

Nadina Lake Four-Phase Full-Rotation Integrated Visual Design Plan

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The Nadina Lake IVD Report and Image Documents are presently available at:
<ftp://rdiftp.1rdi.com:rdiftp@ftp.1rdi.com/WestFraser/RDI-NadinalVD-070221-Images.pdf>
<ftp://rdiftp.1rdi.com:rdiftp@ftp.1rdi.com/WestFraser/RDI-NadinalVD-070221-Report.pdf>

Executive Summary

An Integrated Visual Design (IVD) plan was prepared by Ken Fairhurst, R.P.F., RDI Resource Design Inc. (RDI) for West Fraser Mills Ltd., Houston Forest Products Division, for the visually sensitive north and east portions of the Nadina Lake landscape. Though not the foremost reason for conducting the plan, the surrounding forest is under widespread attack from the pine bark beetle. The plan applied 3-D computer visualization and integrated visual design techniques to produce a full rotation plan of ecologically and operationally available, pine-dominated, timber that would be capable of meeting established Visual Quality Objectives (VQOs) over the duration of the plan. The plan was designed and fully assessed from the required minimum of three primary Landscape Control Points (LCPs) along the lake. An additional seven LCPs were used to spot-check the appearance of the plan, but were not included in the full analysis. In all, 1944 individual harvestable planning units comprising 2051 hectares were assigned to phases using visual design principles, summarized in the table on the front cover (p.1).

The large area involved in Phase 1 is mainly not visually sensitive (564 ha non-visible, based on forest-cover adjusted viewshed; 730 ha based on GEOptics value of 0). Units in Phase 99 were left unscheduled at this time. For details, see the companion report "RDI-NadinalVD-070221.pdf".

With some fairly minor exceptions, and within the expressed limitations of the modelling procedures, it is predicted that the plan is reasonably capable of meeting the established VQOs in each phase from the three main LCPs. It is further predicted, within the same limitations, that the plan will meet the 2004 Morice Land and Resource Management Plan (LRMP) stipulation of no more than 4% of the viewshed to be altered as seen from the lake. It is recommended that full analysis be conducted from the seven remaining LCPs as a further project to derive and document the predicted appearance of the IVD plan more widely along the lake and thereby, further the assurance of the IVD plan's capabilities for largely maintaining the highly valued visual quality of Nadina Lake.

The project provided the opportunity to test Ken Fairhurst's GEOptics apperency model that was developed for his Ph.D. dissertation. The ratings derived in the model were very helpful when setting the phasing schedules, and should provide on-going guidance when planning harvesting operations and when updating the IVD plan. Forest Investment Account funding of this project and Houston Forest Products' authorization of use of the Nadina Lake data for university research is greatly appreciated. The research model is to be tested with forest operations and landscape specialists this year to determine if the approach can improve on conventional landscape planning tools including viewshed analysis, times-seen maps, slope analysis and visual force analysis.

Discussions with Jaret van der Giessen, Planning Forester, Houston Forest Products, and with Nadina Lake Lodge owners, Wendy and Brad Thompson, who also presented a map of key features and viewpoints on and around the lake, provided much useful insight into the issues and values involved when developing this plan. It is sincerely hoped that the IVD plan will be seen to have responded at least adequately and perhaps fully to these over both the short- and longer-term.

Contract No. FIA-IVD-06
February 21, 2007

1. Introduction

Nadina Lake is accessible by gravel road, 1½ -2 hours drive south of Houston, British Columbia. The Nadina landscape provides a near wilderness-type setting for visitors to the Nadina Lake Lodge at the east end of Gordeau Bay, operated by Wendy and Brad Thompson, and to the Forest Service recreation site at the east end of Sawmill Bay. The lake is 8 km long with no other lodges or inhabitants. The lodge looks out onto the narrowly enclosed Gordeau Bay landscape and distant mountains (the majestic Sibola Mountain range). Nadina Lake supports an outstanding wild Rainbow Trout population, with fish up to 12 lbs. The area is habitat to abundant moose, bear, wolves, mountain goats and upland game birds. There are some areas of recent, mainly visually greened-up, timber harvesting in close and distant views, including in the low landscape on the north side of Sawmill Bay near the Recreation Site and on the upper reaches of the south side of Gordeau Bay, not seen from Gordeau Bay. The accompanying graphics document, RDI-NadinalVD-070221-images.pdf, provides an orientation map including the location of the 2 bays.

The Ministry of Forests and Range's Recreation Opportunity Spectrum (ROS) rates the lake as "semi-primitive non-motorized" along the western half of the lake's north shore landscape, and "motorized recreation" along the eastern half of the north shore landscape and further around the lake's south shore. The Morice Land and Resource Management Plan (LRMP), prepared in 2004, identified the Nadina Lake Visual Management Area as "VMA3", a category in which "visual quality is primarily concerned with the area immediately surrounding the area of interest but there are portions of the viewscape that are impacted to the height of land", i.e. along the north side of the lake. The visual modification was to remain subordinate, with the specific statement that "no more than 4% of the visible landscape from the viewpoint (i.e. the lake) will be altered by harvesting". Visual Landscape Inventory was conducted in 1996. The LRMP gave high priority for an update of the inventory to be completed in 1996, although none has been made known at the time of this Integrated Visual Design (IVD) plan preparation. The established Visual Quality Objectives (VQOs) for the Scenic Area are mainly Retention (R), Partial Retention (PR), and, on more distant landforms, Modification (M). The Retention VQO was more restrictive (R = 0% - 1½%) than the LRMP statement, Partial Retention permitted a range of alteration from below to above the LRMP statement (PR = >1½% - 7%), and Modification permitted even more alteration (M = >7% to 18%). The IVD plan generally worked towards achieving the Retention VQO, broadly speaking, in each scene from each Landscape Control Point (LCP), as that was the VQO which covered most of the visible areas.

The predominant lodgepole pine forest around the landscape is undergoing severe beetle attack, much of it in a red-brown foliage condition in 2006-2007. The beetle attack raised the priority for the development of a long-term

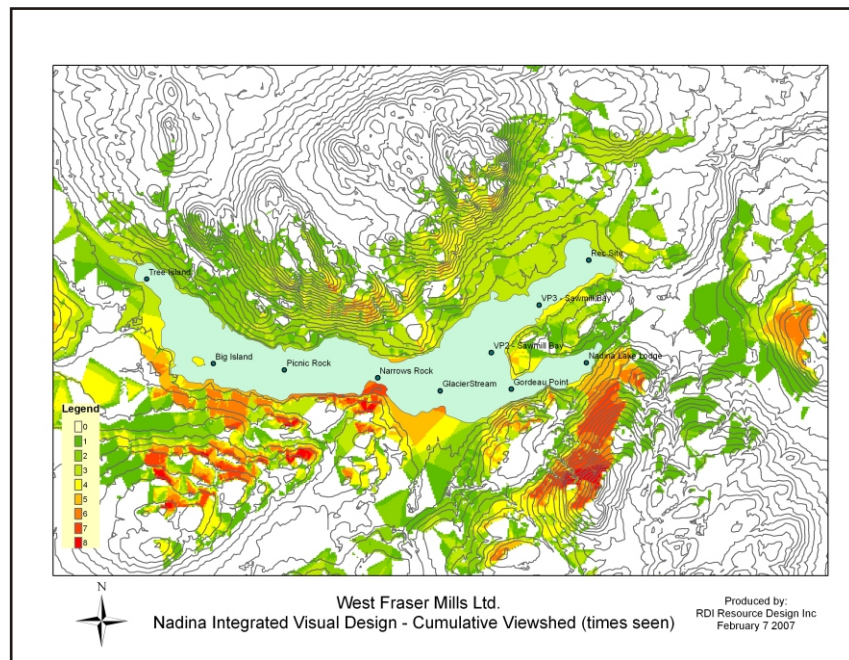
forest development plan. Recognizing the scenic sensitivity, Houston Forest Products (HFP) determined to undertake an Integrated Visual Design (IVD) Plan under Forest Investment Account funding. In a competitive bid process, RDI Resource Design Inc (RDI) was awarded the contract (FIA-IVD-06) to produce a full rotation IVD plan for the Nadina Lake Scenic area located along the north, east, and south-east shores of the lake, and provide visualization and analysis from a minimum of 3 viewpoints. The key map and all other graphics prepared in the IVD project are presented in the accompanying graphics document.

The goal of the Nadina Lake Integrated Visual Design project was to produce an integrated visual design for Nadina Lake Scenic Area along the north and east Shore of Nadina Lake, with the objectives of designing appropriate leave and clear-cut harvest area options for a full rotation that would be capable of meeting the VQOs established for the area, using the 3 criteria of verbal definition, design quality, and percent alteration (source: MOFR 2001, Visual Impact Assessment Guidebook, Second Edition). As well, the plan was to be environmentally sustainable, technically feasible, and economically viable over the short and longer term. Of primary consideration were the pine-leading types.

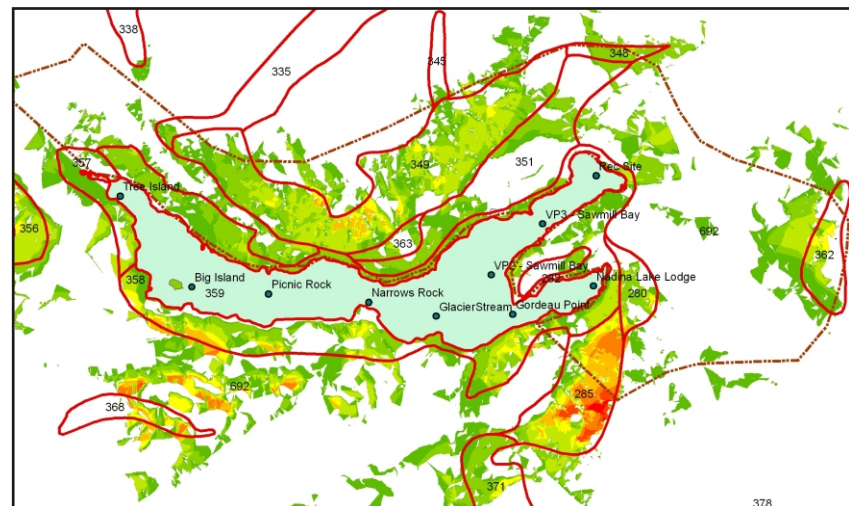
The planning approach applied the integrated visual design concepts outlined in the FIA: Integrated Visual Design Interim Procedures and Standards (<http://www.for.gov.bc.ca/hfp/publications/00040/FIA-Standards-Final.pdf>) and the Ministry of Forests' the Visual Landscape Design Training Manual (1994). RDI was provided with digital files containing a large array of potential harvest units generated by a harvest planning computer model, a computer-generated road plan, forest cover files, terrain (TRIM), and harvesting constraint files, including VQOs, ROS, accessibility, stability, etc. Photos of the eastern half of the lake, taken in 2001, were provided by Jaret van der Giessen, HFP's Planning Forester. Ortho-photography was also provided which clearly depicted recently altered areas.

The project was conducted by Ken Fairhurst, R.P.F. The project also served as a practical test of his Ph.D. Dissertation research process for which HFP kindly granted use of the Nadina Lake IVD database. The research is called GEOptics Landscape Apperency Modelling. The expectation for GEOptics is that the intensity, representing how each land plane is seen along a view corridor, can be used to guide the location, size, pattern, and shape of resource development and/or protection necessary to maintain visual quality.

For full planning approach details, see the companion report "RDI-NadinalVD-070221.pdf".



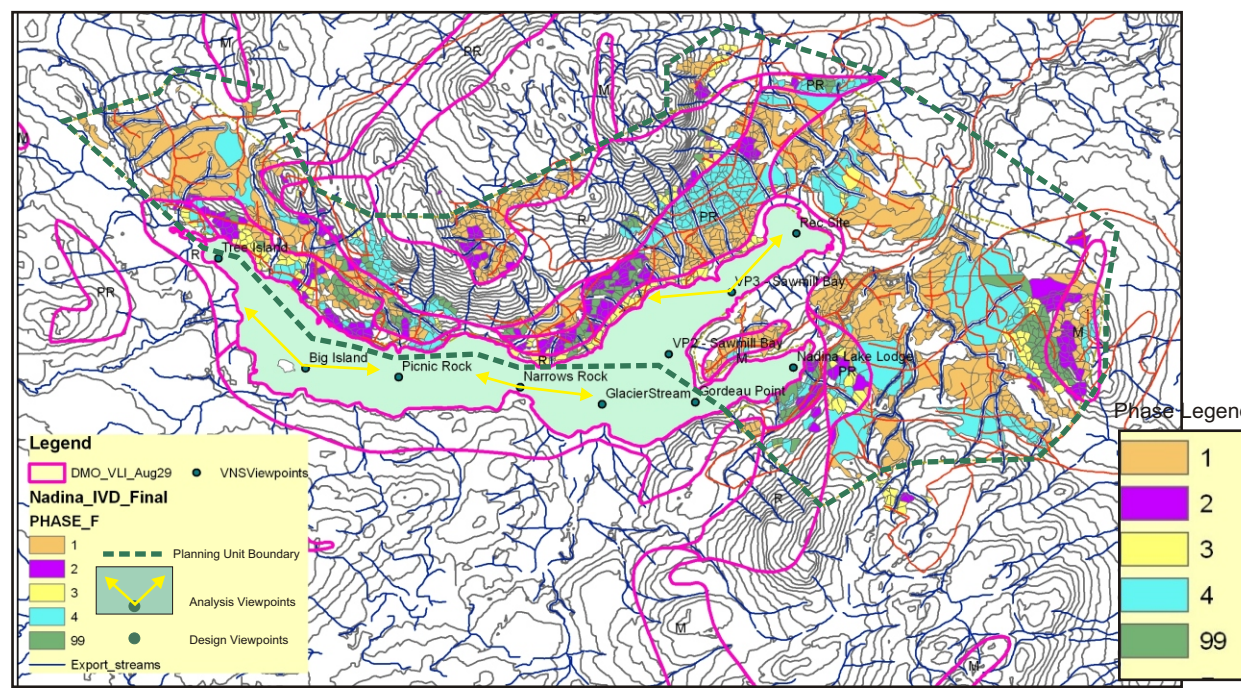
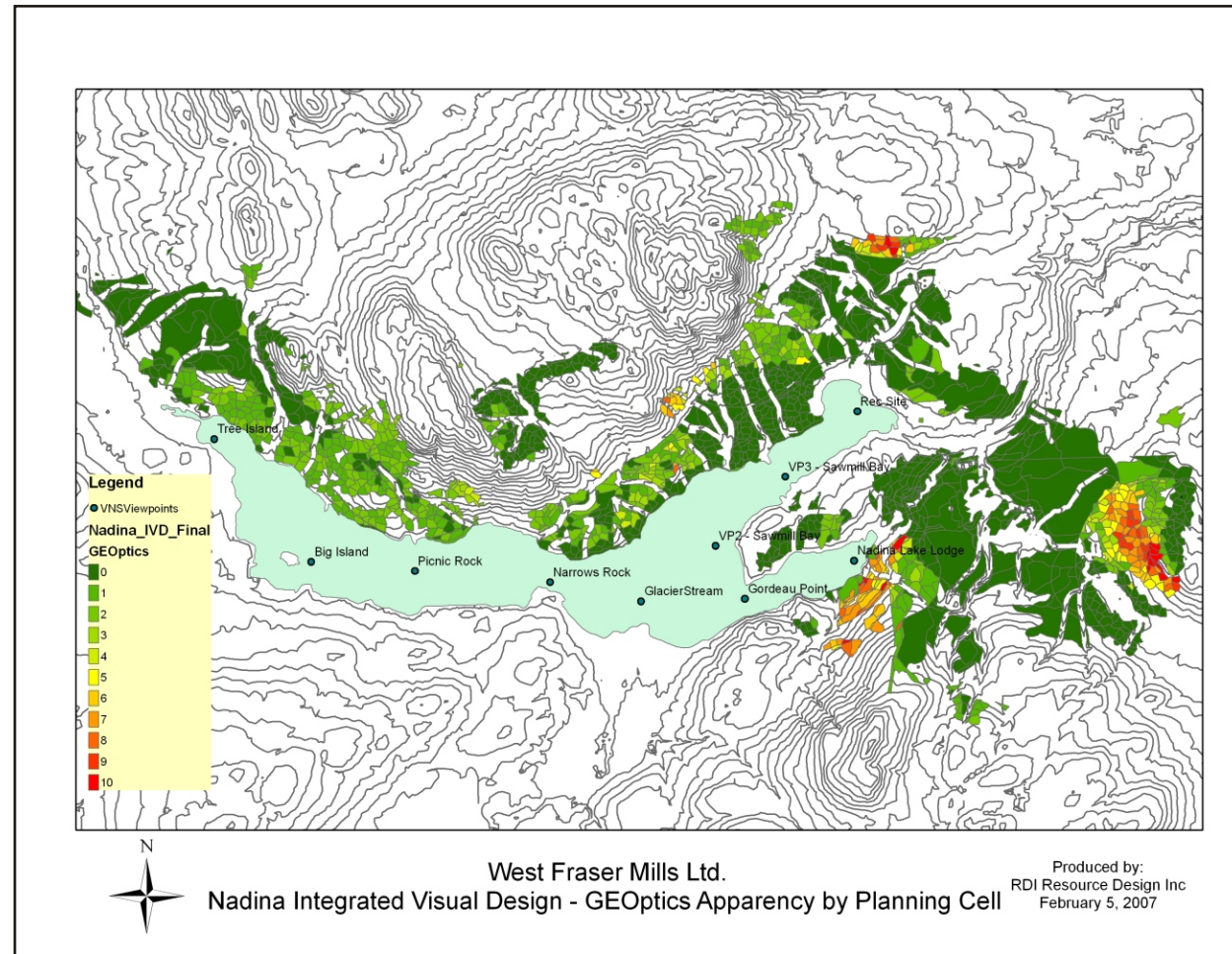
Viewshed - Times-seen Map



Viewshed - Times-seen Map - Forest Height Adjusted with VSU and Scenic Area Overlays

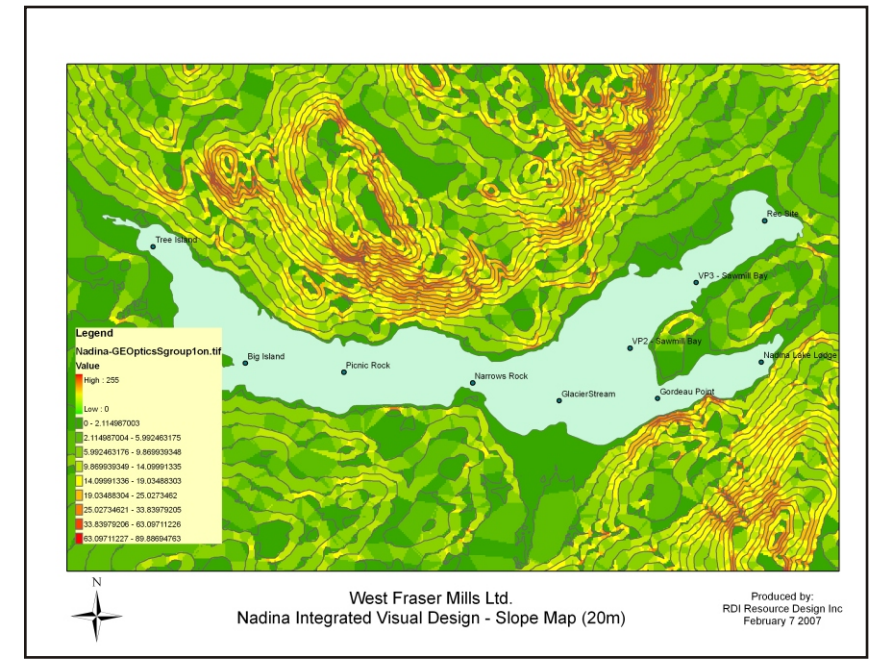
Composite viewshed analysis was conducted in ArcMap 9.1 3D Analyst. The representation provides a relative importance weighting based on the number of times each pixel is seen from the array of viewpoints which were assigned an elevation of 2m above lake level. The top viewshed was produced with bare terrain; the lower viewshed was adjusted for forest height. The adjusted viewshed can be compared with the Visual Sensitivity Units created in the Visual Landscape Inventory. The key units are:

- 358 (R) - shorezone around most of Nadina Lake
- 349 (R) - main north hill
- 351 (PR) - north-east flats in Sawmill Bay
- 348 (PR) - small north-east hill in Sawmill Bay
- 282 (M) - knoll on Gordeau Bay peninsula
- 280 (PR) - south-east portion of south hill, Gordeau Bay
- 285 (R) - south hill, Gordeau Bay
- 362 (M) - far east hill
- 363 (NVS) - area below 349, not visually sensitive
- 692 (NVS) - area below 349 and all other NVS

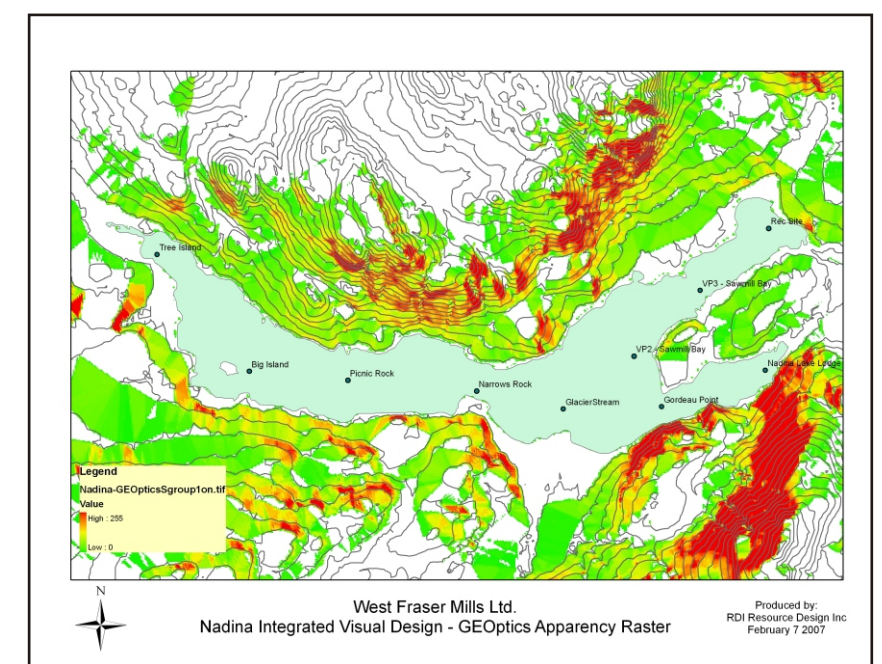


Nadina IVD Phases

Nadina Lake Integrated Visual Design Plan
Viewshed and GEOptics Analyses

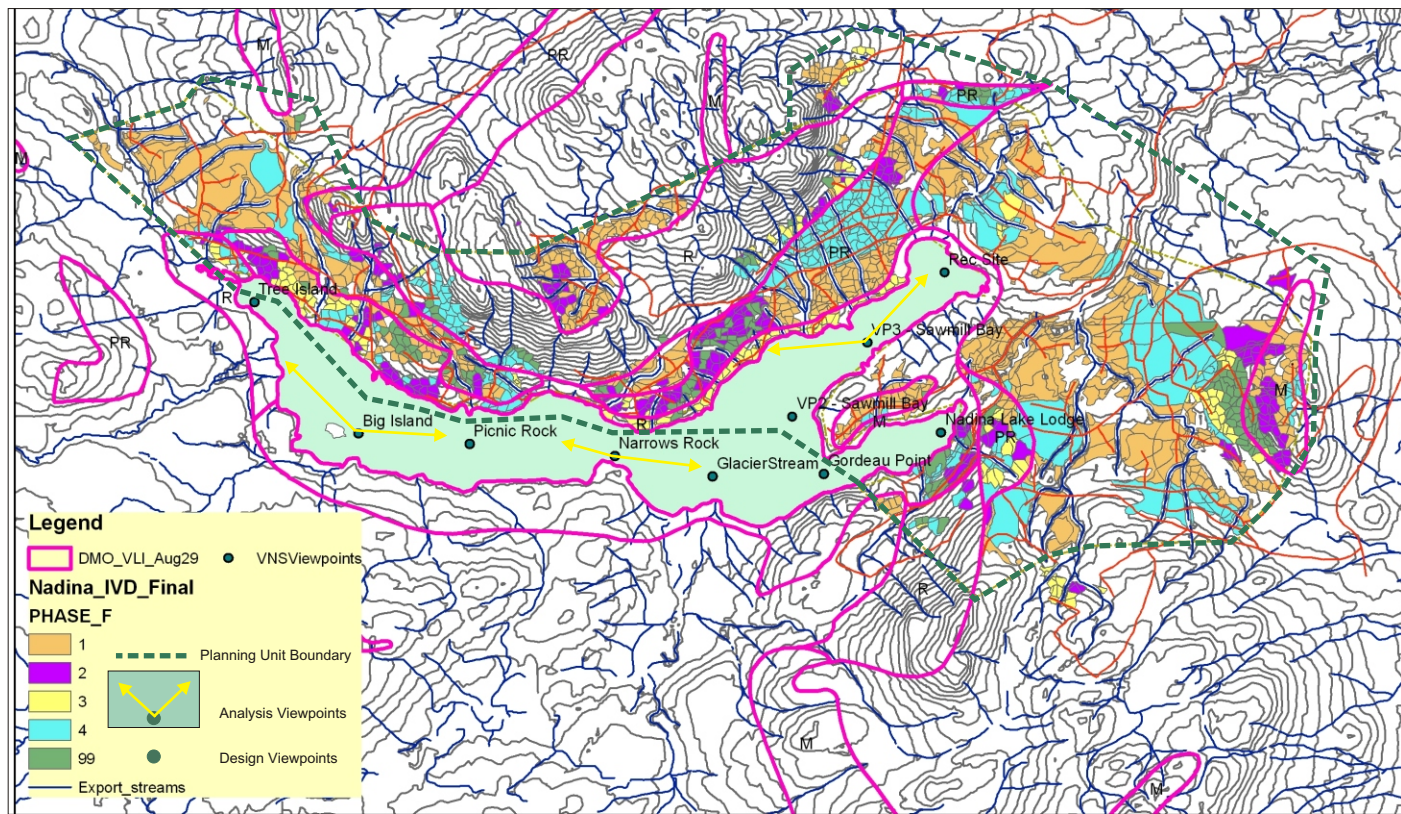


Slope Map

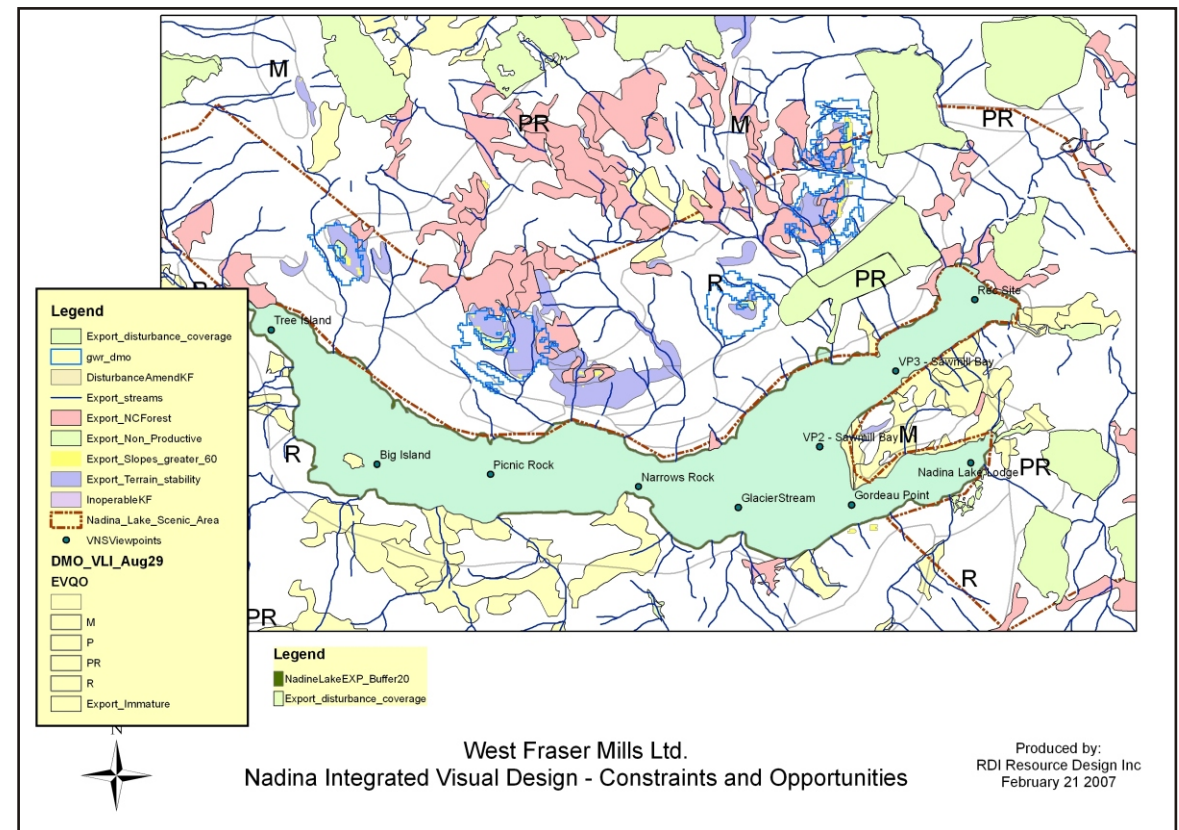


GEOptics Apparency

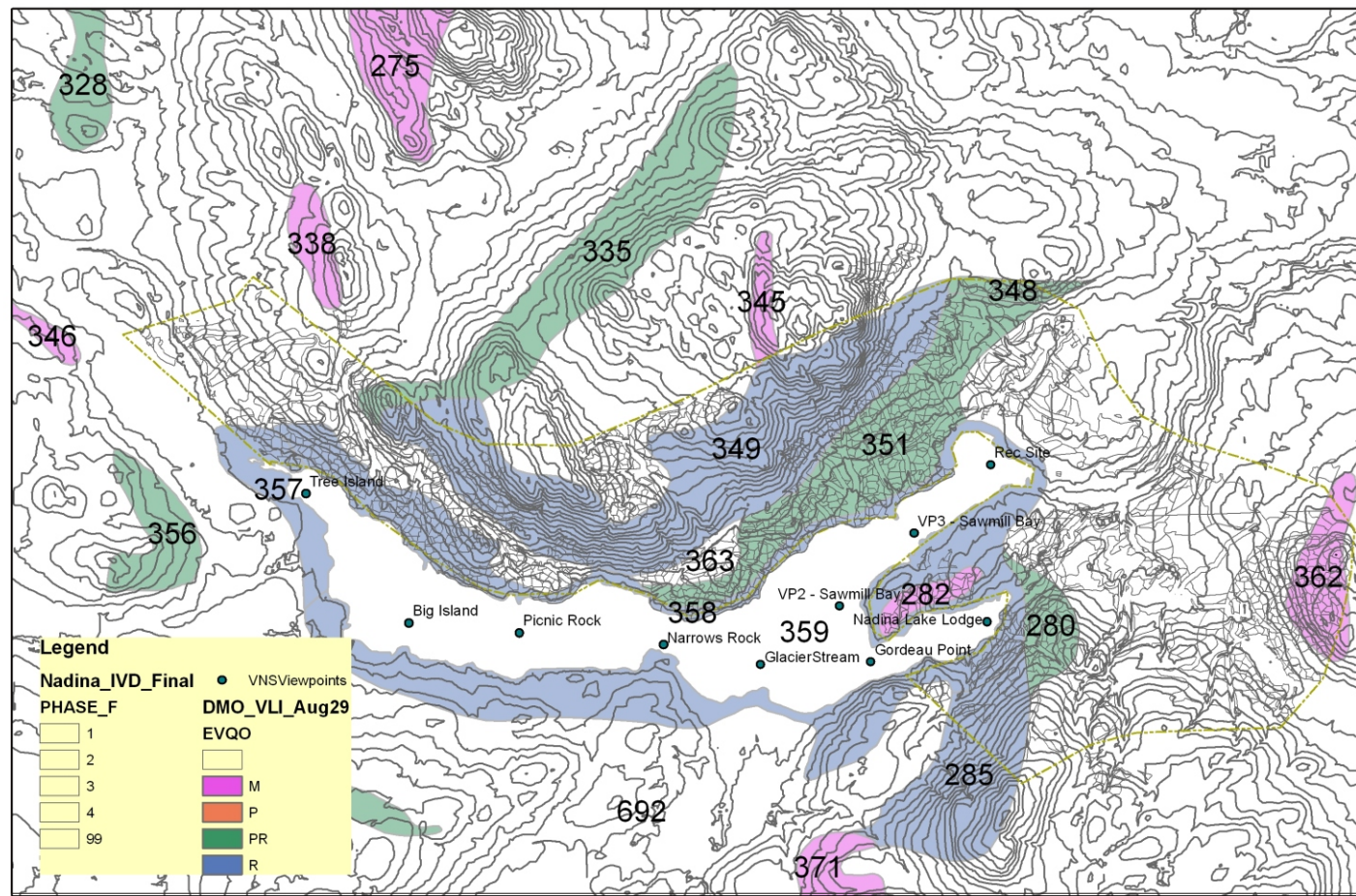
GEOptics Apparency is the term assigned to K.B. Fairhurst's Ph.D. Dissertation research model that gathers cumulative visual incidence angles from landscape control points. When each planning cell is classified by GEOptics rating (0-10), the relative visual vulnerability across the entire planning area is known. Class 0 has no apparency. Planning cells in this category may be scheduled at any time without influence on visual quality. As apparency increases, visual vulnerability increases, and meeting the VQO is more difficult, requiring detailed design and scheduling over time. Eight LCPs were used in the GEOptics analysis, covering all VNS viewpoints except Glacier Stream and Gordeau Point which were derived for additional plan checking after the GEOptics analysis was completed. More information about GEOptics is available at www.GEOptics.com.



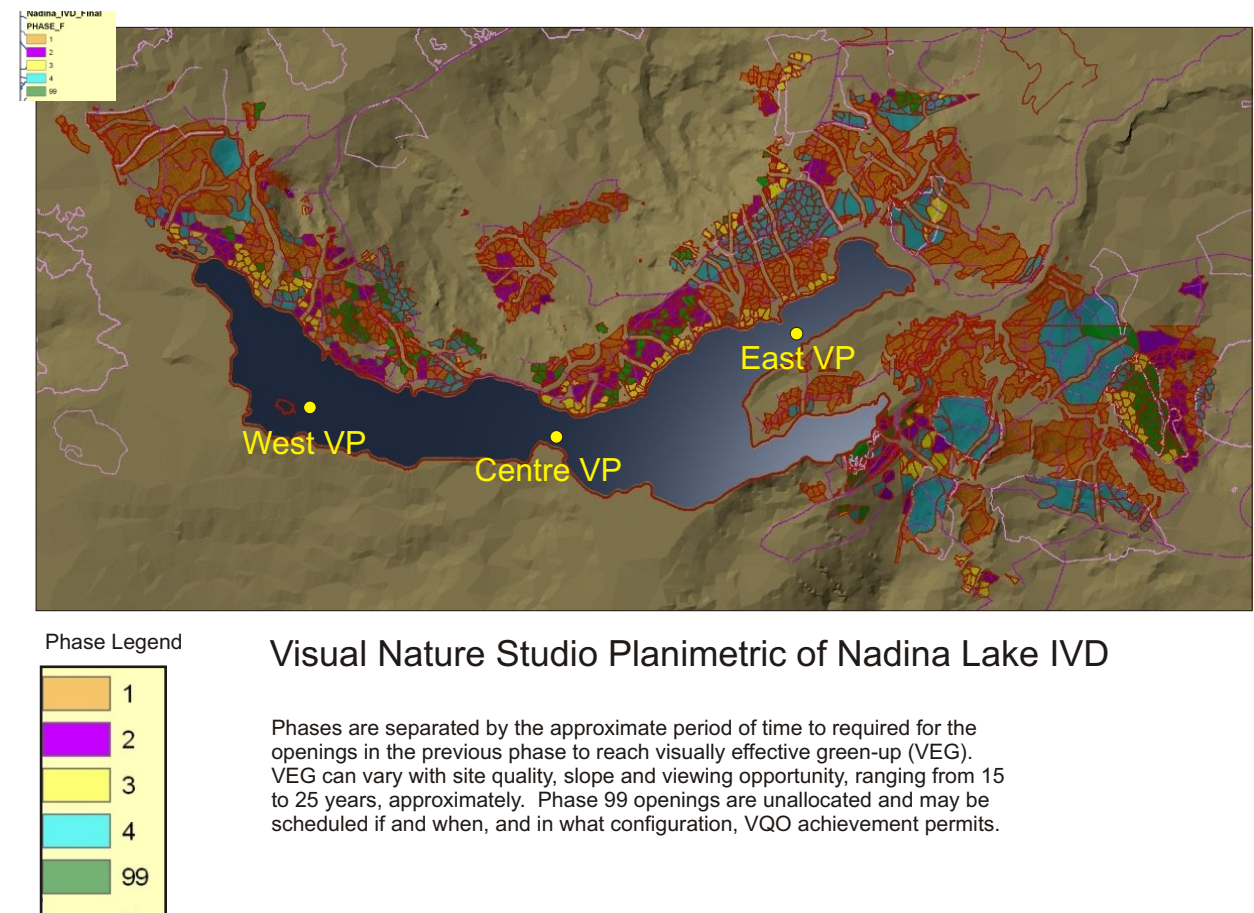
Four Phase Full-Rotation Integrated Visual Design Plan



Constraints and Opportunities Analysis



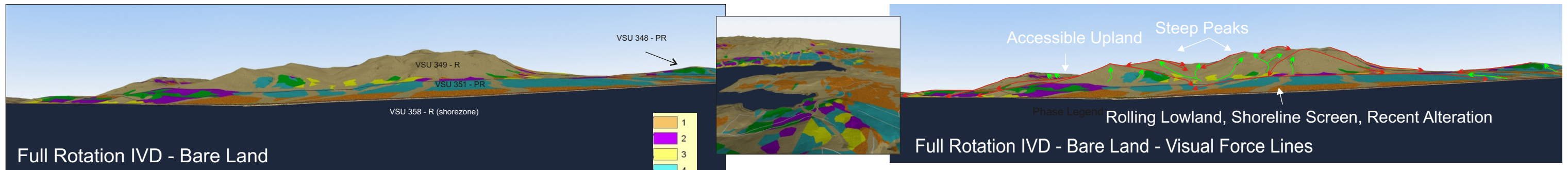
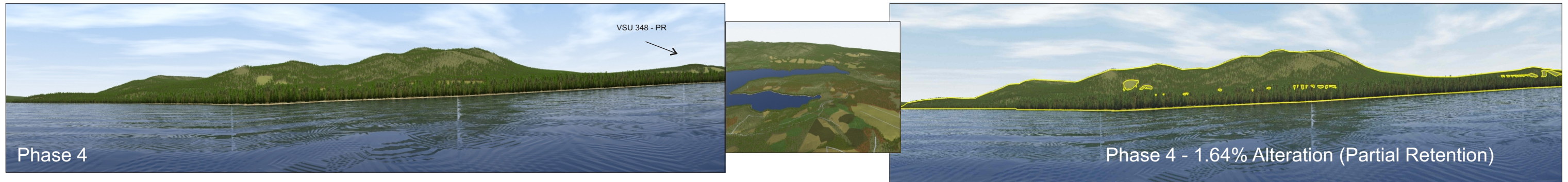
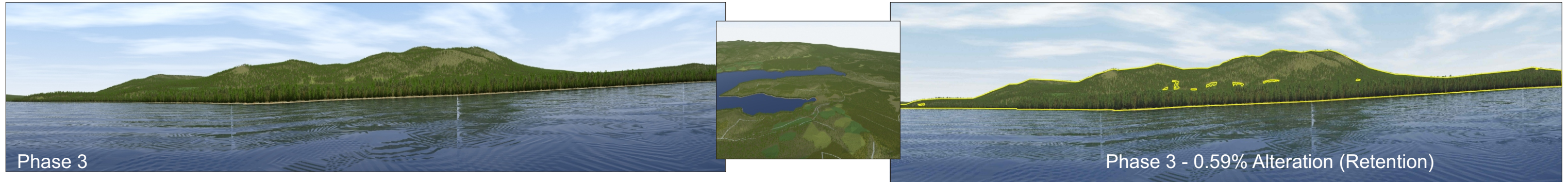
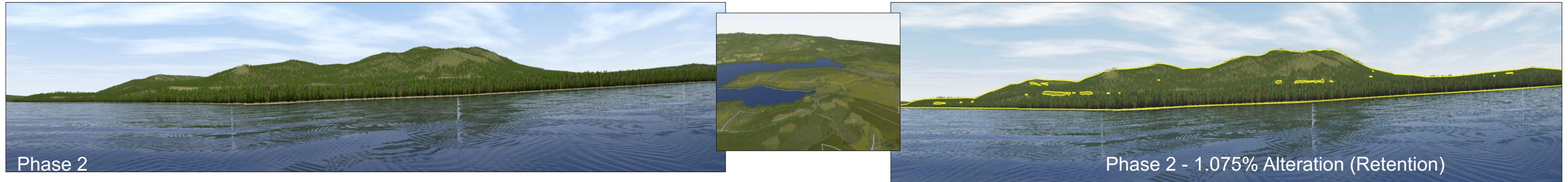
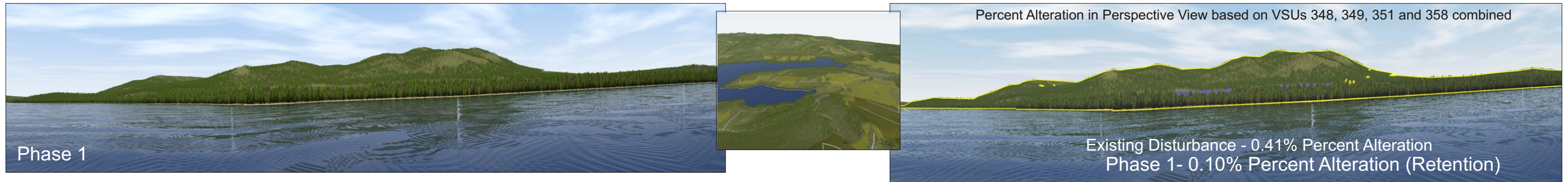
Established Visual Quality Objectives



Visual Nature Studio Planimetric of Nadina Lake IVD

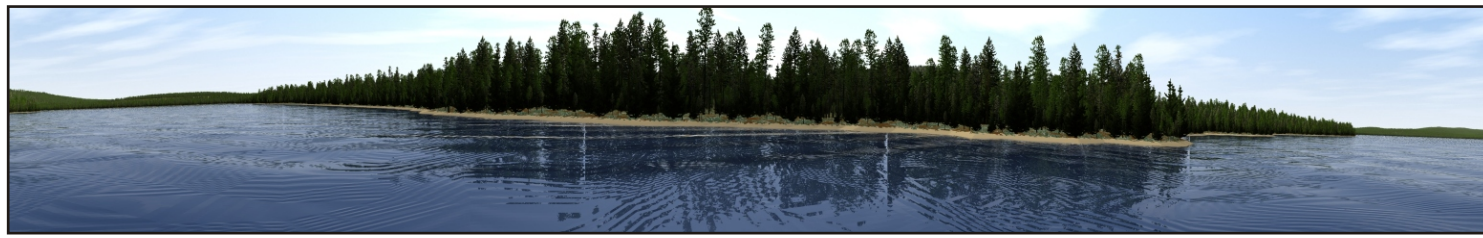
Phases are separated by the approximate period of time to required for the openings in the previous phase to reach visually effective green-up (VEG). VEG can vary with site quality, slope and viewing opportunity, ranging from 15 to 25 years, approximately. Phase 99 openings are unallocated and may be scheduled if and when, and in what configuration, VQO achievement permits.

Aerial Views - East Section

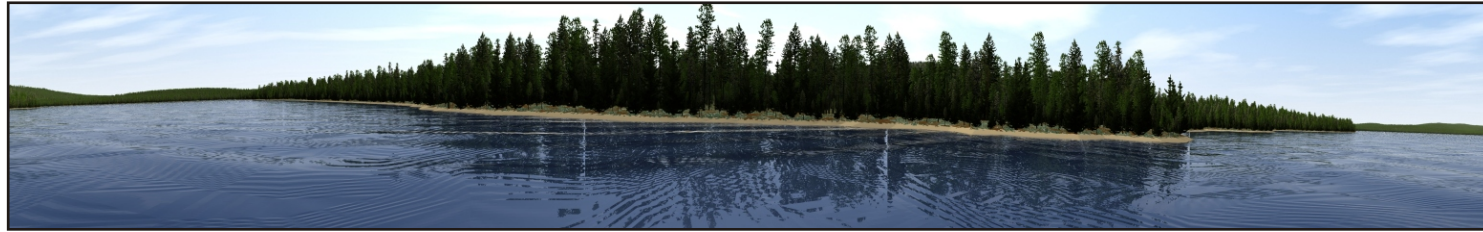


Phase Legend

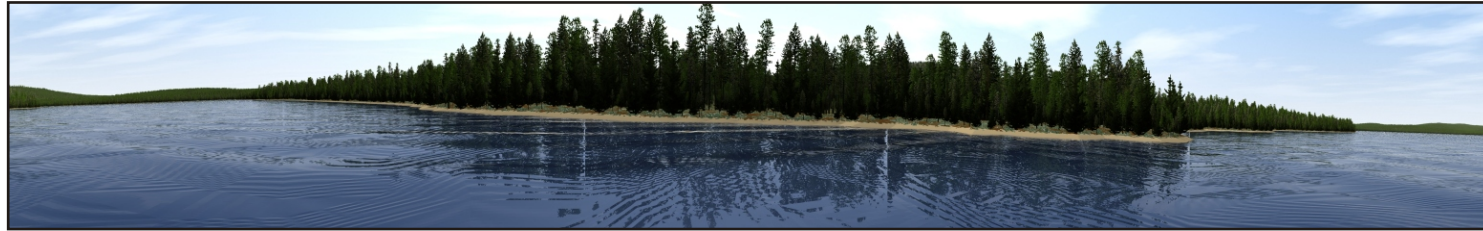
East LCP Average % Alteration P1-P4 = 0.85% (Retention)



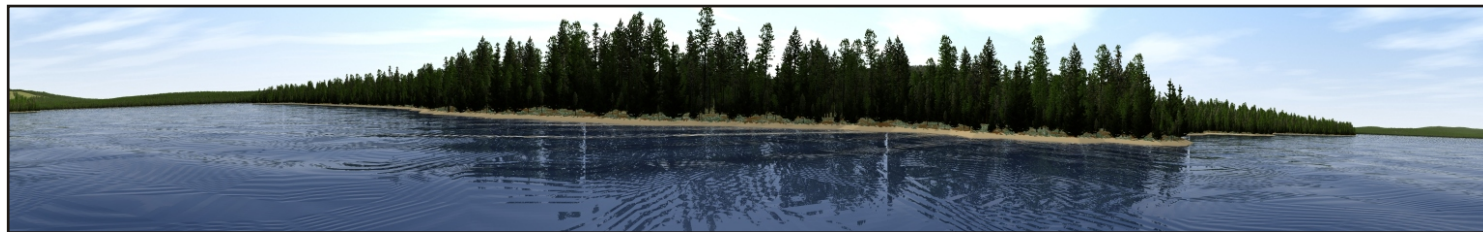
Phase 1



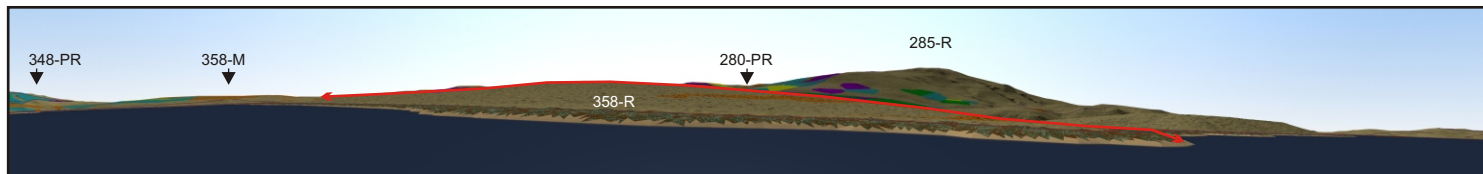
Phase 2



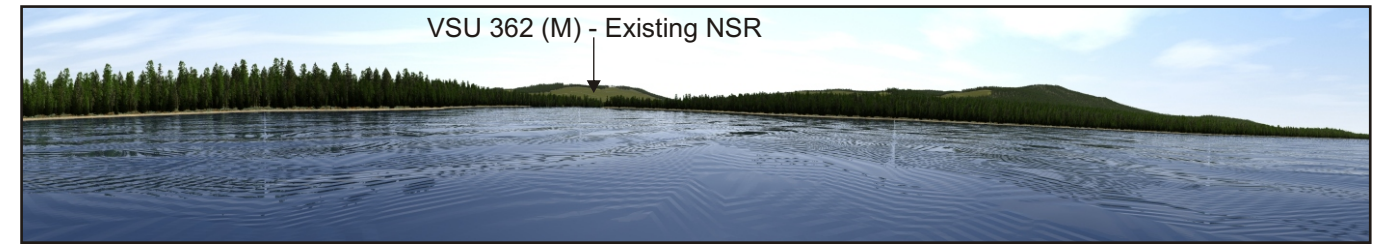
Phase 3



Phase 4



Full Rotation IVD - Bare Land



Phase 1



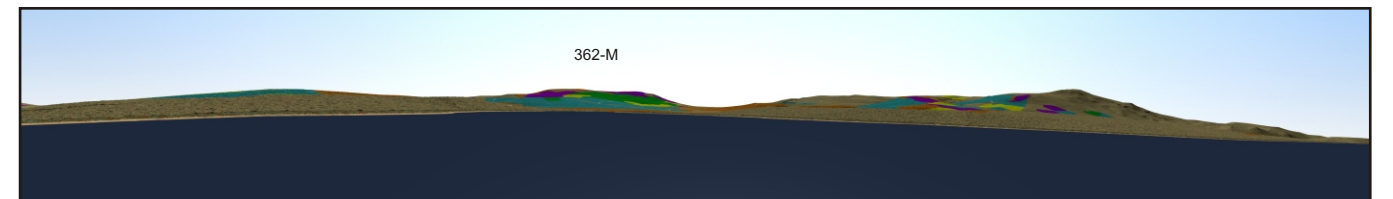
Phase 2



Phase 3



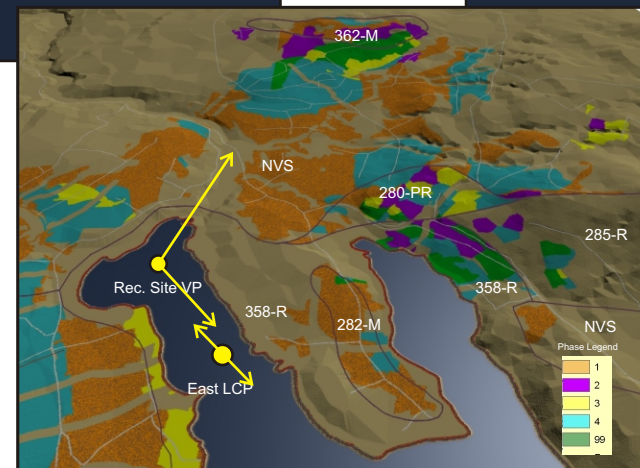
Phase 4



Full Rotation IVD - Bare Land

East LCP to VSU 358 Visual Estimate/Achieved Design Definition:

- P1 - R
- P2 - R
- P3 - R
- P4 - R



Recreation Site VP to VSU 362 Visual Estimate/Achieved Design Definition:

- P1 - M (existing NSR)
- P2 - M
- P3 - PR
- P4 - M

Photos - Jaret van der Giessen 2001



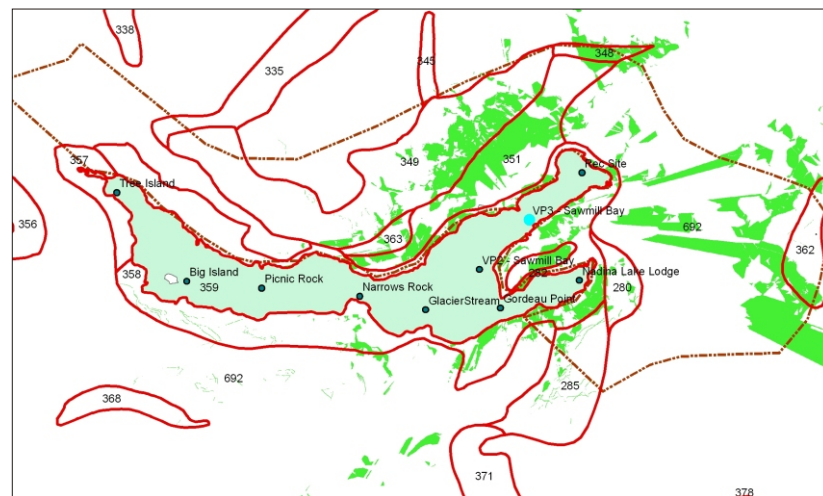
Viewpoint 2



East Viewpoint (Viewpoint 3)



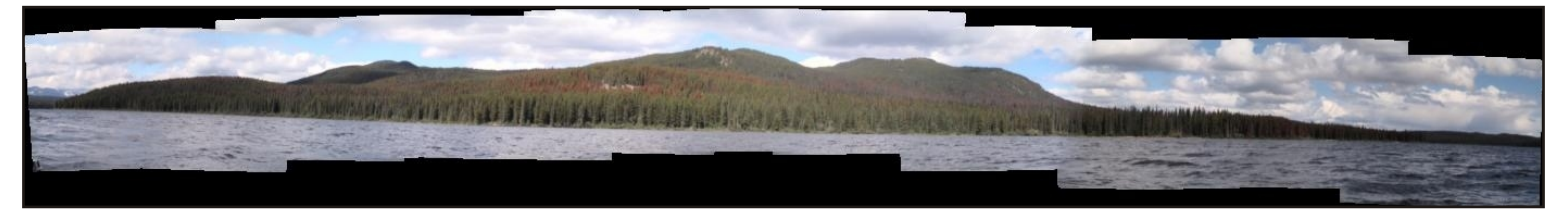
Recreation Site Sawmill Bay (HFP Viewpoint 4)



Photos - KB Fairhurst, August 8, 2006



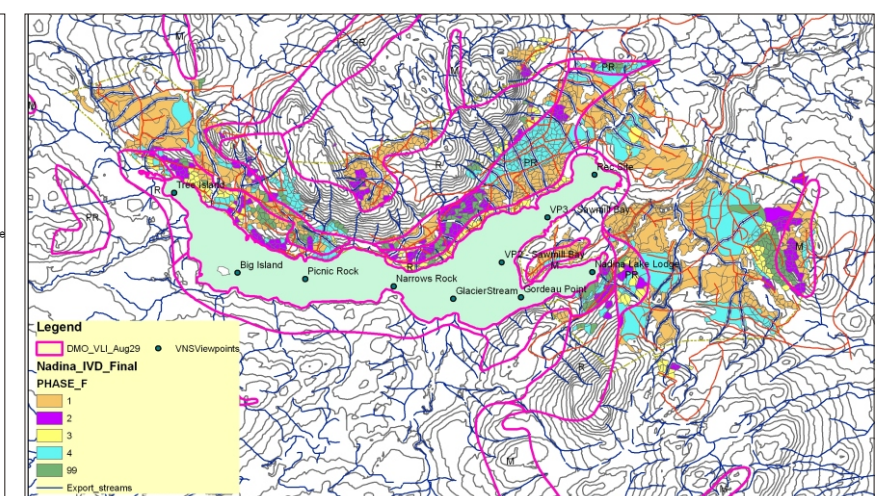
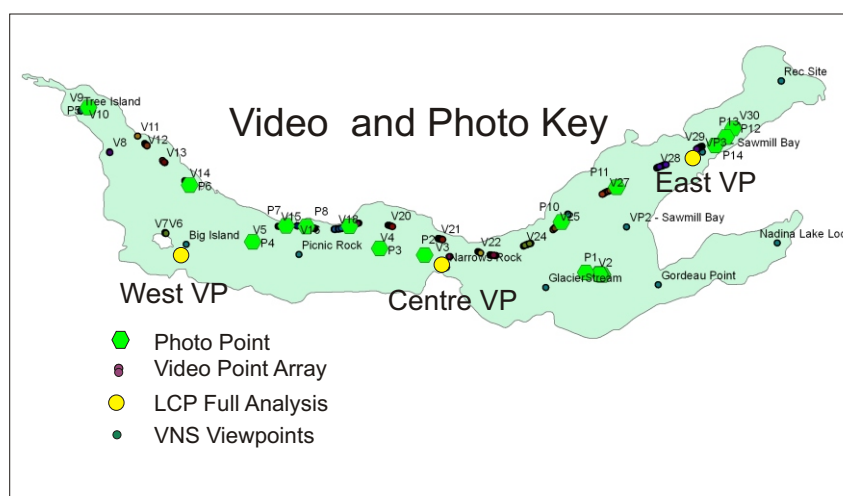
East Viewpoint (VP3)



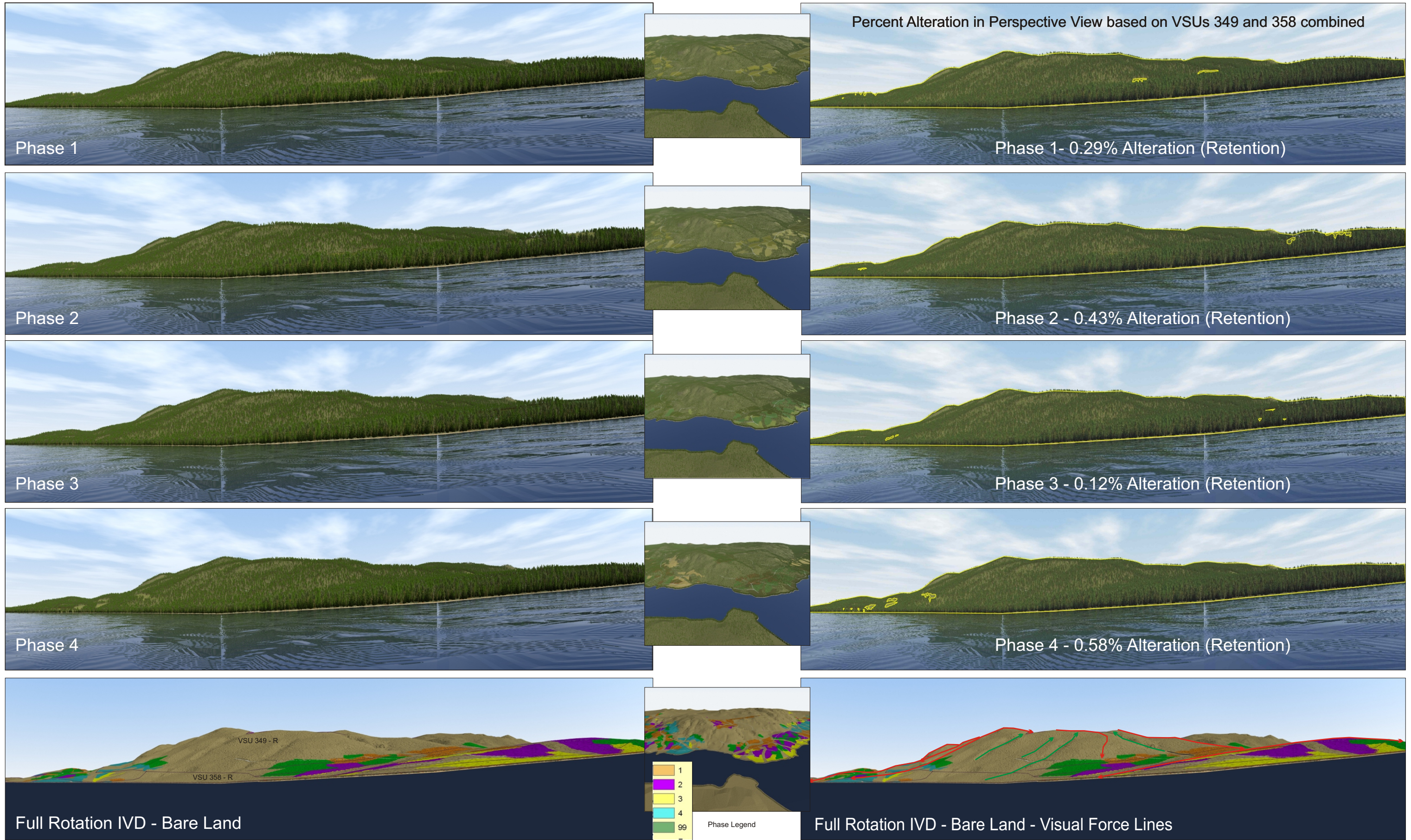
P11



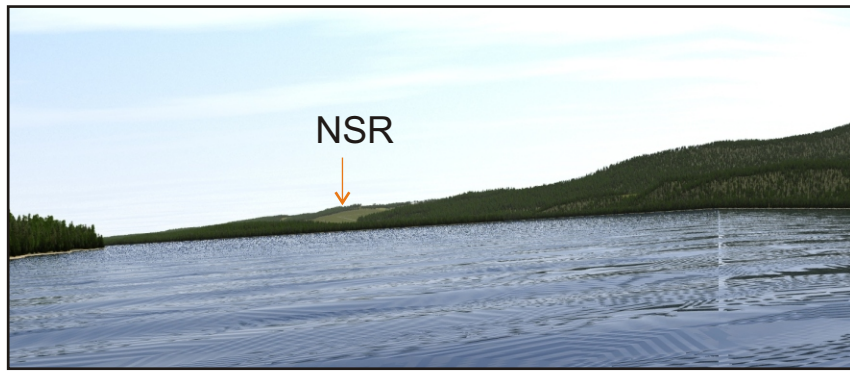
P12



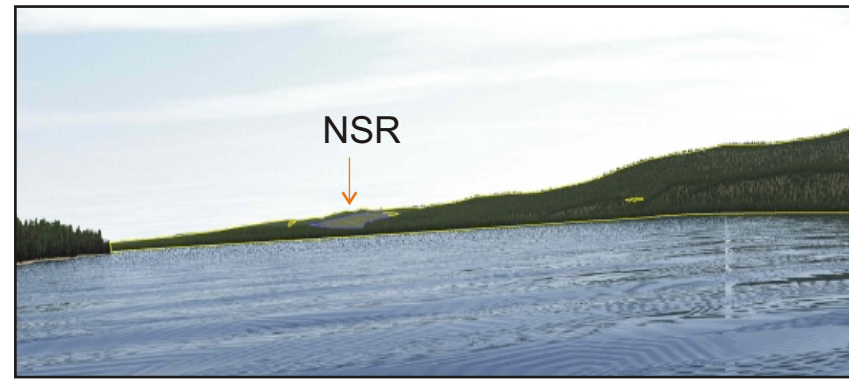
Aerial Views - Centre Section



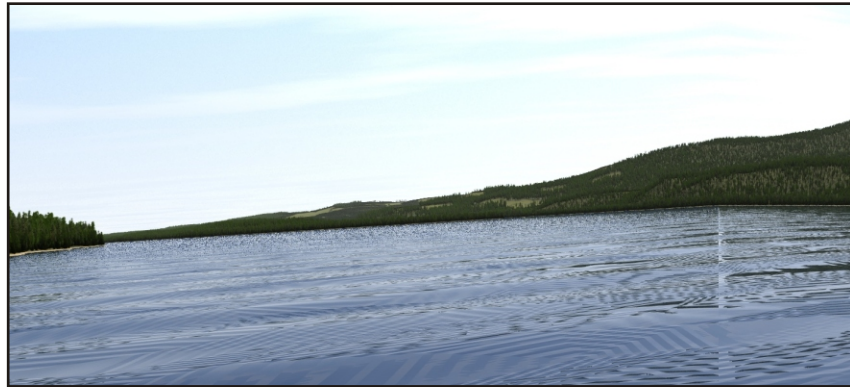
Centre LCP Average % Alteration P1-P4 = 0.35% (Retention)
8.



P1



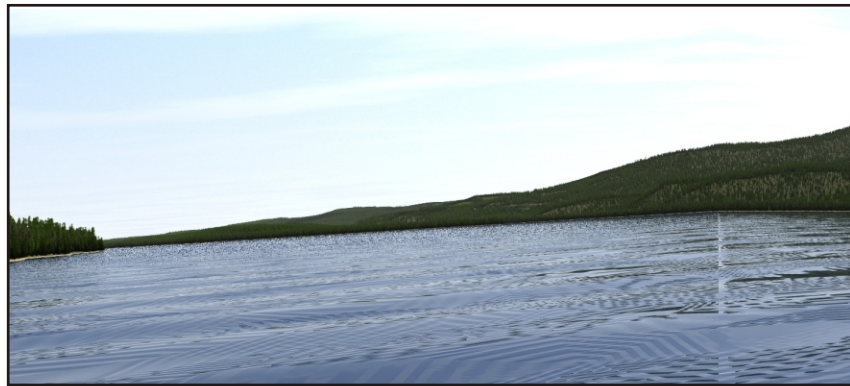
P1 - % Alteration = 0.24% (Retention); NSR - 1.96%; Total 2.2%



P2



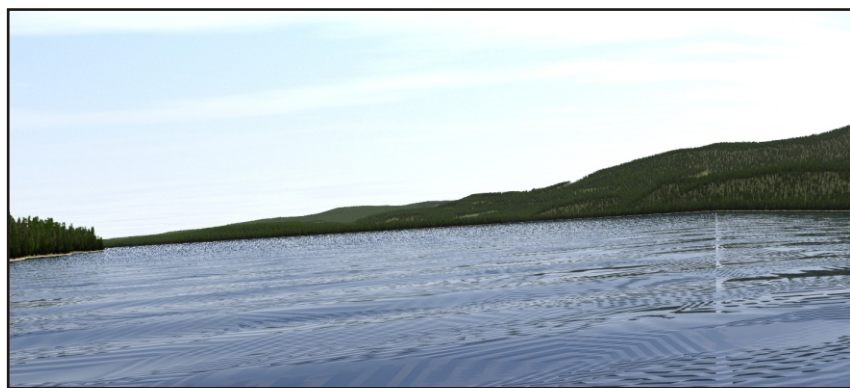
P2 - % Alteration = 2.6% (Partial Retention)



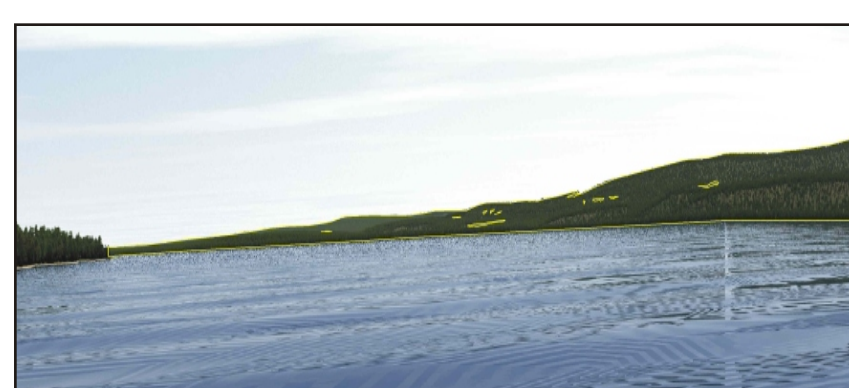
P3



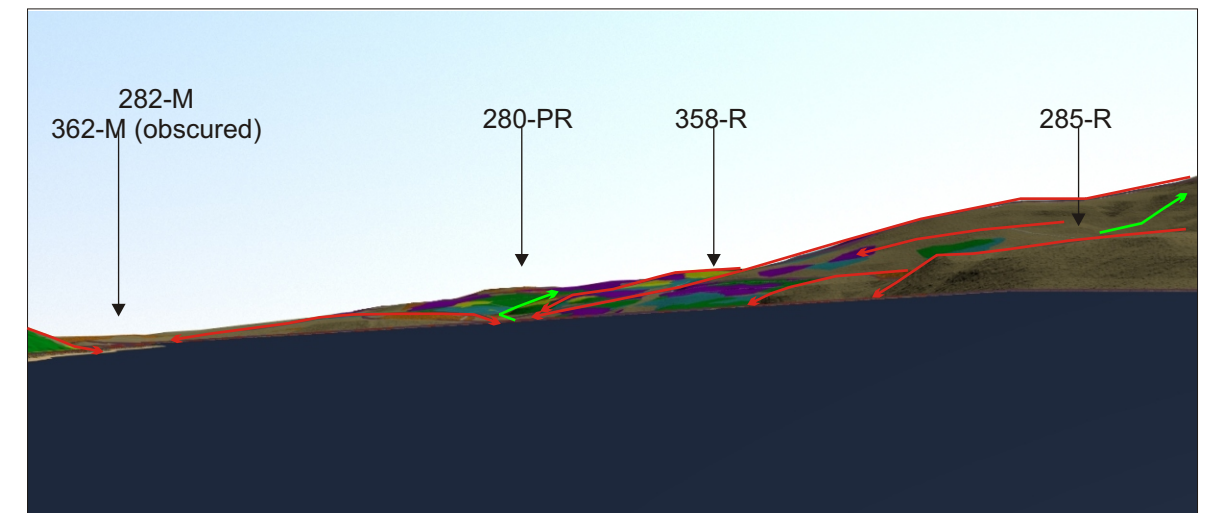
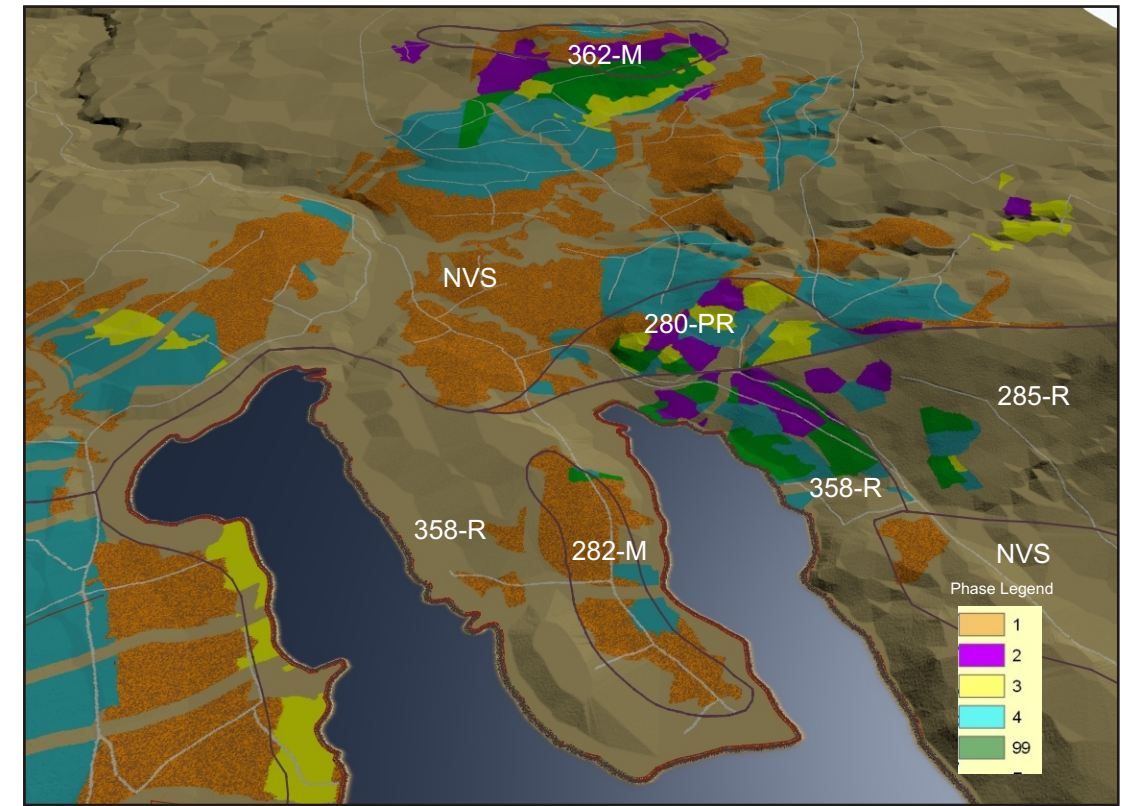
P3 - % Alteration = 0.25% (Retention)



P4



P4 - % Alteration = 0.57% (Retention)



Percent Alteration in Perspective View based on VSUs 280, 285, and 358 combined

Average % Alteration P1-P4 = 0.92% (Retention)

Photos - Jaret van der Giessen 2001



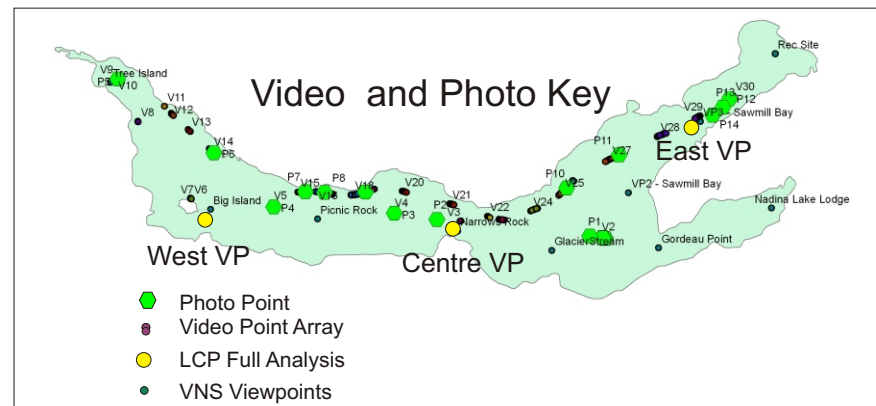
Glacier Creek (HFP Viewpoint 6)



Centre Viewpoint (Narrows Rock) HFP Viewpoint 7



HFP Viewpoint 1 (Fishing Hole)



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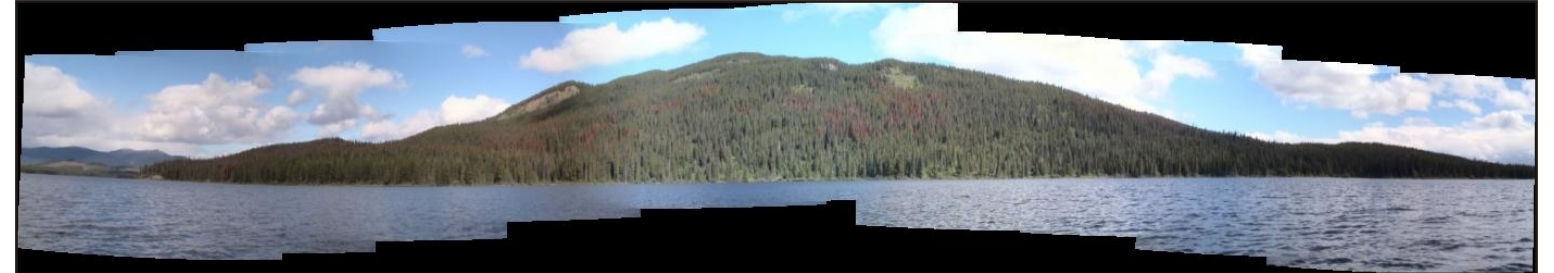
Photos - KB Fairhurst, August 8, 2006



P1



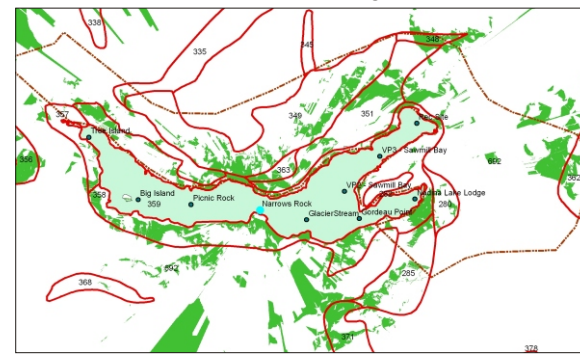
P2



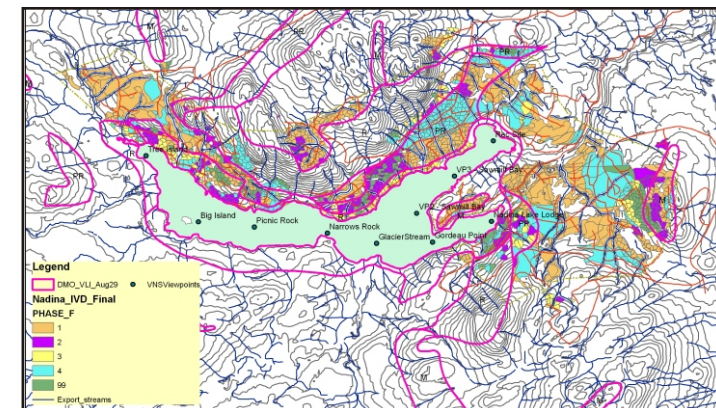
P3



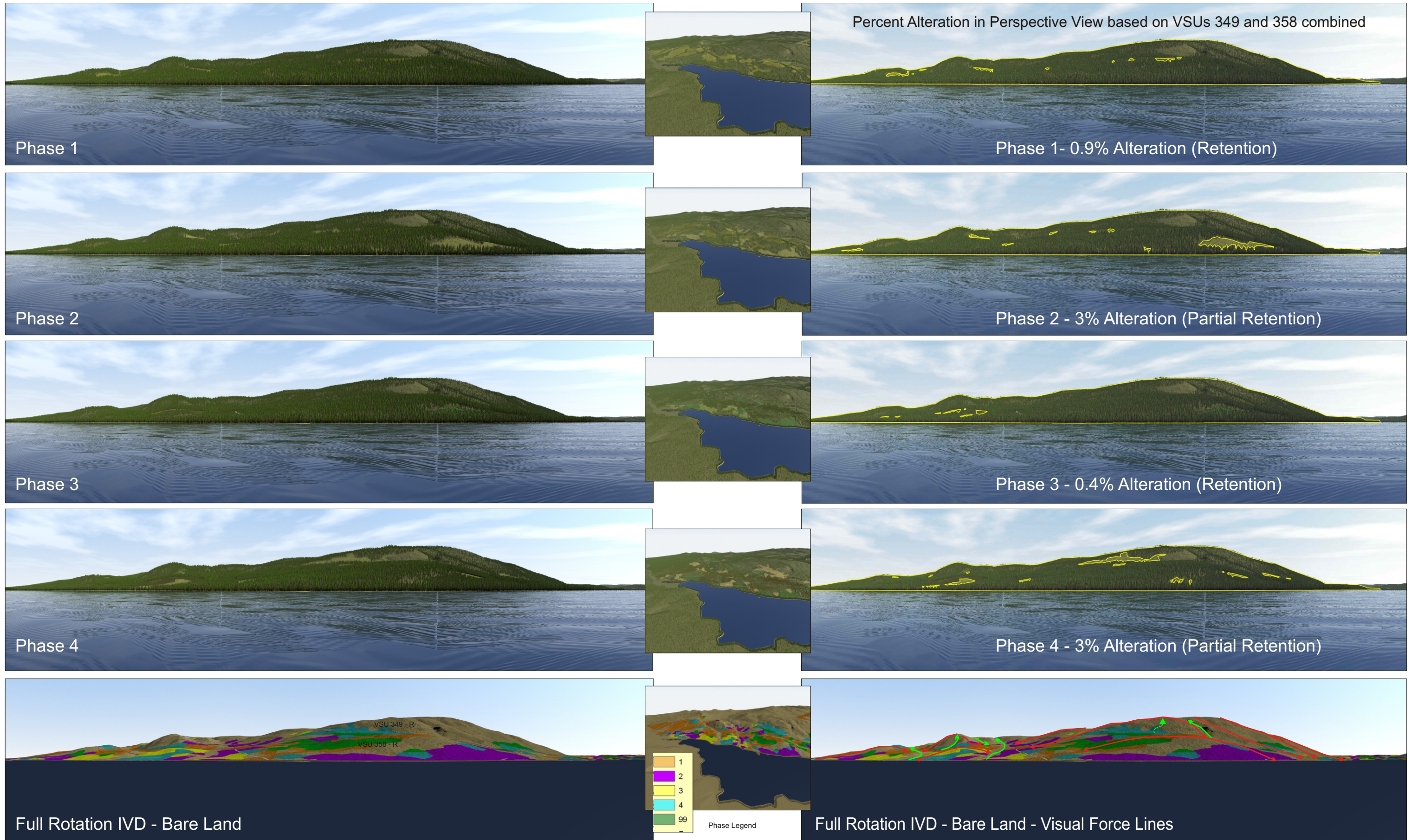
P10



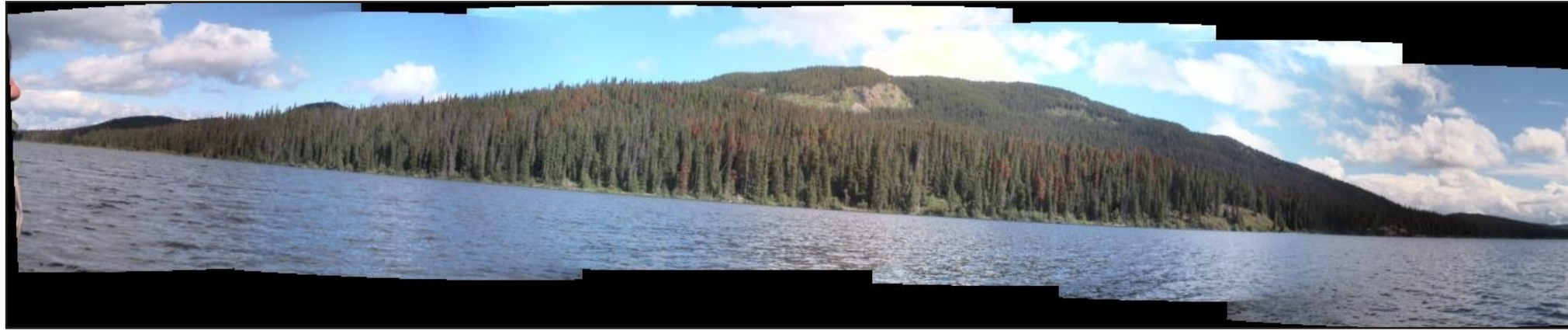
Centre Viewshed (Narrows Rock), adjusted for Forest Cover
Nadina Lake Integrated Visual Design Plan
Centre Area Photography and Video Key



Aerial Views - West Section



West LCP Average % Alteration P1-P4 = 1.82% (Partial Retention)



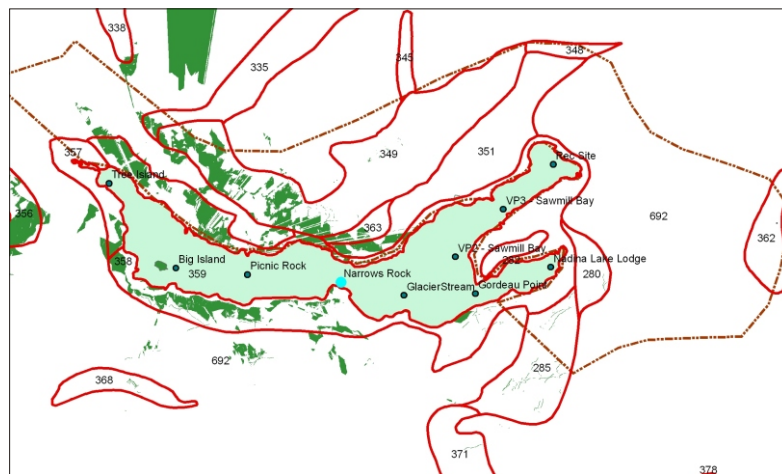
P4



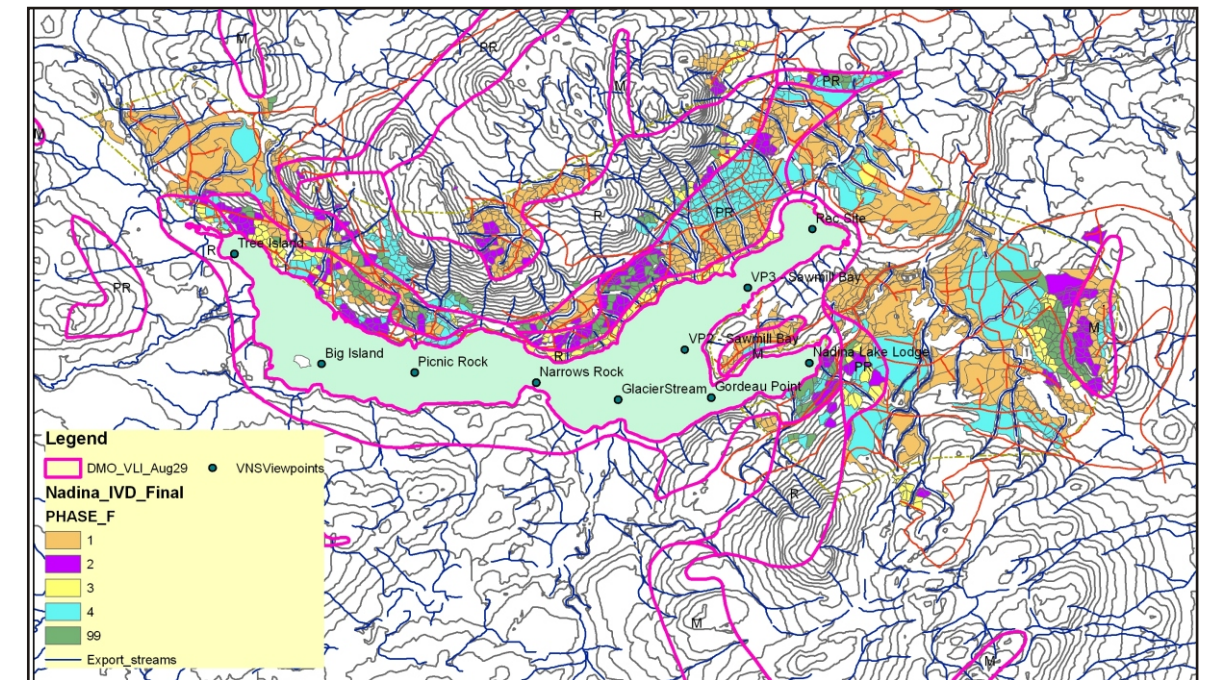
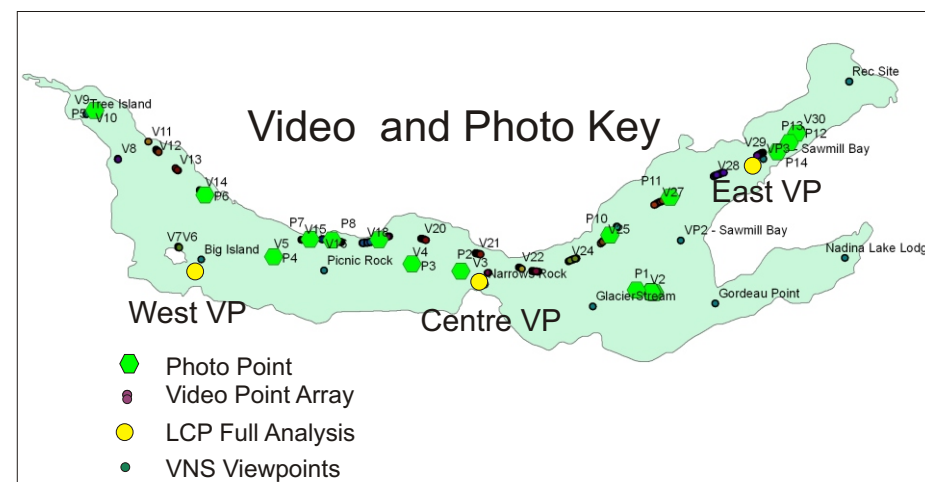
P5



P10



West Viewshed (Big Island), adjusted for Forest Cover



6. Visual Impact Assessment

The plan was assessed using the analysis format provided in a standard MOFR Visual Impact Assessment:

1. ASSESSING BASIC VQO DEFINITION

Describe the level of impact that the proposed alteration, in combination with any existing non-VEG alterations, will have on the landscape from each viewpoint, using one of the following terms: Not visible (P), Not visually evident (R), Subordinate (PR), Dominant (M), Out of scale (MM)	<u>East LCP</u>	<u>Centre CP</u>	<u>West LCP</u>
	P1 – R	P1 – R	P1 – R-PR
	P2 –PR	P2 – R-PR	P2 – PR-M
	P3 – R	P3 – R	P3 – R
	P4 – PR	P4 – R-PR	P4 – PR
Which basic VQO definition would the proposed alteration, in combination with any existing non-VEG alterations, meet from all the selected viewpoints and taking into account viewpoint importance, viewing distance and viewing duration? P ___ R ___ PR ___ M ___ MM ___ (see results by LCP, above).	<u>Rec. Site</u> (VSU 358)	<u>Gordeau Bay</u> VSUs	
	P1 – R	P1 – R	
	P2 – R	P2 – PR-M	
	P3 – R	P3 – R	
	P4 – R	P4 – R-PR	

Which basic VQO definition would the proposed alteration, in combination with any existing non-VEG alterations, meet from all the selected viewpoints and taking into account viewpoint importance, viewing distance and viewing duration? P ___ R ___ PR ___ M ___ MM ___ (see results by LCP, above).

If applicable, state reasons why the proposed alteration(s) does not achieve the basic definition of the established VQO from any of the selected viewpoints. (VQO achievement by phase is also mentioned for consistency).

East LCP

Phase 1 is R. The flats on the north side of Sawmill Bay currently have greened-up alteration and a PR VQO (VSU 351).
 Phase 2 introduces some visually subordinate, horizontally elongated openings that achieve PR.
 Phase 3 has some openings that are visually subordinate but overall meets R.
 Phase 4, VSU 349 (VQO: R) has a somewhat large opening on the steep face that exceeds R. (achieves PR). The unit is in proposed Goat winter range and may or may not be excluded.
 Phase 4, VSU 348 (VQO: PR) has several openings which exceeds PR (achieves M). VSU is small and isolated, but seen as part of broader scene which meets PR.

East - Recreation Site (to cover VSU 358)

Phases 1-4 meet R.

Centre LCP

Phase 1 is fully R.
 Phase 2 introduces some visually subordinate, shorezone hilltop openings in east side of the view that achieve PR but overall meets R.
 Phase 3 is fully R.
 Phase 4 introduces some visually subordinate, shorezone openings in west side of the view that achieve PR while working well with the lines of force. Overall meets R.

Centre LCP – East – Gordeau Bay (VSUs 280 – PR, 285 – R, 358 – R)

Phase 1 has past alteration on upper slopes, new is R.
 Phase 2 introduces somewhat visually dominant alteration in east side of the view (M), but achieves PR more broadly. VSU 280, in isolation, somewhat exceeds PR in Phase 2, though the overall scene meets R.
 Phase 3 is R.
 Phase 4 introduces some visually subordinate, shorezone openings in west side of the view

East - Recreation Site (to cover VSU 358)

Phases 1-4 meet R.

Centre LCP

Phase 1 is fully R.
 Phase 2 introduces some visually subordinate, shorezone hilltop openings in east side of the view that achieve PR but overall meets R.
 Phase 3 is fully R.
 Phase 4 introduces some visually subordinate, shorezone openings in west side of the view that achieve PR while working well with the lines of force. Overall meets R.

Centre LCP – East – Gordeau Bay (VSUs 280 – PR, 285 – R, 358 – R)

Phase 1 has past alteration on upper slopes, new is R.
 Phase 2 introduces somewhat visually dominant alteration in east side of the view (M), but achieves PR more broadly. VSU 280, in isolation, somewhat exceeds PR in Phase 2, though the overall scene meets R.
 Phase 3 is R.
 Phase 4 introduces some visually subordinate, shorezone openings in west side of the view that achieve PR while working well with the lines of force. Overall meets R.

West LCP

Phase 1 is R overall, with a few well-designed and distributed openings that may appear as PR.
 Phase 2 introduces a dominant opening on the right-hand side, somewhat emulating natural openings above (see photos), and working with lines of force, achieving M in that portion and PR broadly.
 Phase 3 is fully R.
 Phase 4 has upper opening in the centre, and smaller, lower openings left and right that meet PR. Upper opening ties in to rock outcrop and has good design, all follow force lines.

2. ASSESSING VISUAL DESIGN

Have major lines of force been identified and used to develop the size and shape of the proposed operation? (If Yes, attach visual force analysis to this form.)	Yes X No
Has the proposed operation borrowed from the natural character of the landscape? Rock outcrops are emulated with openings more vertically oriented to meet force lines, including Phase 4. Openings in lowlands have more horizontal orientation to meet force lines.	Yes X No
Have edge treatments been incorporated into the design of the proposed operation (feathered edges, irregular cutblock design, etc.)? Shorezone buffer provides substantial screening; irregular design and intervening screening is effective in mitigating most visual exposure.	Yes X No
Have "islands," or patches of trees, been maintained to mitigate visual impacts and other resource management objectives? Riparian Management Areas contribute to impact mitigation but are subject to field review. The silvicultural prescription will require clear-cut removal of beetle-killed timber. Site-specific leave areas may be determined during field layout.	Yes X No
Are there any existing human-made alterations visible in the unit that exhibit poor design? If Yes, describe design deficiencies below: Phase 1 has a long horizontal existing opening is regenerating, and has a strongly evident forest edge.	Yes X No
If applicable, list any additional design techniques used and/or state reasons why certain design techniques could not be employed. The application of variable retention within blocks was not considered due to silvicultural requirements.	

Results

The Integrated Visual Design covered all VSUs along the north and east sides of Nadina Lake within the Scenic Area. Defined during the Landscape Inventory process, VSUs are often not distinct but are seen together as one "scene" by the average viewer. For analysis purposes, the VSUs were considered in their scene grouping, from each of the 3 LCPs as shown in Table 1.

Scene summary, by VSU

VSU	West LCP Scene	Centre LCP Scene	East LCP Scene
358 (R) - shorezone around most of Nadina Lake	X	X	X
349 (R) - main north hill	X	X	X
351 (PR) - north-east flats in Sawmill Bay			X
348 (PR) - small north-east hill in Sawmill Bay			X
282 (M) - knoll on Gordeau Bay peninsula			X
280 (PR) - south-east portion of south hill, Gordeau Bay		X	
285 (R) - south hill, Gordeau Bay		X	
362 (M) - far East hill			X*
363 (NVS) - area below 349, not visually sensitive	X	X	
692 (NVS) - area below 349 and all other NVS	X		X
Scene VQO (estimated by RDI)	R	R	R

* Recreation Site Viewpoint used, not included in the scene summary

Percent Alteration in perspective view was determined for each scene from each of the 3 main LCPs to see if it meets the VQO for that measure. The outlines of each scene and each opening used to determine percent alteration were digitized in Didger and portrayed for each LCP on the graphics page for that LCP.

ase	East LCP	Centre LCP	Centre LCP- Gordeau Bay	West LCP	Average All LCPs
1	0.1% - R	0.3% - R	0.24 - R	0.9% - R	0.4% - R
2	1.1% - R	0.4% - R	2.6 - PR [±]	3.0% - PR [±]	1.8% - R-PR [±]
3	0.6% - R	0.1% - R	0.25 - R	0.4% - R	0.3% - R
4	1.6% - PR [±]	0.6% - R	0.57% - R	3.0% - PR [±]	1.4% - R
Average	0.85% - R	0.35% - R	0.92% - R	1.82% - PR[±]	1.0% - R

[±] indicates VQO Exceeded (R = 0% - 1½%, PR = >1½% - 7%, M = > 7% to 18%)

East LCP

The PVC achieves the VQO in Phases 1-3 as seen from East LCP, looking north. Alteration in Phase 4 is partly concentrated in VSU 348 which has a VQO of PR. The VQO is exceeded in that VSU and slightly exceeded in the overall scene (by 0.1%).

Centre LCP

The PVC (PR) achieves the VQO in all phases as seen from East LCP, looking north. The PVC (PR) exceeds the VQO in Phase 2 (by 1.1%) as seen from the Centre LCP, looking south-east towards the landscape south of Gordeau Bay. In isolation, VSU 280 likely exceeds its VQO of PR. The VQO is met in all phases progressing further towards, and into, Gordeau Bay.

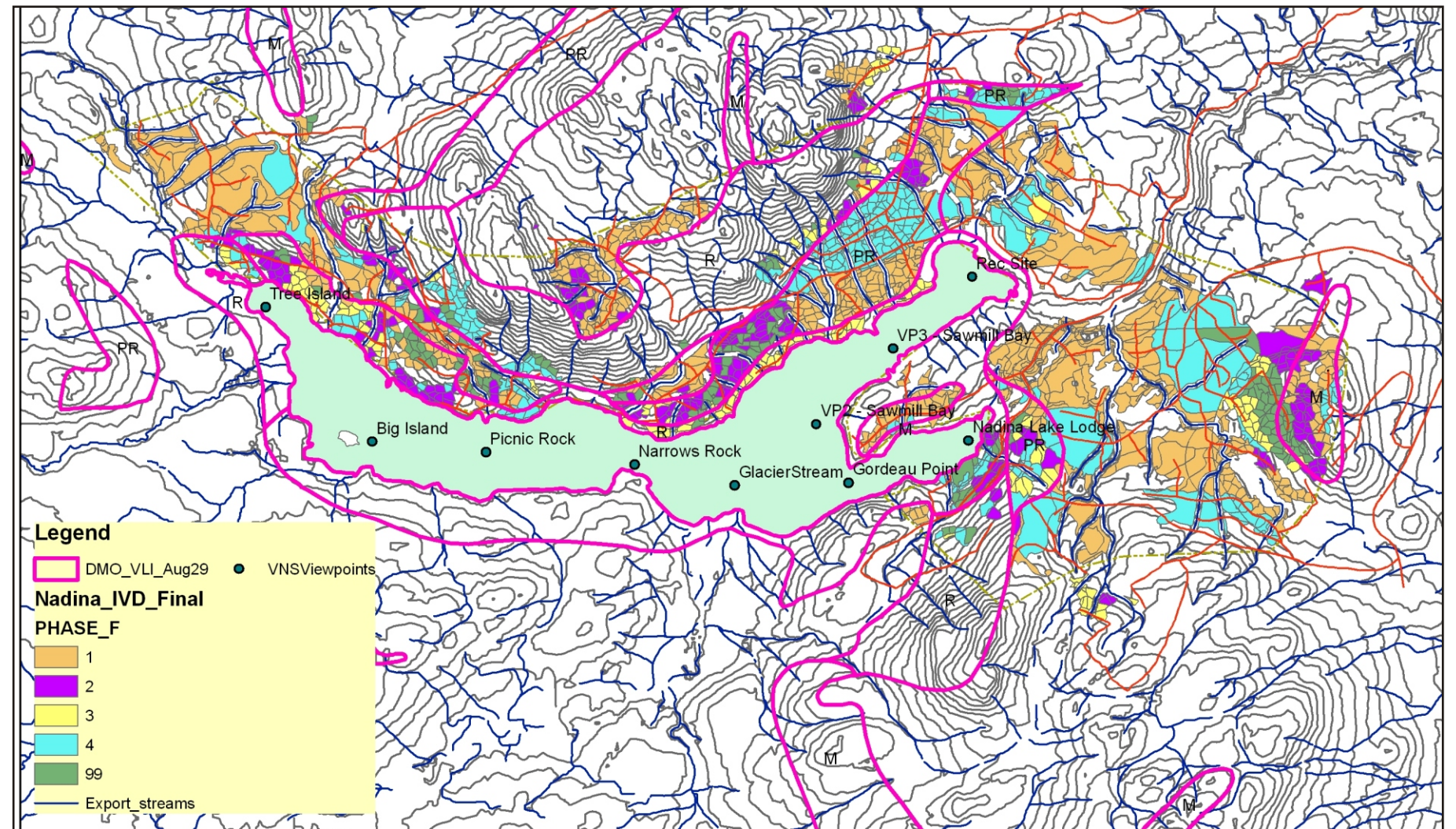
West LCP

The PVC (PR) exceeds the VQO (R) as seen from the West LCP in Phases 2 and 4 (by 1.5% in each phase). Averaging across phases brings the percent alteration to Partial Retention (1.82% which is 0.32% above that which is permitted for the Retention VQO).

Averaging PVCs across LCPs and across phases, the established VQOs are expected to be met throughout the full rotation plan. The Integrated Visual Design will allow access to a significant volume of timber that is being impacted by the bark beetle while maintaining the visual quality that is highly valued.

IVD Plan Summary Table

Phase	Units	Area (ha.)	Volume (m3)
1	893	1005	265,632
2	311	215	56,737
3	195	159	44,606
4	369	526	174,770
99	176	146	43,079
Total	1944	2051	584,824



Limitations of the Plan

The limitations of the data and visualization methods that may have over- or under-estimated the visibility of landscape change over the course of the plan must be acknowledged when making these predictions. These include:

- 1. Variations in terrain** not present in the 20m terrain (TRIM) data.
- 2. Variations in the screening capacity** afforded by overstory tree height and density and understory foliage density, in particular the shoreline buffer.
- 3. Variations in through-tree transparency/opacity** in the VNS model relative to the actual transparency/opacity. The needle-drop and mortality expected from beetle invasion will definitely change through tree visibility and therefore will have a potential impact on visual quality. This effect was not tested in the visualization and analysis.
- 4. Variations in Riparian Management Areas (RMAs).** Stream RMAs were rendered as 30m reserves. The shoreline RMA was rendered as a 20m reserve. These buffers may be adjusted or removed as appropriate to new information determined in field assessment. Variations brought about through modification of buffer widths on both the lake and streams due to site-specific conditions will have a potential impact on visual quality. The screening capacity of buffers, where kept, is subject to change with conditions, such as beetle infestation.
- 5. Variations in proposed Mountain Goat winter range.** There are 33 hectares of units within the proposed Mountain Goat winter range. Depending on final management objectives that are yet to be derived, these areas may become unavailable and therefore visible alteration would be less in some views.
- 6. Variations in operational design** in recognition of site-specific conditions, and environmental and social considerations.
- 7. Variations in Visually Effective Green-up (VEG).** Phases rely on achievement of VEG before proceeding to the next phase if the allowable alteration has already met the VQO. The plan assumes 5-7m regrowth between phases. Phases are not assumed to be scheduled equally by year. VEG achievement will be most likely if operations occur early in the phase to allow for maximum VEG to be achieved before entering the next phase. Green-up rates will vary depending on site conditions.
- 8. Variations in viewing opportunities along the lake.** The lake offers nearly infinite viewing opportunities while boating along the lake. The minimum of three main LCPs were fully portrayed per contract specifications. The main LCPs, spanning 6 km of the 8 km lake, with a 3 km interval, provided coverage of the entire Scenic Area except VSU 358. A fourth, supplementary LCP, the Recreation Site viewpoint, was partially rendered to cover VSU 358. The Recreation Site LCP and six other supplementary LCPs were determined by RDI to provide additional information about the appearance of the plan, affording assessment at approximately 1km intervals along the lake from its 2 eastern extremities to its western end, in conjunction with the main LCPs. These LCPs were spot-checked using a roving virtual (non-saving) "preview" camera in VNS set at each of these points when preparing the core plan. The spot-check procedure was useful for identifying and correcting individual problem elements in the plan, but did not provide full analysis, nor did it provide documented, full assurance of the predicted visual quality from those LCPs. Formal renderings and analyses are recommended for these LCPs as a follow-up project. The supplementary water-based LCPs are:
 - Recreation Site (south-east view already provided)
 - VP 2 Sawmill Bay
 - Picnic Rock
 - Tree Island
 - Glacier Stream
 - Gordeau Point (peninsula point)
 - Nadina Lake Lodge (offshore)
- 9. Variations in Visual Quality Objectives** over the course of the plan. The Morice LRMP (2004) identified the Nadina Lake landscape for an immediate (2006) Visual Landscape Inventory update. There was no update made known, if it was available, at the time of plan preparation. The new inventory may generate different VQOs for the area which could change the level of intensity accepted for development. Changing social sensitivity is likely to influence VQOs over the lengthy period covered by the plan, with expectations, recreational use pressure, and the effects of beetle infestation, including fire hazard, contributing to that influence.
- 10. Variations in actual visual impacts.** Considering all of the above, it is important that visual quality achievement be monitored as operations progress, and adjustments be made to the plan as deemed necessary to meet the visual quality objectives.

8. Conclusions

Although the 2004 Morice Land and Resource Management Plan (LRMP) stipulated that no more than 4% of the viewshed may be altered as seen from the lake, the established VQOs, on average, were more restrictive in the Scenic Area. The Retention VQO was generally strived for throughout the plan. Visualization predictions indicate, when averaged across all phases and from all LCPs, that Retention can largely be achieved. Within the expressed limitations, the plan variously, but only slightly, exceeds the broadly set, most restrictive VQOs in each LCP scene, and is at all times within, and generally well within, the stated LRMP limit of 4% for visible alteration as seen from each broad scene from each LCP. Further analysis and documentation from the seven supplementary LCPs would enhance the assurance of the plan's predicted achievement of visual quality. The Integrated Visual Design plan will allow access to a significant volume of timber that is being impacted by the bark beetle while largely maintaining the highly valued visual quality of Nadina Lake.

The project provided the opportunity to test Ken Fairhurst's GEOptics apperency model that was developed for his Ph.D. dissertation. The GEOptics rating was attached as an attribute to each IVD potential development cell as an indicator of cumulative visual risk from all areas of Nadina Lake. The ratings were very helpful when setting the phasing schedules, and should provide on-going guidance to HFP when planning harvesting operations and when updating the IVD plan. Forest Investment Account funding of this project and HFPs authorization of use of the Nadina Lake data for university research is greatly appreciated. In response, a considerably higher level of effort was taken by RDI in the preparation and presentation of the plan, including the addition of GEOptics apperency as a planning tool that went beyond the standard methods of integrated visual design planning.

Important insights into visual sensitivities of Nadina Lake users regarding the visual quality of the landscape and practical forest management issues affecting the Nadina Lake landscape were gained during the field visit to Nadina Lake, through discussions with Jaret van der Giessen and with the lodge owners who also presented a map of key features and viewpoints on and around the lake. It is sincerely hoped that the IVD plan will be seen to have responded at least adequately and perhaps fully to the issues and values raised in those discussions over both the short- and longer-term.

The Nadina Lake Integrated Visual Design plan report and the graphics are presently downloadable as shown below.

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The Nadina Lake IVD Report and Image Documents are presently available at:
<ftp://rdiftp.1rdi.com:rdiftp@ftp.1rdi.com/WestFraser/RDI-NadinaIVD-070221-Images.pdf>
<ftp://rdiftp.1rdi.com:rdiftp@ftp.1rdi.com/WestFraser/RDI-NadinaIVD-070221-Report.pdf>