and opportunities, design strategies used to achieve the VQO(s), and other notable factors that influenced the assessment. The rationale may also be included on a separate page.

4.0 ASSEMBLE A VIA PACKAGE

Once you have completed the VIA process, it is important to put all the information into a standardized package. This will ensure completeness and consistency among licensees and provide documentation to support professional due diligence. Also keep in mind the discussion in section 2.0 of this handbook regarding due diligence and standard of care. This may help in determining the appropriate content and level of detail to include in the VIA package.

Recommended VIA Package Content:

- A topographic map (1:50 000 or larger scale) showing viewpoint (photo point) locations and numbers, visual landscape inventory polygons and VQO(s), and the location of proposed cutblocks and roads. The associated spatial data may also be included.
- Pre-alteration high resolution colour photograph(s) from significant public viewpoints (labeled with viewpoint number, date of photography, direction of view, and photography information).
- A visual simulation product generated from each viewpoint, labeled, dated, and showing the location and extent of proposed operations on the landform.
- A visual force analysis showing how proposed operations have been designed in response to the underlying topography. It is advisable to include a landscape character analysis and a description of design strategies used, either on the VIA summary form or as a separate document.
- A completed VIA summary form (Appendix 1) for each viewpoint.

BEST PRACTICE:

The goal of a completed VIA is to demonstrate how the established VQO(s) will be achieved from each significant public viewpoint assessed.

5.0 REFERENCES

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6.0 GLOSSARY

Angular – Having angles or sharp corners. (Examples include acute, obtuse, or right-angled corners.)

Difficult to see – Requires much effort or skill to discern visually. Peripheral, obscured, or extremely distant.

Digital terrain model (DTM) – A three-dimensional topographic model or simulation created by a computer using digital elevation data.

Easy to see – Able to discern visually without great effort or difficulty. Directly in sight or unobscured.

Existing visual condition – A component of the visual landscape inventory that represents the level of human-made landscape alteration caused by resource development activities in a visual sensitivity unit; expressed as visual quality classes.

Geometric – Characterized by regular lines or shapes. (Examples include squares, rectangles, triangles, and circles.)

Landform – A distinct topographic feature that is a sub-unit of the broader landscape, three dimensional in form, and delineated from a significant public viewpoint in perspective view. A landform is generally defined by ridges, drainage channels, valleys, shorelines, and skylines.

Landscape – The entire scene viewed at one time from one place.

Natural – Existing in or caused by nature, not made or caused by humankind. (Examples include irregular organic shapes, curvilinear lines, or a diffuse or dispersed pattern or texture.)

Not easily distinguishable – Not visually apparent.

Recommended visual quality class – A specialist's recommendation describing the level of alteration that would be appropriate for a visual sensitivity unit; this recommendation considers visual and other resource values.

Rectilinear – Contained by, consisting of, or moving in a straight line or lines. (Examples include straight cutblock boundary lines and roads.)

Scenic areas – Areas established by order by the minister responsible for the Land Act if the minister is satisfied that the area (a) is visually important based on its physical characteristics and public use, and (b) requires special management that has not otherwise been provided for by the GAR or another enactment. (GAR Section 7).

Significant public viewpoint – A place or location on the land or water that is accessible to the public and provides a direct viewing opportunity to the alteration and landform being assessed, including but not limited to travel routes, settlements, public use areas, tourism facilities, and parks.

Simulation – A three-dimensional model commonly created using computer software and digital elevation data; it may have features and elements placed on its surface in a realistic way.

Very easy to see – Able to discern visually with little effort or difficulty. An immediately identifiable, visually dominant feature.

Visual absorption capability – A component of the visual landscape inventory that rates the relative capacity of a landscape to absorb visual alterations and still maintain its visual integrity.

Visual force – An illusion or sensation of movement created by a static image, object, or position of a number of elements in the landscape.

Visual force analysis – An analysis of landform structure to identify primary, secondary, and tertiary ridge lines and hollows in the landscape for use in visual landscape design.

Visual impact assessment -- A set of procedures and criteria that are applied to a proposed landscape alteration(s) to estimate the level of visual impact and determine consistency with visual quality objectives. It is an iterative process that involves selecting viewpoints, taking photographs, developing design options, simulating proposed cutblocks and roads, and evaluating the simulations to determine if the VQO(s) will be achieved.

Visual landscape design – A process that works with the natural forms, patterns, processes, and characteristics of the landscape to plan and design resource management activities that achieve public expectations for visual quality.

Visual quality class – The visual condition resulting from management activities expressed using visual quality objective categories.

Visual quality objective – The FPPR defines visual quality objective as (a) an objective continued, in respect of a scenic area, under section 181 of the FRPA, (b) an objective established for scenic areas under the GAR, or (c) a visual quality class continued, for a scenic area, under section 17 of the GAR.

Visual resource management – A specialized field involving the planning and management of visual quality and aesthetic resources. It includes the identification of visual values and sensitivity, the establishment of objectives and management actions to achieve or maintain those objectives, and research into public values and perceptions relating to aesthetics and visual quality.

Visual sensitivity class – A component of the visual landscape inventory that rates the sensitivity of the landscape to visual alteration based on biophysical characteristics, as well as viewing and viewer-related factors.

Visual sensitivity unit – A distinct topographic unit as viewed from one or more viewpoints and delineated based on the homogeneity of the landscape and biophysical elements. It is equivalent to a polygon in a visual landscape inventory.

Visual simulation – "pictures of real places seen from a particular perspective which can be manipulated…to show features of importance, or future conditions based on land management decisions." (Sheppard, Lewis et al. 2004)

Visually effective green-up – The stage at which regeneration on a harvested area is seen by the public as newly established forest. At minimum, the forest cover should block views of tree stumps, timber harvesting debris, and bare ground.

7.0 ABBREVIATIONS USED IN THIS HANDBOOK

2D – two dimensional

3D – three dimensional

AOI – area of interest

CP – cutting permit

DTM – digital terrain model

DEM – digital elevation model

CHM – canopy height model

EVC – existing visual condition

FPC – Forest Practices Code

FPPR – Forest Planning and Practices Regulation

FREP – Forest and Range Evaluation Program

FRPA – Forest and Range Practices Act

FSP – forest stewardship plan

GAR – Government Actions Regulation

GIS – geographic information system

GPS – global positioning system

LiDAR – light detection and ranging

OSBG – objective set by government

VAC – visual absorption capability

VEG – visually effective green-up

VIA – visual impact assessment

VLI – visual landscape inventory

VQC – visual quality class

VQO – visual quality objective

VSC – visual sensitivity class

VSU – visual sensitivity unit

APPENDIX 1: VISUAL IMPACT ASSESSMENT SUMMARY FORM

(To be completed from each viewpoint analyzed) Viewpoint Number _____of_____

3.1.1 Site Information (Office)

Natural Resource District ____________________	Licensee ____________________
General Location ____________________	Licence No. ________ CP No.________ Block ________

3.1.3 FSP & Objective Information (Office)

VLI Polygon No. _________ EVC______VAC ______VSC ______EVQO ______	Date Est. ______________ Source Document ____________________

3.2.1 Viewpoint (Field)	3.2.2 Photography (Field)
GPS Longitude____________________	Camera Make & Model ________________ Lens Focal Length __________
GPS Latitude ____________________	Sensor Crop Factor _________ Adjusted Focal Length __________________
Elevation (m) ____________________	Digital Photo ID No's: ____________________
Viewing Direction _______________Viewing Distance ____________________	Viewpoint Description ____________________
Viewpoint Importance: 1 2 3 4 5	

3.4.1 Assess Basic VQC (Ocular)	Category of Alteration Criteria
Alterations meet which VQC definition? Mark location on the scale:	1. not easily distinguishable, difficult to see, easy to see or very easy to see
Basic VQC: P R PR M MM	2. very small, small, medium, large, or very large in scale
|--|--|-------|-------|-----------|-----------|---------------|------→	3. natural in appearance angular in appearance, rectilinear or geometric.

3.4.2 Numerical Assessment Initial VQO (Simulation)	3.4.4 Partial Cut Alterations
a) % of landform altered by proposed openings ________	Proposed Partial Cutting % removal _________
b) % of landform in access roads (outside openings) ________	Average tree height (m) _________
c) % non-VEG contribution of existing openings ________	**Clearcut equivalent** % _________
X = (a+b+c) ______ % alteration **Initial VQO**: ________	Enter or add this value on line 3.4.2(a)

3.4.3 Assess Adjusted VQO (Simulation)				3.5.1 Determine VQO rating on landform (**Note:** The definition is the primary determining factor.)
Design Elements:	**G (-1)**	**M (0)**	**P (+1)**	☐ **Well met**
Response to visual force lines	_________	________	_________	Definition achieved; % alteration well within VQO range
Borrows from natural character	_________	________	_________	☐ **Met**
Edge treatments incorporated	_________	________	_________	Definition ***achieved***; % alteration may be near boundary or in excess of
Distance from the viewpoint	_________	________	_________	VQO range
Position on the landform	_________	________	_________	☐ **In-conclusive**
Number, Size and Spacing of Alterations	_________	________	_________	Definition on class boundary, % alt. may be in excess of VQO range.
a) Design		Adj. Factor __________		☐ **Not met**
b) Impact of roads, sidecast, etc. (within openings)				Definition ***not achieved***; % alteration may be near boundary or within
☐ none ☐ subordinate ☐ significant ☐ dominant		Adj. Factor __________		VQO range
c) Tree retention: ☐ Good ☐ Moderate ☐ Poor		Adj. Factor __________		☐ **Clearly not met**
Total adjustment: Y = (a+b+c)		Adj. Total __________		Definition ***not achieved***; % alt. in excess of VQO range
Calculate Adjusted % alteration:		X*(1 + 0.14*Y) = __________		____________________
Adjusted VQC: P R PR M MM				3.5.2 Rationale
|--|--|-------|-------|-----------|-----------|---------------|------→				
%alt: 0 1.5 4 7 12 18 24 30+				

Evaluated By: ____________________ Signature: ____________________ Date: ____________________

CATEGORIES OF VISUALLY ALTERED FOREST LANDSCAPE

Visual Quality Objectives are defined as categories of visually altered landscapes under the Forest Planning and Practice Regulation Section 1.1:

a. **preservation**: consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is
   i. very small in scale, and
   ii. not easily distinguishable from the pre-harvest landscape;

b. **retention**: consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is
   i. difficult to see,
   ii. small in scale, and
   iii. natural in appearance;

c. **partial retention**: consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint, is
   i. easy to see,
   ii. small to medium in scale, and
   iii. natural and not rectilinear or geometric in shape;

d. **modification**: consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint,
   i. is very easy to see, and
   ii. is (A) large in scale and natural in its appearance, or
   (B) small to medium in scale but with some angular characteristics;

e. **maximum modification**: consisting of an altered forest landscape in which the alteration, when assessed from a significant public viewpoint,
   i. is very easy to see, and
   ii. is (A) very large in scale,
   (B) rectilinear and geometric in shape, or
   (C) both.

EXPLANATION OF WORDS AND TERMS USED IN FPPR SECTION 1.1 (VQO DEFINITIONS)

Disclaimer: The explanation of words and terms outlined here are not legal Interpretations. Rather, they are derived from research and collaboration amongst subject matter experts.

VISIBLENESS

Not easily distinguishable – Not visually apparent.

Difficult to see – Requires much effort or skill to discern visually. Peripheral, obscured, or extremely distant.

Easy to see – Able to discern visually without great effort or difficulty. Directly in sight or unobscured.

Very easy to see – Able to discern visually with little effort or difficulty. An immediately identifiable, visually dominant feature.

SCALE

FPPR Section 1.1 describes categories of visually altered forest landscapes using scale descriptors (i.e., very small, small, small to medium, large and very large). The 2001 Visual Impact Assessment Guidebook contains numerical ranges for each VQO category that have been derived from research, used operationally since 1996, and help to put parameters around the notion of scale.

VQO	SCALE	% ALTERED (POLICY)
P	Very small	0%
R	Small	0 – 1.5%
PR	Small to medium	1.6 – 7%
M	Large	7.1 – 18%
MM	Very large	18.1 – 30%

DESIGN

The third variable assessed in each VQO definition is the notion of design. The definitions below provide more rigour around what the words in each definition mean.

Natural – Existing in or caused by nature, not made or caused by humankind. (Examples include irregular organic shapes, curvilinear lines, or a diffuse or dispersed pattern or texture.)

Angular – Having angles or sharp corners. (Examples include 90-degree right angle corners.)

Rectilinear – Contained by, consisting of, or moving in a straight line or lines. (Examples include straight cutblock boundary lines and roads that can result in unnatural or geometric shapes.)

Geometric – Characterized by regular lines or shapes. (Examples include squares, rectangles, triangles, and circles.)

APPENDIX 2: PHOTOGRAPHY AND PHOTOGRAPH PRESENTATION CRITERIA IN PERSPECTIVE VIEW

Taking Photographs

- Take photographs on clear days with the sun behind or perpendicular to you for best rendering of details.
- Use a 50- or 55-mm lens to maintain the same proportions on photographs as seen in the field. Avoid wide-angle or telephoto lenses. A wide-angle lens (e.g., 28 or 35 mm) provides a wider angle of vision, but "pushes" landforms away from the viewer; a telephoto lens (e.g., 200 mm) "pulls" landforms closer to the viewer.
- Take enough photographs to capture entire landforms (i.e., panoramic shots) even if no proposals are planned for adjacent landforms. Once juxtaposed and mounted, these photomontages provide the visual context necessary to assess the overall visual impact of specific proposals Figure A2.1).

Figure A2.1. **Example showing how individual photo frames are combined to form a panorama.**

- A global positioning system (GPS) can be used to accurately determine the spatial coordinates of each viewpoint. Use the same coordinates to produce models for comparison to the photographs taken from the same viewpoints. The horizontal view direction (using a compass) and vertical angle of view (using a clinometer) can also be recorded for each photograph or set of photographs for panoramic views.

Lighting, Season and Conditions

- Lighting conditions and time of day can greatly influence the quality of images. A good time to collect images is often at the first or last light of the day, particularly for west, north and east aspects.
- Seasonal conditions also influence the quality of images. The lighting is typically better between the spring and fall equinoxes as the sun is higher in the sky and the days are longer, giving more opportunities to capture the landform.
- In the fall, fog or smoke will often settle into valley bottoms and prevent good site photography. One advantage of winter photography is that the natural stand conditions can be interpreted slightly better with the contrast of snow under a dark canopy. However, the visual absorption under winter versus summer is very different. It is important to consider the expectations of the viewers involved in your area.

Sensor Crop Factor and Adjusted Focal Length

- Calculate the actual focal length used to take the photos. This step is very important if you want your photography and visual simulations to match (Figure A2.2).
- If you are not using a full-frame DSLR (digital single lens reflex) camera, your sensor will have a "crop factor" due to its smaller size. Nikon DSLR cameras that are not full frame have a crop factor of 1.5; Canon DSLR cameras that are not full frame have a crop factor of 1.6.
- As an example, if you are using a Nikon camera that is not full frame with a 50-mm focal length, the actual image is 1.5 x 50 which equals a 75-mm image. To photograph the landscape at a 50 mm equivalency, you would have to use a 35 mm lens (50 mm/1.5 = 33.3 mm). Record your camera's sensor crop factor in section 3.2.2 of the VIA summary form.
- If you are not using a DSLR camera, make a best estimate of the focal length by adjusting the viewfinder image to match the view of an unaided eye in the field.

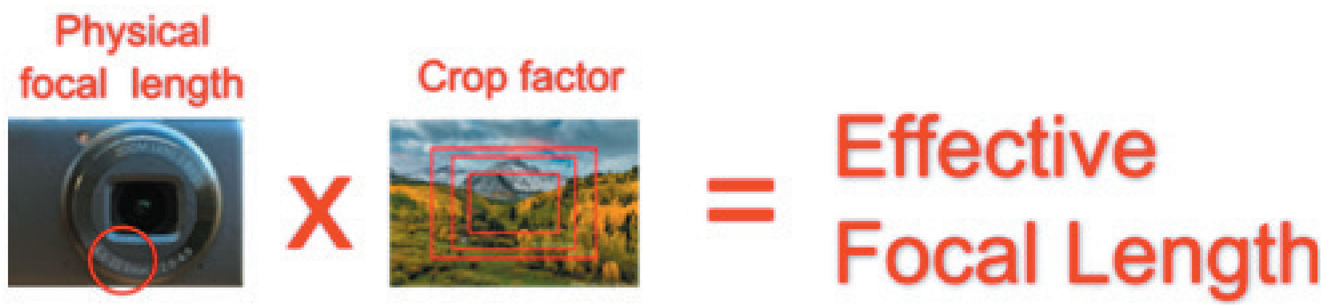


Figure A2.2. **The crop factor of the camera (sensor size) is an important consideration in determining effective focal length.**

Presenting Photographs

- Minimum recommended image size for reports and other documents is 4 x 6 inches, preferably 5 x 7 inches or larger. A larger size is easier to work with and helps overcome the illusion of compression created by small images.
- Automated software can be used to stitch together digital images to present broad panoramas.
- If the photographs and simulations will be used for public meetings or displays, refer to Appendix 7 to calculate the optimum image size for viewing at a distance. These enlarged images can be mounted on a rigid backing, such as foam core board, for easy transport and setup.

APPENDIX 3: DEFINING LANDFORMS

A landform is a distinct topographical feature that is three dimensional in form and generally defined by ridgelines, drainage channels, shorelines, tree lines, skylines, and valley bottoms. Examples include hills, knolls, and mountains. Eighty percent of the time landforms are reasonably easy to define (Figure 3.1).

To define specific landforms, it is helpful to look for recognizable forms (e.g., conical or pyramidal) in your photograph. To break them out of the landscape, identify the key ridgelines present. These diagonal lines will form the sides of a landform. The top of a landform will be defined by a skyline ridge or mountain peak. The bottom of a landform will generally be defined by a physical break created by features like coastal or lake shorelines, or the location where a form (hill) ties in with a flat area. The base of a landform can also be defined by the tops of foreground trees.

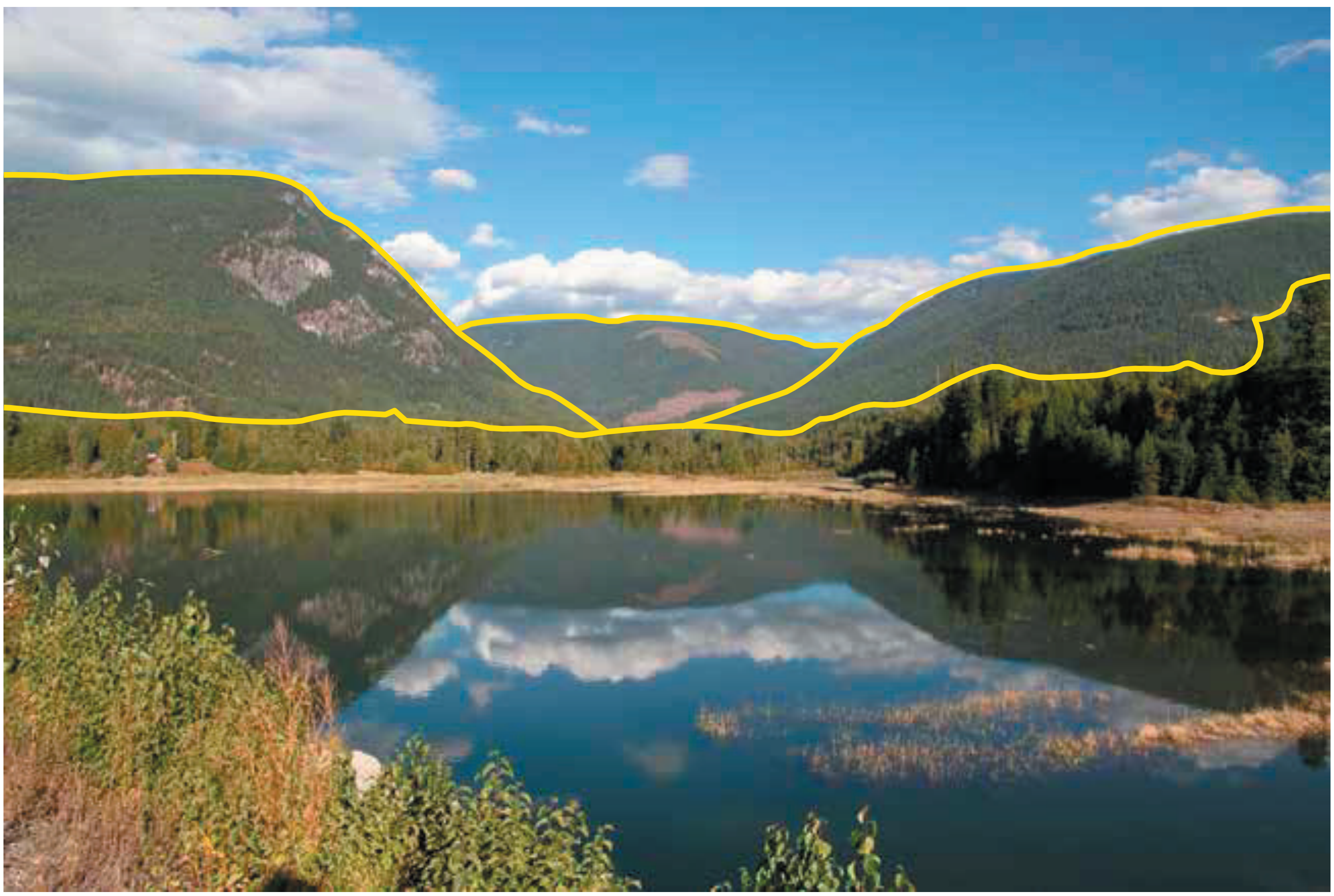


Figure A3.1. **Three different landforms are outlined in this scene using a combination of viewing distance and ridgelines.**

More on defining landforms

One tip to help define a landform is to determine if a creek draw bisects the topography. Where this occurs, independent landforms (topographic features) are typically created (Figure A3.2).

Landforms can have different orientations in different types of landscapes. In vertical landscapes, vertical creek draws and diagonal ridgelines frame units.

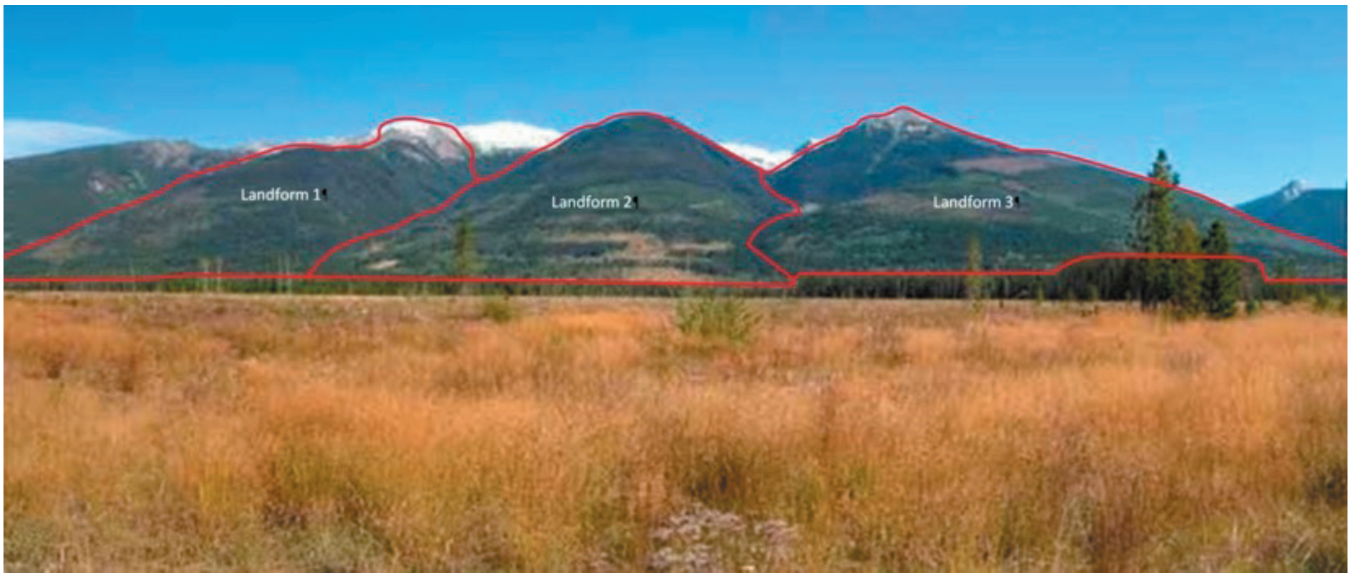


Figure A3.2. **These landforms are vertically oriented and defined based on deeply incised creek draws.**

In horizontal landscapes, foreground trees and ridgelines in different distance zones may frame units. The distance zones may correspond to distinct landforms because they are separated by incised valleys, creeks, or topographic breaks (Figure A3.3).

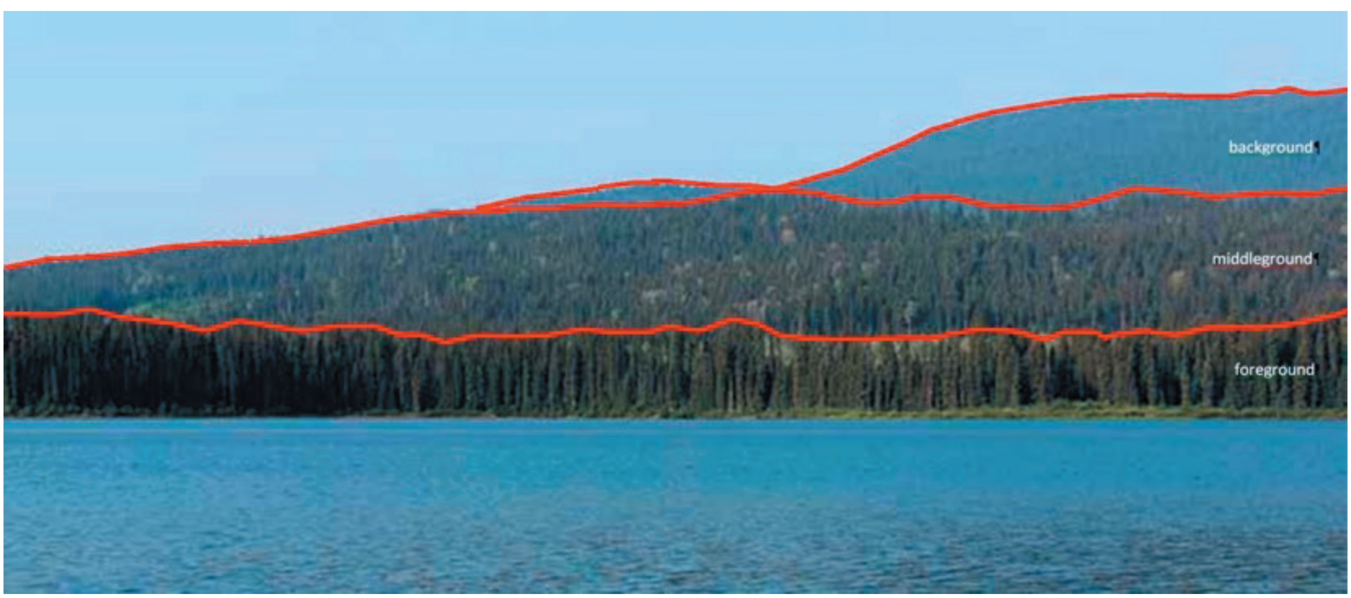


Figure A3.3. **These landforms are horizontally oriented and defined based on viewing distance and ridgelines.**

Shoreline Treatment

When defining or outlining landforms adjacent to water bodies, the following guidance may be helpful. If you are greater than 1 km from the landform, map to the shoreline. Parts of the scene that may be visible beyond the landform of interest or in the foreground are excluded from the delineation. Finally, exclude those portions of the landform screened by foreground vegetation (Figure A3.4).

Figure A3.4. **This landform is greater than 1 km from the viewer and extends to the lakeshore.**

If you are 1 km or less from the landform, map to the top of the foreground trees (Figure A3.5). There are two rationales for this: 1) trees less than 1 km away are in the foreground zone, and 2) as foreground elements, the trees would make up a disproportionate percentage of the landform.

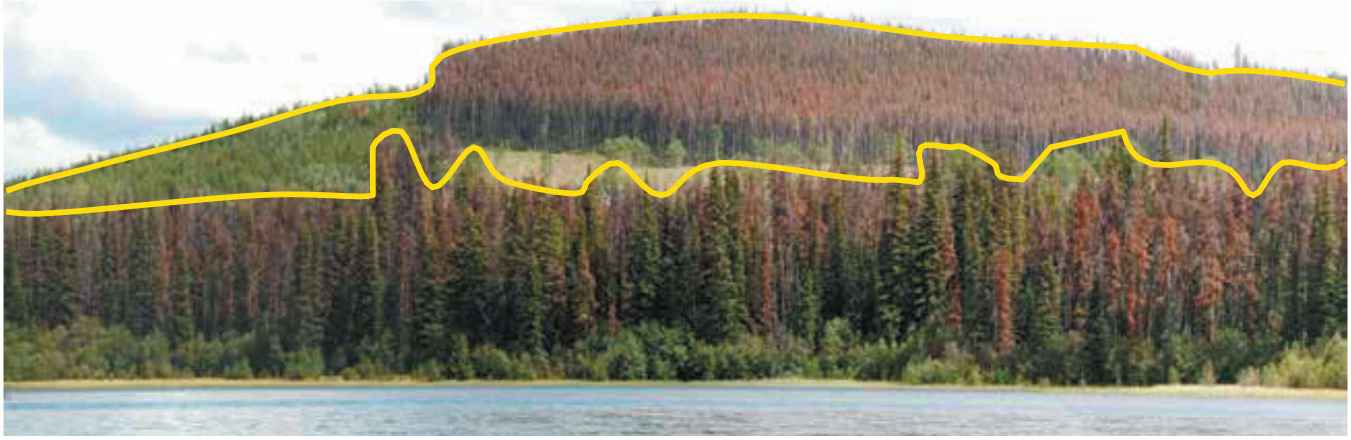


Figure A3.5. **This landform is less than 1 km from the viewer and does not include the shoreline trees.**

APPENDIX 4: COMPLETING VISUAL FORCE AND LAND FEATURE ANALYSES

The purpose of this appendix is to explain how visual force and land feature analyses are carried out (for further information, see the *Visual Landscape Design Training Manual*, 1994).

Visual force analysis

The visual force concept is based on the premise that, as we observe the landscape, our eyes are drawn up hollows and down ridge lines. Learning how to map lines of force is useful in developing cutblock designs that better fit the natural landscape. Lines of force are mapped in plan and perspective view using different colours and weights of arrows: red arrows are drawn down ridges and green arrows up hollows (Figures A4.1 and A4.2).

Mapping procedures

1. Identify and label all major peaks, summits, ridges, and saddles on both the photograph(s) and GIS or topographic map. These landmarks will help make the transition between plan and perspective easier.
2. Starting on the photograph, pick either the convexities or the concavities and complete each set before working on the other. Often it is easiest to start with the convexities. Identify the major convexities and ridges in red. Try to ensure that the lines follow the apexes of the ridges as far as they can be traced. Transpose the lines identified on the photo to the contour map as you go.
3. Identify secondary-strength ridges, which will tend to spring from the primary ones. A branching pattern may well emerge. It is usual to find that the number and structure of arrows relates closely to the structure of the landform. There are naturally going to be more force lines in a broken, jagged landform than in a smooth, flowing one. There may be three or four levels in the hierarchy of forces, shown by different thicknesses of arrows.
4. When mapping the convexities is complete, repeat the process on the concavities using green lines. Some of the major hollows will coincide with streams or rivers, while others may be dry. A connected dendritic system of green arrows is typical.

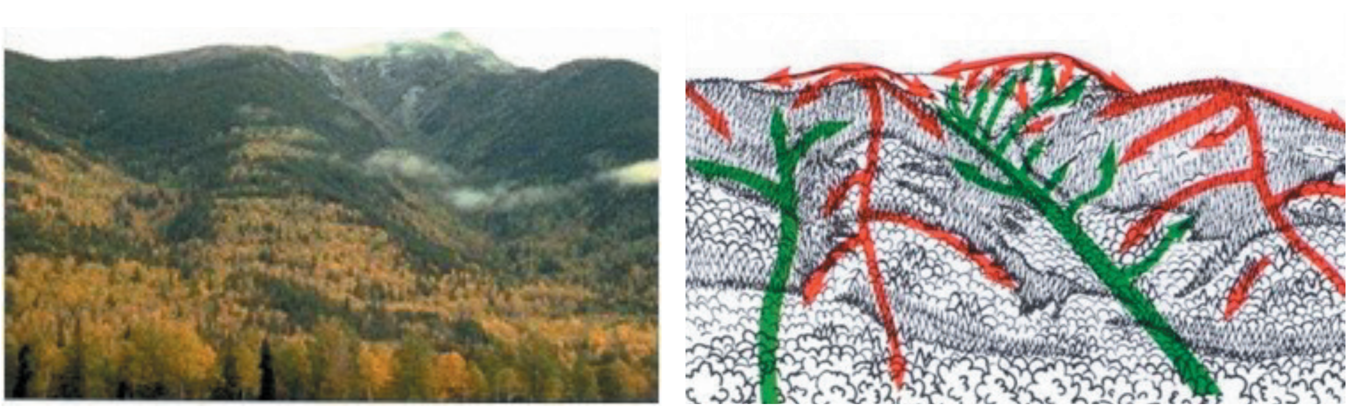


Figure A4.1. (a) **Photograph of a landscape and** *(b)* **corresponding dendritic pattern of visual force lines.**

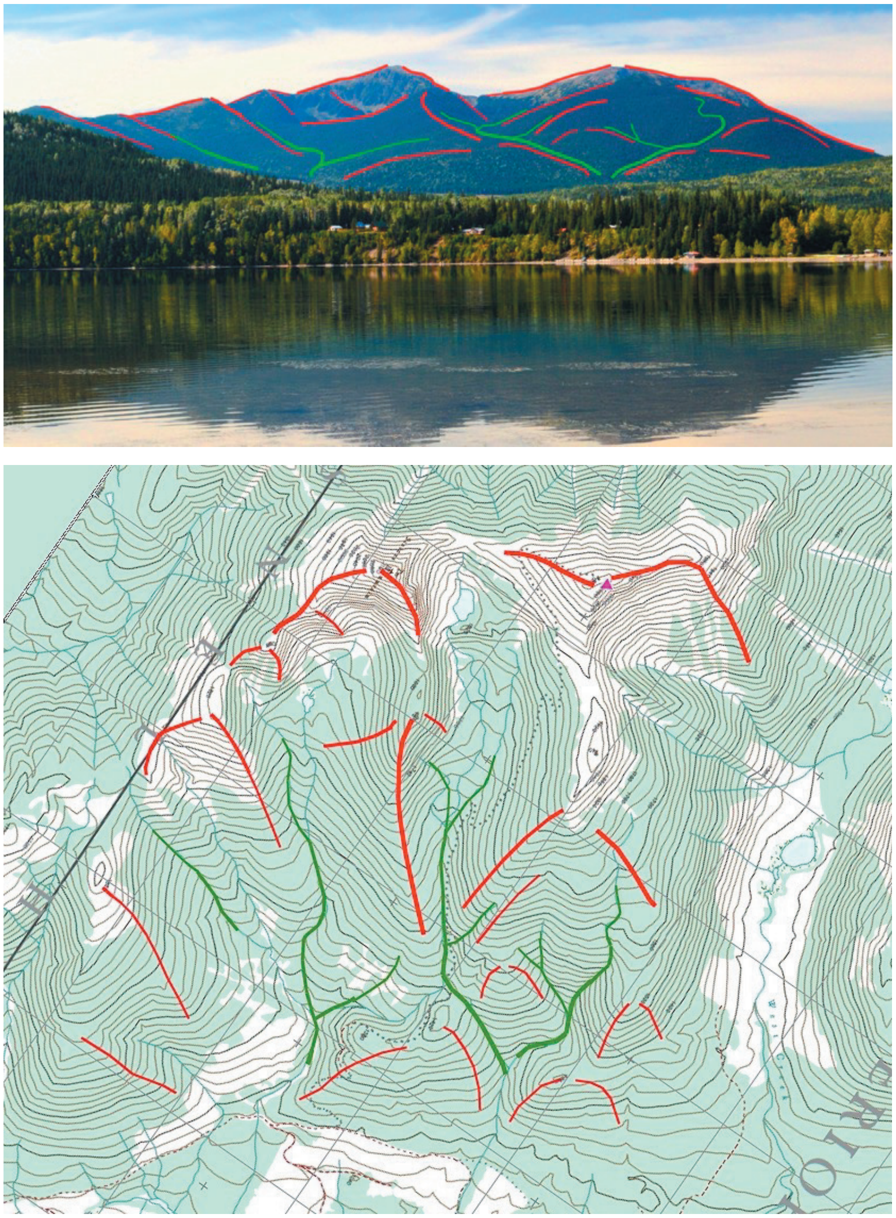


Figure A4.2 **Visual force analysis shown in perspective and plan view. Red arrows indicate major peaks, summits, ridges, and saddles. Green arrows indicate major valleys and gullies.**

Notes:

- Red arrows should not cross green arrows, and vice versa.
- If either the gullies or ridges are generally more dominant, then the primary arrows should be thicker to emphasize this; it may have an impact on the later design.
- It is possible that the contour maps, by reason of their resolution and the spacing of the contour lines, do not show all the visible features of the landform. In this case, additional arrows can be added from analysis of the photograph.
- Conversely, working from a photograph can be misleading when mature forest hides the topography and smooths over subtleties in the landform. It is important to try to look beneath the canopy because if timber harvesting takes place, the topography will be revealed.

- On completion, the structure of the topography should have become very clear. The very action of drawing the arrows will help to get the feel of the landform.
- Three-dimensional computer simulations of the views help to show what lies beneath the trees or can be used to produce different viewpoints with the visual forces in place. This can help to show how the relative strengths of different parts of the landform vary depending on the viewer position.

Using visual force lines

Mapping the visual force lines in perspective and plan view is used to guide cutblock design. When cutblocks are being designed, they should respond to visual force analysis mapping in plan-view, by pushing up in gullies (green arrows) and dropping down on ridge lines (red arrows). The weight of the arrow will dictate the amount of response. The thicker the arrow, the stronger the response; the thinner the arrow, the weaker the response.

Land feature analysis

Land feature analysis builds on the visual landscape inventory and identifies all the various features in the landscape that make up its character and diversity, its visual absorption capability (VAC), and its existing visual condition (EVC). However, it is not just a process of identifying features, such as rock outcrops, vegetation, and water features, the point is to also try to discern a pattern in the occurrence of these features and their distribution. Some underlying logic generally exists as to why some features occur where they do; for example, rock outcrops are related to geology, erosion, and landform; vegetation to drainage, soil, and exposure; and water features to landform structures and geology. Historic events, such as wildfires, insect attacks, or blowdown, may also have left their mark, along with landscape alterations from human activities.

The basic materials required to carry out a landform analysis are panoramic photos, topographic maps, ortho photos, GIS data, vegetation or forest cover maps, and terrain stability maps. The objective of the landform analysis is to guide cutblock design by identifying visible landscape features in photographs and transferring them to plan-view maps.

For example, identifying the size, shape, and distribution of natural openings on the photograph and map can give a designer some insight about the size, shape, and distribution of cutblocks that would work best on the landscape. Describing the type of landforms present (e.g., sharp, rugged peaks) can indicate that vertically oriented shapes may best fit the landscape (Figure A4.3).

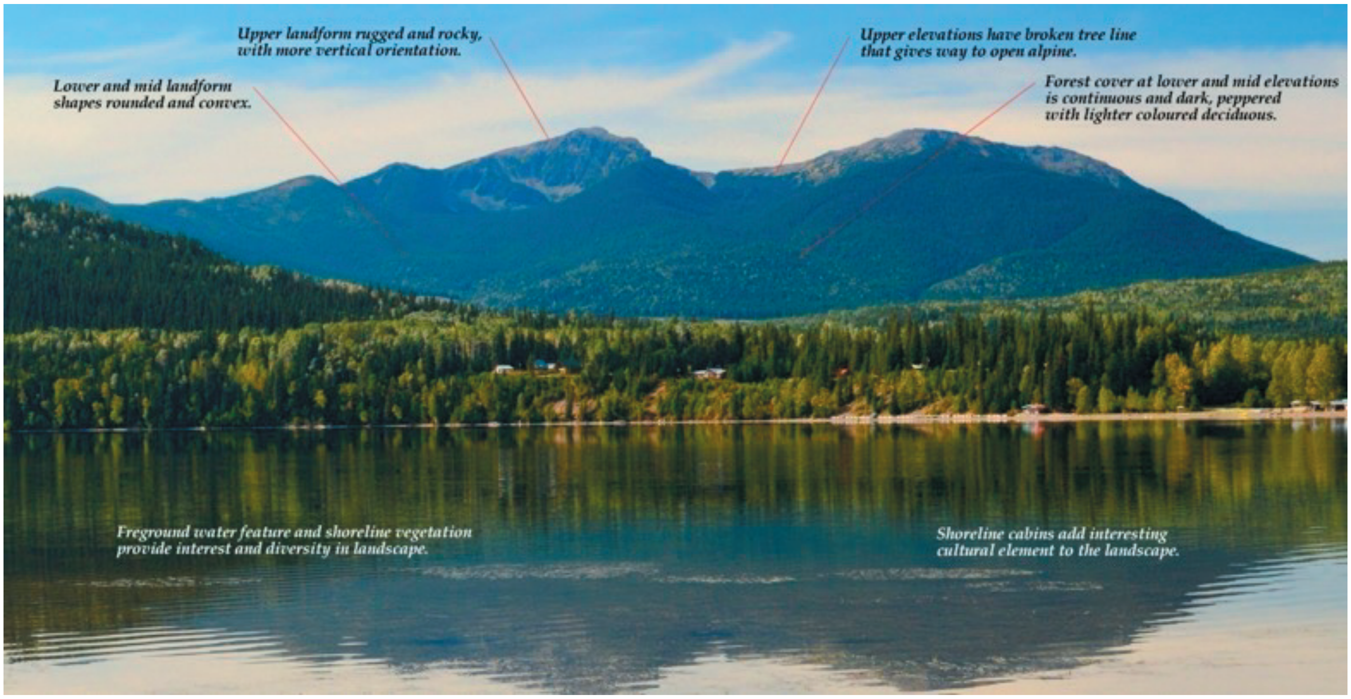


Figure A4.3. **Land feature analysis in perspective view.**

Notes:

- Much of the detail to be analyzed can be seen only in the photographs; it will not be obvious on maps.
- Other information can be transferred from the maps to digital images or printouts of the photographs. Annotations and symbols are useful for this part of the analysis.
- Features beneath the canopy might be revealed after timber harvesting. Some of these might help with the design, others may suggest places where forest cover needs to be maintained.
- The notes and comments recorded on the plan and perspective views should point out aspects of the patterns and relationships between different parts of the landscape.

After the land feature analysis is complete, the annotated maps and photographs will provide useful guides to the shape, size, and distribution of cutblocks on the landscape. See Appendix 5 for information about specific visual design concepts and principles.

APPENDIX 5: DESIGN GUIDELINES

Visual landscape design is a process that involves working with natural patterns and forces to develop solutions that meet visual quality objectives and management guidelines. The following is a summary of design guidelines that may assist when planning timber harvesting developments in visually sensitive areas. For more detailed information and guidance in visual design, refer to the Visual Landscape Design Training Manual found at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/training-vrm/vrm_visual_landscape_design_training_manual_complete.pdf.

Landform-level cutblock design

The following guidelines provide some recommendations for designing cutblocks at the landform level based on internationally recognized design concepts and principles.

- Start in the less sensitive hollows and work up the hillside when designing the first harvesting pass on a landscape.
- Locate larger openings on lower slopes and decrease the size of openings as the slope increases.
- Ensure that opening boundaries follow visual force lines up hollows and down ridge lines.
- Design the shape of harvest units to reflect the quality of those shapes found in the natural landscape (i.e., rounded curvilinear shapes in rounded landforms; spiky jagged shapes in more rugged terrain).
- Use the visual cues presented by the landscape, vegetation (timber types), and natural openings to determine the shape that is most appropriate for the landscape.
- Make sure that the general shape, scale, and position of the proposed operations fit the landscape. Organic shapes are generally more compatible with the natural landscape than geometric shapes.
- Design proposed operations with future passes or entries in mind to ensure that both visual quality objectives and timber removal can be maintained over the long term.
- Use curved lines rather than horizontal and vertical lines.
- Avoid jagged edges, right angles, and straight lines when designing opening boundaries. Where necessary use diagonal lines.
- Vary opening sizes and the spacing between openings to achieve an irregular appearance.
- Vary the texture on the landscape by introducing small cutblocks or by using partial-cutting techniques.
- Protect Genius Loci or the spirit of place.
- Make use of interlocking shapes like pieces of a jigsaw puzzle to improve the blending of proposed operations into the surrounding forest.
- Reduce contrasts in colour and shape through partial cutting and minimizing surface disturbances as much as possible (e.g., road building).
- Design asymmetric cutblock shapes rather than symmetric ones (i.e., a large cutblock and a small one is better than two cutblocks of equal size and shape for a given landscape).

- Avoid creating notches or abrupt changes in the tree canopy for openings proposed along skylines and ridgelines. If openings must cross a skyline, they should cross in saddles or on breaks in ridgelines.
- Distribute openings between visible and non-visible areas, and between steeper and gentler slopes within visual sensitivity units.

Stand-level cutblock design

The following guidelines provide some recommendations for designing cutblocks at the stand level based on internationally recognized design concepts and principles.

- Feather clearcut opening edges to reduce the sharp contrasting line between the opening boundary and the forest edge.
- Leave healthy, undamaged conifer and deciduous trees standing in well-designed clumps or in sufficient densities to break up an opening, reduce its apparent size, and avoid blowdown.
- Remove damaged, leaning, or poor-quality residual trees in foreground views to avoid a scruffy appearance.
- Avoid leaving individual trees standing on ridge lines when these trees are viewed against the sky.

Road design

The following guidelines provide some recommendations for designing roads on the landscape based on internationally recognized design concepts and principles.

- Design road lines to curve gently and blend with the landform by climbing in hollows and dropping on ridgelines.
- Design road locations to make as much use of landform as possible, and take advantage of non-visible areas, benches, and vegetative screening wherever possible to reduce visual effects.
- Align roads diagonally to slopes in those situations where mid-slope roads cannot be avoided; vary alignment in response to the landform.
- Reduce the visual effects where roads cross skylines by locating them in hollows.
- Locate roads away from skylines.
- Locate switchback roads on benches or in hollows, where possible, to minimize road cuts.
- Avoid locating roads that follow the viewers' line of sight on gentle foreground slopes; roads should curve away or cross at another angle.
- Reduce the size of cut-and-fill slopes to decrease the contrast between a road and the landscape.
- Use techniques, such as end-hauling and controlled blasting, to mitigate the visual effects of road construction on steep, visually sensitive slopes.

APPENDIX 6: GIS TOOLS TO SUPPORT FIELD ACTIVITIES

Creating Viewsheds.

A "viewshed" is a GIS procedure that uses the elevation data in a digital elevation model (DEM) to determine visibility to or from a particular point. Viewsheds may be a helpful tool in determining potential viewpoints. Google Earth includes a simple viewshed tool, and more precise analysis can be performed using ArcMap's 3D Analyst or Spatial Analyst extension, or QGIS (open source).

The viewshed analysis can also be run on a digital surface model; however, this requires more advanced GIS skills. Add the canopy height model (CHM) to the DEM after removing the proposed cutblocks from it (Figure A6.1). This yields a digital surface model (DSM). This method is more accurate than running a viewshed on a bare-earth DEM which does not include any timber screening in the model.

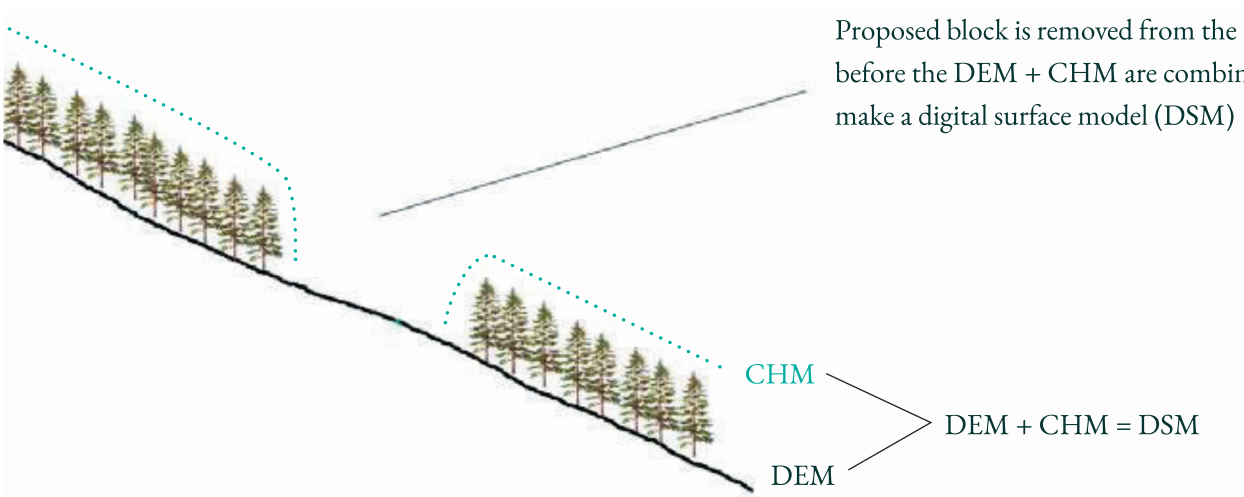


Figure A6.1. **A canopy height model may be modified in a GIS environment to simulate a proposed cutblock.**

Using Google Earth

Google Earth can be used to identify potential viewpoints in preparation for field work. Checking ground-level views in 3D mode can provide an idea of whether the alteration and landform will be viewable from a potential viewpoint. Viewpoint coordinates can also be recorded. Note that tree screening may change the actual view on the ground since tree heights are not modeled in Google Earth (Figure A6.2).

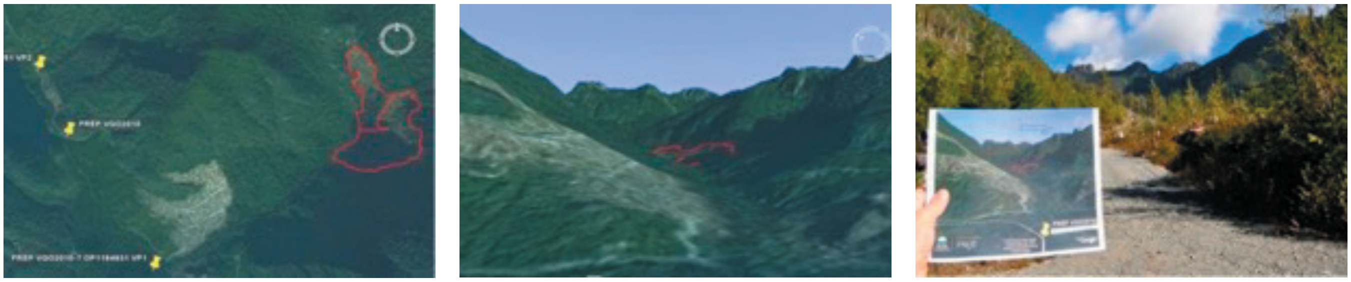


Figure A6.2. **Images showing (l to r):** ***(a)*** **2D view of potential viewpoints,** ***(b)*** **3D view from single viewpoint, and** ***(c)*** **on-site photo of same view.**

Google "Street View" can be used to help predict views from potential viewpoints if this tool is available for the road of interest (Figure A6.3). If not, "Terrain View" (not Street View, but still in Google Earth 3D) is quite helpful. Do not depend solely on Street View for the assessment since the imagery is not high quality and is often outdated.

Figure A6.3: **Images showing** ***(a)*** **potential viewpoint on map and** ***(b)*** **StreetView image from same viewpoint.**

APPENDIX 7: VISUAL SIMULATION PRESENTATION TIPS

Recommended information to include with, or show on, each 3D visualization:

- Title (e.g., "Visualization of…" or "Perspective view of…"),
- Geographic area name (e.g., Lake X, Highway XX),
- Name and/or number of viewpoints used,
- Viewpoint GPS coordinates,
- Elevation of viewpoint above ground (normally 1.6 m),
- Licensee name and cutting permit number,
- Existing cutblock or road (including numbers),
- Proposed cutblock or road (including numbers),
- Average tree height used for forest cover,
- Lens focal length (50 mm recommended),
- Direction of view angle in degrees (centre line of vision cone),
- Vertical viewing angle (degrees),
- Vertical exaggeration (none recommended),
- Contact information of the person that produced the model,
- Date plotted, and
- Grid resolution.

Notes:

- The recommended plot size is 11 x 17 inches. Each plot should be accompanied with a plan-view map.
- A photograph taken from the same viewpoint location as the visualization should also be attached to the plot, especially if used for public presentations.
- The map, visualization plot, and photograph(s) should all be oriented in the same way in relation to each other.
- If colour codes are used on the plot instead of labels, then a colour-coded legend should be used to differentiate between water features, existing and proposed roads, and existing and proposed cutblocks.

Recommended information to show on the accompanying plan-view map:

- Topographic map index number,
- Contour lines, roads, and water features,
- Scale of map; 1:50 000 or larger scale preferred (e.g., 1:20 000 or 1:10 000),
- Existing and proposed cutblocks or roads,

- Viewpoint location used for the simulation (shown on the map with a symbol) with centre and cone of vision lines matching the perspective view, and
- Visual landscape inventory data, such as visible area and visual sensitivity unit (VSU) boundaries, VSU label including number and ratings, and visual quality objective(s).

APPENDIX 8: PLOTTING PHOTOGRAPHS AND VISUAL SIMULATIONS AT SCALES THAT REPRESENT ONSITE VIEWING CONDITIONS

The relationship between the size of a photograph or simulation and the distance of the observer is important for creating a realistic image (Figure A8.1). A minimum image size of 25 by 30 cm can be viewed at a comfortable arm's length and is preferable to smaller simulations. Poster-size simulations, approximately 61 x 76 cm, that can be viewed from about 1.2-1.5 m away are suitable for public display. It is extremely important that photographs are viewed in the same context that they were taken. There is a formula for determining the correct size of the image in relation to viewing distance. The formula requires several pieces of information:

- Width of image (WOI) = the width of your printed image measured in inches or centimetres.
- Horizontal field of view (HFOV) of the camera lens used. The HFOV of a full-frame DSLR (digital single lens reflex) camera with a 50-mm lens is 39.6 degrees. See Table A8.1 below for the HFOV for other lens focal lengths. Note the discussion in Sections 3.2.3 and 3.2.4 of this handbook regarding camera sensor crop factors to ensure that the focal length used for photographs has been adjusted if necessary.
- Distance from viewer (DFV) = distance to the image being viewed in inches or centimetres.

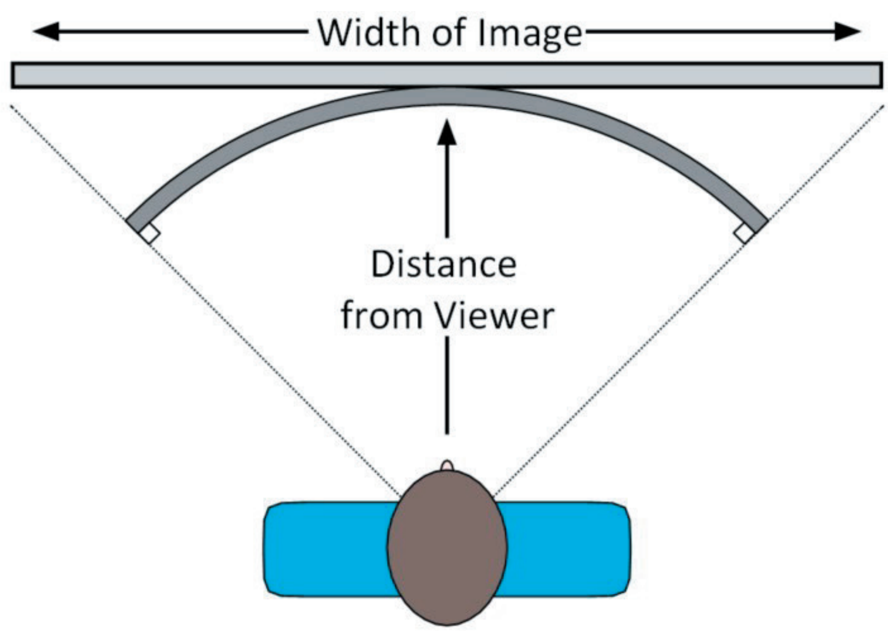


Figure A8.1. **There is an important relationship between viewing distance and appropriate image width.**

You can use the formula two different ways:

1. Calculate the optimum viewing distance for an existing photo by entering the width of the photo you want to view into the following formula:

   distance from viewer = width of image / [2 x tan (HFOV / 2)]

   example: distance from viewer: 38.1 cm / [2 x tan (39.6 / 2)] = 53.2 cm

2. Calculate the width of the photo necessary for a given viewing distance by entering the distance from the viewer into the formula:
   width of image = distance from viewer x [2 x tan (HFOV / 2)]
   example: width of image = 53.2 cm x [2 x tan (39.6 / 2)] = 38.1 cm

Table A8.1. **HFOV by lens focal length**

FOCAL LENGTH MM	HFOV DEGREES
12	111.1
16	95.1
20	82.4
24	73.7
35	54.4
50	39.6
70	28.8
85	23.9
105	19.5
200	10.3
300	6.87

APPENDIX 9: SAMPLE VISUAL QUALITY CLASS PHOTO SHEETS

RETENTION

Hwy 3 rest stop

VQC=R

VQO Definition:
Difficult to see
Small in scale
Natural in appearance

Numeric Assessment:
% unadjusted – 1.1%
% adjusted – 0.5%

RETENTION

Edna Lake

VQC=R

VQO Definition:
Difficult to see
Small in scale
Natural in appearance

Numeric Assessment:
% unadjusted – 1.6%
% adjusted – 1.2%

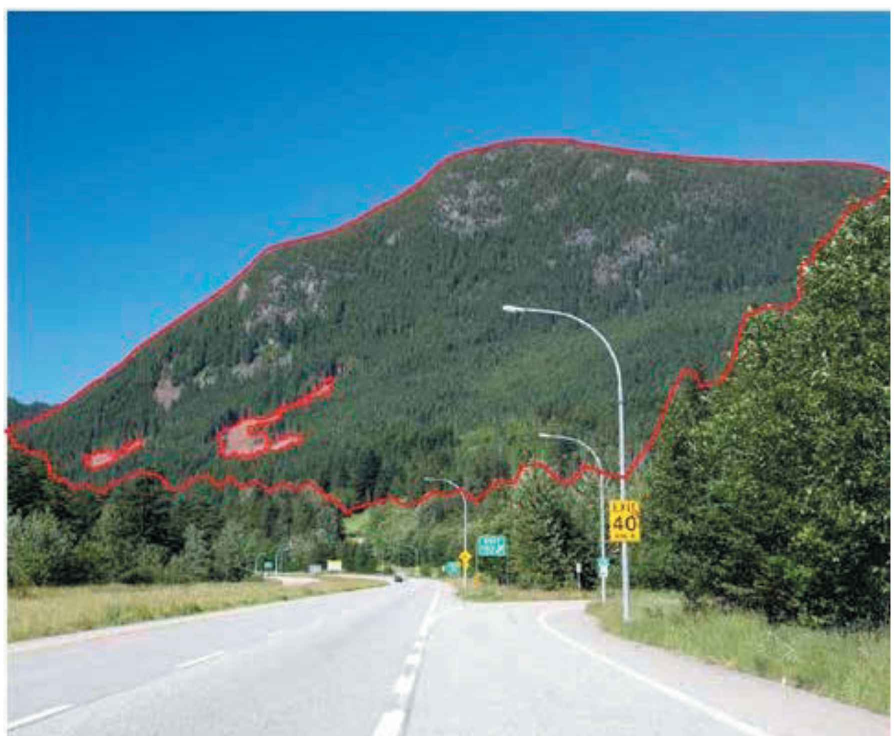
PARTIAL RETENTION

Coquihalla Hwy

VQC= PR

VQO Definition:
Easy to see
Small to medium in scale
Natural in appearance

Numeric Assessment:
% unadjusted – 1.4%
% adjusted – 0.8%



PARTIAL RETENTION

Harrison Lake

VQC=PR

VQO Definition:
Easy to see
Medium in scale
Natural and not rectilinear or geometric in shape

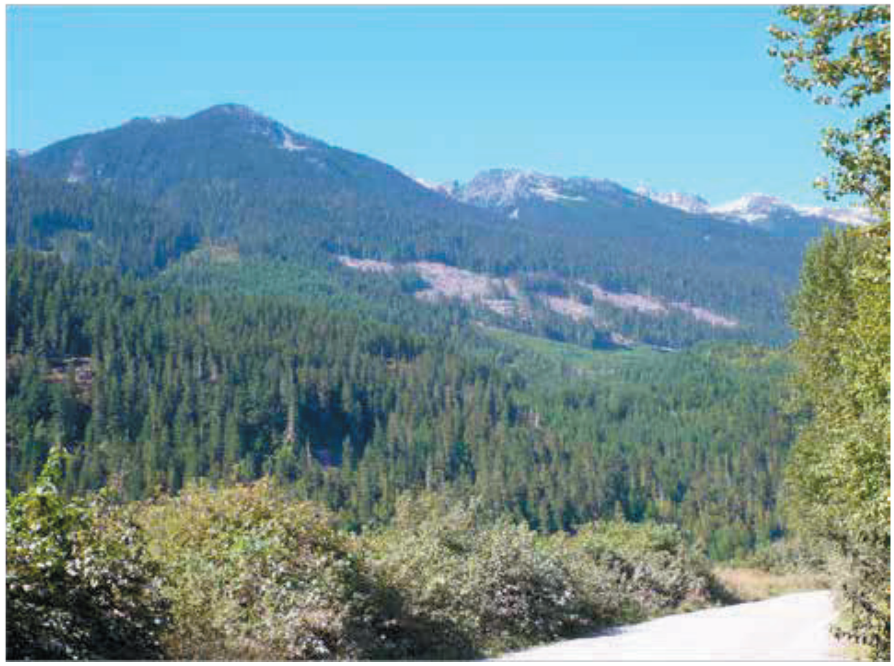
Numeric Assessment:
% unadjusted – 7.1%
% adjusted – 6.1%

MODIFICATION

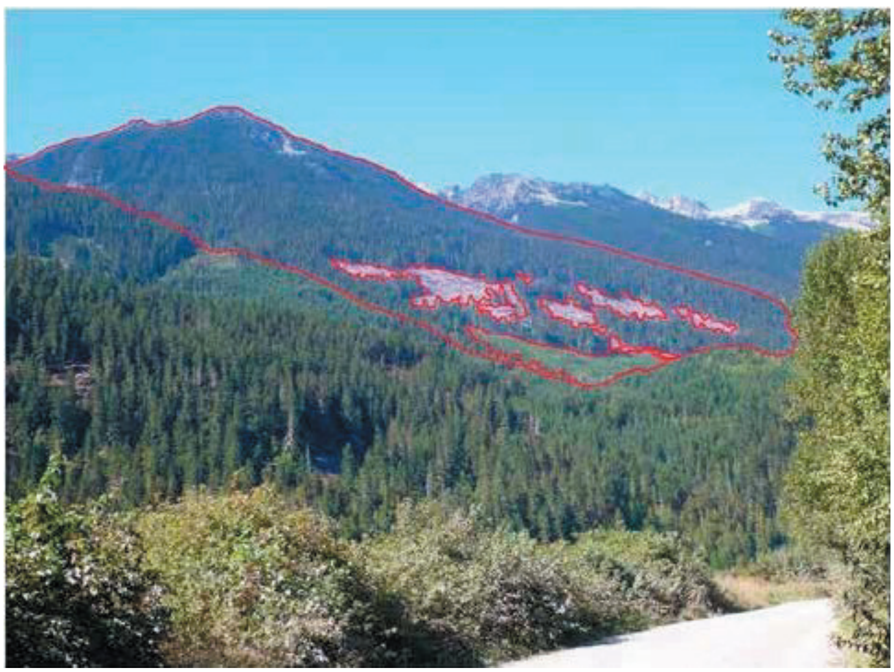
Lillooet South

VQC=M

VQO Definition:
Very easy to see
Large in scale
Natural in appearance



Numeric Assessment:
% unadjusted – 11.0%
% adjusted – 9.4%



MODIFICATION

Phillips Arm

VQC=M

VQO Definition:
Very easy to see
Medium in scale
Some angular characteristics

Numeric Assessment:
% unadjusted – 8.5%
% adjusted – 9.5%

MINISTRY OF FORESTS