A Visual Resource Management Study of Alternative Dams, Reservoirs and Highway and Transmission Line Corridors near Copper Creek, Washington[1]

John Ady, Brian A. Gray and Grant R. Jones[2]

Abstract: Three alternative dams have been considered by Seattle City Light for the Skagit River Narrows in the North Cascades National Recreation Area, Washington. The authors assessed the area's existing visual resources, identified three alternative highway and transmission line realignments, evaluated changes in visual character and quality for 13 different combinations of reservoirs, roads and powerlines, and recommended alternatives and mitigation opportunities. These combinations were simulated on "before" and "after" oblique aerial color photographs which facilitated visual impact evaluation. The loss of visual quality after development was generally small in comparison to the dramatic change in visual character. The study proved valuable for presenting impacts credibly to both client and public groups. It also demonstrated the parity of visual assessment with other assessments.

INTRODUCTION

Effective visual resource management involves three distinct realms: 1) a landscape setting, 2) viewers of that landscape, and 3) the planning process. The visual resource manager must function well within each realm; in such a central position, he[3] has a special responsibility and opportunity to move between realms and serve on behalf of all.

First of all, the visual resource manager must know the landscape setting: familiarity with its geology, climate, physiography, soils, water forms, vegetation, wildlife, settlement patterns, historic development, land use activities and future trends is a prerequisite to a true understanding of the natural and cultural processes which give form to the landscape (McHarg 1969; Jones 1973 and Spring 1975). To this knowledge he must add an objective assessment of the visual character and quality of the setting, the relative uniqueness or scarcity of its resources within a local, regional and national context, and the setting's ability to absorb visually various types of land use patterns over time. Since the landscape setting is not vocal (a disadvantage in dealing with the other two realms), the visual resource manager must know the landscape intimately and serve as its representative, speaking for it and intervening in its behalf. The manager must be able to determine and document pertinent quantitative and qualitative information about the landscape setting: for example, what is unique about a particular setting, what is similar and held in common with other settings, and the significance of any uniqueness within a larger context.

Secondly, the visual resource manager must become familiar with the viewers who frequent a particular landscape setting. He must know its actual visibility to them, including frequency and duration of view. He must also know viewer positions within the setting, their numbers, movement patterns, activities, and

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[2] Associates and Partner, Jones & Jones, Seattle, Washington.

[3]The word "he" is used to refer to the visual resource manager, regardless of gender.

expectations of visual quality and character in the landscape. He must be able to identify groups of viewers, and their likely sensitivity to a proposed alteration on the basis of this information. He must know how to communicate the actual appearance of an alteration to the viewers, and how to elicit meaningful responses from them so that he can make recommendations about a proposed action in a way that best represents actual viewers' interest and concerns.

Thirdly, the visual resource manager must understand the planning process, comprehend all the visual ramifications of a particular project and be able to simulate its appearance accurately from key viewpoints. Even if personally opposed to one or more alternatives, the visual resource manager must often play the role of advisor or even designer, clarifying or giving intelligent form to a project so that visual impacts are properly depicted and assessed. He must therefore be creatively active within the planning process, knowing project requirements and offering visual resource management guidelines from which reasonable alternatives can be developed and mitigating measures determined. He must be able to communicate with clients, other planners, government agencies, and the public.

Then, the visual resource manager will be capable of integrating all three realms - landscape setting, viewer concerns and planning process - in a meaningful way. In 1978, the authors received the opportunity to play such a role as subconsultants to CH2M Hill, in order to assess the potential visual impacts of Seattle City Light's proposed hydroelectric dam on the Skagit River near Copper Creek. Jones & Jones assessed the visual resources of the landscape setting in its regional context, determined environmental and functional guidelines and actually generated highway and transmission realignment alternatives. They also presented simulated views of these alternatives to planners and clients, conducted limited workshops, and evaluated the types and degrees of visual impact for each alternative. Finally, they were able to suggest mitigating options and made recommendations based on visual impact concerns.

This undertaking is documented in the technical report on the Scenic Environment in the Copper Creek Environmental Assessment (Ady 1979). Following procedures similar to those presented in the FHWA "Esthetics and Visual Resource Management for Highways" course (Jones and Jones 1978), this study illustrates the application of this method for highway location and its transfer to dams, reservoirs and transmission lines. It assumes that the visual quality of landscapes before and after change can be evaluated and compared by professionals using explicit criteria to reduce preferential bias and to anticipate ratings by the general public. These evaluations are modified by the relative scarcity of the resources and the numbers, exposure and sensitivity of the viewers.

EXISTING VISUAL CONDITIONS

The Skagit River Valley in northwestern Washington is remarkable for its variety of largely unspoiled landscapes from mountain passes to delta and the clarity of their relationships, all visually accessible to cross-state travelers. The Skagit Narrows runs southwest for 9½ miles from Newhalem Village to the boundary of Ross Lake National Recreation Area, a transitional gateway between the rugged mountainous upland and the open pastoral valley downstream.

Spatially, the valley is a lowland floor lying between steep forested walls, combining intimate riverside diversity with grandeur of scale. The Narrows reach contains three runs based on major spatial subdivisions: Upper Narrows, Central Narrows and Lower Narrows. Within these are six visually distinct landscape units or "rooms" (see figure 1).

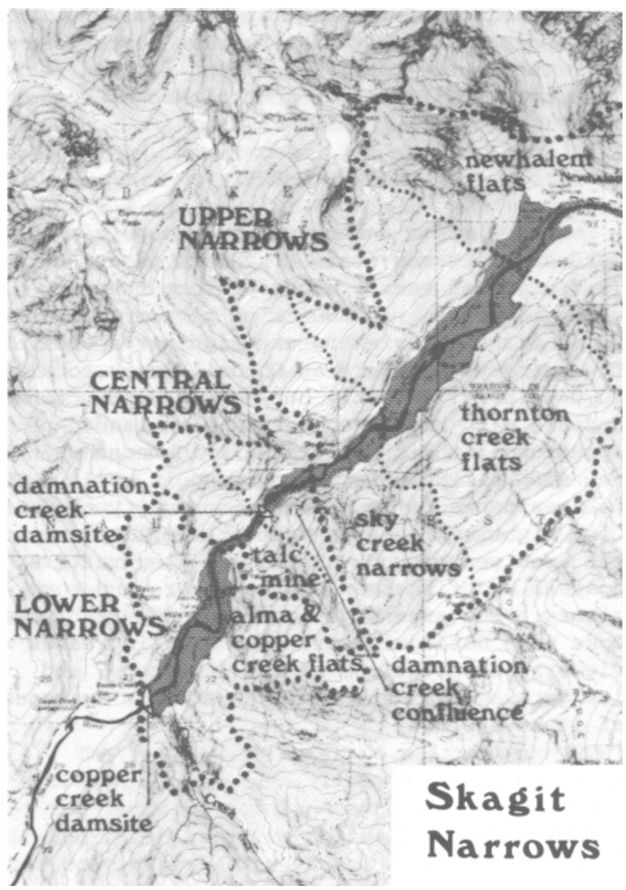


Figure 1--*Dam locations and landscape units.*

The main landforms within the valley include floodplain (which would be inundated by a reservoir), river terraces, small alluvial fans, and steep valley walls, with a discontinuous shoulder on the north wall. The floor of the Narrows drops 130 feet in ten miles, which creates the last remaining white-water on the Skagit. The diversity of channels and shorelines is high; there are many small mountainside streams and 30 acres of gravel-pit ponds. A rich mixed lowland forest covers the valley floor, with a dense coniferous forest clothing the valley walls. Manmade development is not extensive except for the dominant highway and powerlines.

LANDSCAPE VISUAL SIGNIFICANCE

The project area is unique: a) in being within Ross Lake National Recreation Area, b) in containing the only major free-flowing river within the North Cascades National Park Complex, including the last rapids on the Skagit, and c) in its character of narrow lowland valley floor fingering deeply into the mountains. Regionally, the Narrows Reach is comparable to certain reaches of five other major rivers in similar valleys in the northwest Cascades. Of these, the Skagit River has the largest drainage basin and highest stream flow, making it the largest river of its kind in northwestern Washington. Locally, the Narrows reach is an important entry corridor, mixing lowland recreation opportunities with mountain-related uses.

VIEWER GROUPS

Three major and two minor groups view this landscape. Cross-state travelers along Route 20 (a designated scenic highway) form the largest group, averaging 38,580 trips per month in 1976. These transient viewers are highly responsive to the scenery. Campers at Goodell Creek totalled 10,046 in 1977, mostly between May and October, and are also highly concerned with landscape appearance; their numbers will increase when the new 436-unit Newhalem campground is built. The 250 residents of Newhalem (a community of Seattle City Light employees and their families) view the area year-round. There are also rafters, boaters and fishermen on the river, and some hikers. The area's designation as part of the Ross Lake National Recreation Area increases viewers' expectations of its landscape, and its gateway character heightens their awareness of it as a place.

PLANNING ALTERNATIVES

Alternative Dams

Three alternative dams are being considered by City Light (figure 1):

- Copper Creek high dam: 495-foot pool elevation, flooding 2,200 acres of valley floor, 9½ miles long.
- Copper Creek low dam: 480-foot pool elevation, 1,700 acres, 9 miles long.
- Damnation Creek high dam: 495-foot pool elevation, 1,500 acres, 7 miles long.

Alternative Road Alignments

Since the reservoirs would flood 7 to 10 miles of State Route 20, four alternative road realignments were developed (three by Jones & Jones and one by the State Department of Highways). In locating these routes, the four main visual management principles of protection, enhancement, conservation and mitigation helped to develop specific planning criteria. These included the functional criteria of utility, safety and economy. The environmental criteria were compatibility with the NRA (protection), enhancement of the traveler's experience of the landscape, and minimal environmental and visual impacts (conservation and mitigation).

The alignments lie in one corridor on the lower north wall of the valley, and all would require large cuts and fills (see figure 2). All were designed as two-lane 50 m.p.h. roads. Steepness of slope proved the key locational criterion, and slight benches in the landform were often used to locate the hillside roads. Overall length and steep grades were minimized. A balance of cut, fill and structures was worked out for road siting on each category of slope. Minimal grading scars with maximum screening by topography and vegetation were intended; alignments were also chosen to reveal the valleys' main features and views to travelers.

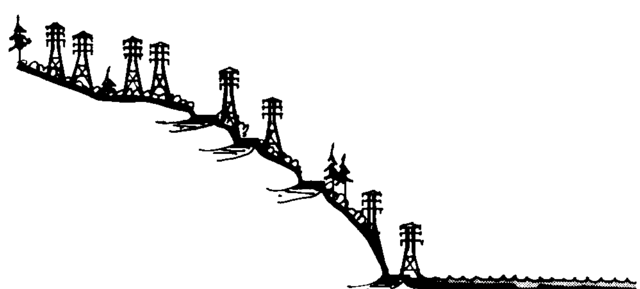


Figure 2--*Road and transmission line location alternatives.*

The four alternative road realignments and their objectives are:

- o High road (high point 1,000 feet above the lake): minimize impacts on the lake and use a hillside bench to reduce grading. Over half the length of road would run in forest, screening both road and outviews.

- o Middle road (300-500 feet above the lake): maximize views of the valley and mountains. This alignment uses a discontinuous shoulder in the landform but involve: much conspicuous grading.

- o Lakeshore road(s): provide visual access to the lake and valley floor and avoid climbing. This alignment would impact the lake heavily. The Department of Highway's design (480-foot pool. level) involves extensive fill along the lake edge, and is one mile shorter.

Alternative Transmission Line Alignments

The reservoirs would also flood sections of the existing powerlines. Three alternatives, high, middle and low (or "existing") alignments were developed (figure 2), each above and roughly parallel to a highway alignment. Each would be a double-circuit 230 kV line with a 200-foot right-of-way. The location criteria included environmental protection (minimal visual impact, minimal disruption to natural ecosystems and forests), compatibility with land use (minimal disruption to existing and projected settlements and recreational lands) and engineering feasibility (maximum utilization of existing right-of-way, system accessibility, and economy).

PHOTOGRAPHIC SIMULATIONS

Visual resources and project proposals were illustrated in a comprehensive series of before-and-after views comparing various combinations of alternatives (see color plates, figure 6*). To locate the potential lake level (up to 105 feet above the existing forested ground level) on oblique aerial photographs, Jones & Jones tethered several red 4-foot diameter helium-filled weather balloons along the riverbanks of the proposed pool elevation and photographed the valley from a helicopter from 2,000 feet, 500 feet and potential lake level. Viewpoints were chosen with the intention of approximating views from various road positions, the lake surface and from the proposed Newhalem campground. To facilitate accurate depiction of alternatives as seen from each viewpoint, we employed a "modelscope" to photograph a model of the valley showing alternative lakes, roads and transmission lines from the same viewpoints. (The modelscope is a periscope lens attachment which can easily reach actual viewpoints in a model.) These data were collected on hand-drawn perspective overlays, to which was then added cuts, fills and other details. These drawings were delivered to an artist who airbrushed the enlarged color photographs to simulate alternatives. Use of these illustrations to summarize potential impacts, evaluate the visual quality of alternatives, and present these to client and public amply justified their expense.

TABULATION OF VISUAL CONDITIONS

To facilitate the inventory and evaluation procedures, scores were recorded in various tables. Since these are referred to in the following sections, this will serve as an introduction. A tabulation of visual resources before and after project development is excerpted as figure 3--*Visual resources before and after development*, which considers the overall supply and expression of visual resources at each of the six individual landscape units of the Narrows, both existing and as generally affected by any dam, reservoir, road and transmission realignments. Figure 3 is essentially concerned with the detailed visual character of each unit in response to the overall project.

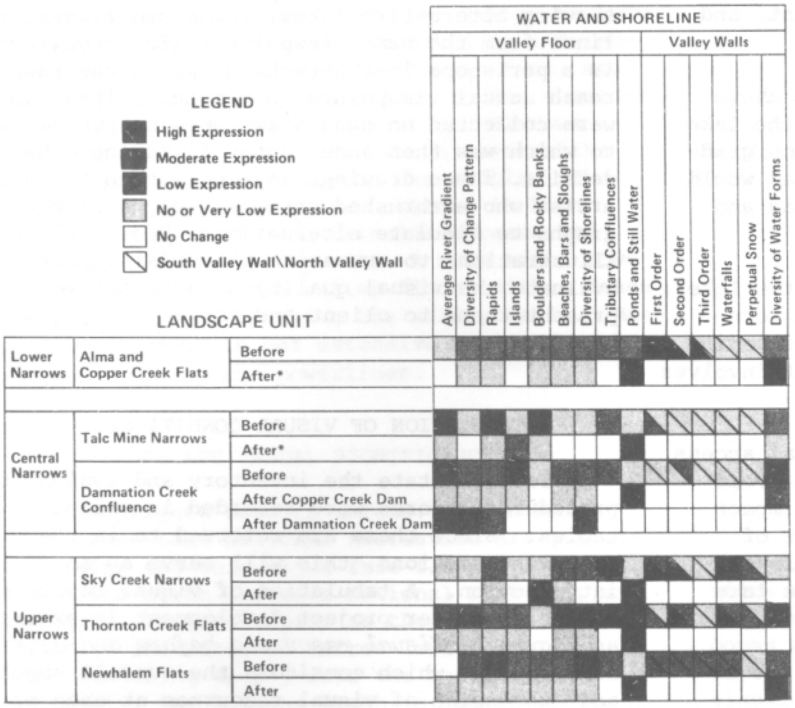
Figure 4 --*Selected visual impacts*, recombines all six units back together into the Narrows reach as a whole, and compares the various combinations of alternatives (only a few are shown here) as each combination would influence the visual character and visual quality of the Narrows: a) as a total valley(i.e. as viewed from an overall vantage point), b) as viewed from the road, and c) (not pictured) as viewed from the water. Probable viewer response for travelers along the road is also tabulated; all scoring methods will be discussed below.

Figure 5 verbally summarizes all the visual impacts in the Narrows for each combination of alternatives (again, only a few are shown here), considering the changes in visual character, visual quality and impact on viewers, once again relative to the a) total valley, b) view from the road, and c) view from the water.

VISUAL CHARACTER

The visual character of a landscape can be described by the form, line, color and texture of the landform and landcover patterns composing it and their relative dominance, scale, diversity and continuity. The visual resources of each landscape unit of the Narrows were inventoried in a table excerpted as figure 3, within six

*See color illustration on page 397.



* Copper Creek alternatives only

WATER AND SHORELINE

Average River Gradient	- 10′/mi.	- 15′/mi.	- 20′/mi.	20′/mi. plus
Diversity of Channel Pattern	Low	Mod. Low	Mod. High	High
Rapids	Absent	Present	Mod. Prominent	Very Prominent
Islands	Absent	Present	Mod. Prominent	Very Prominent
Diversity of Shoreline	Very Low	Mod. Low	Mod. High	High
Beaches, Bars and Sloughs	Absent	Present	Mod. Prominent	Very Prominent
Boulders and Rocky Banks	Absent	Present	Mod. Prominent	Very Prominent
Tributary Confluences	Absent	1 - 3/mi.	3 - 5/mi.	5/mi. plus
Ponds and Still Water	Absent	Present	Mod. Prominent	Very Prominent
Valley Walls:				
First Order Tributaries	Absent	1 - 2	3 - 5	5 plus
Second Order Tributaries	Absent	1 - 2	3 - 5	5 plus
Third Order Tributaries	Absent	1 - 2	3 - 5	5 plus
Waterfalls	Absent	Present	Mod. Prominent	Very Prominent
Perpetual Snow	Absent	Present	Mod. Prominent	Very Prominent
Diversity of Waterforms	Low	Mod. Low	Mod. High	Very High

NOTE: water and shoreline visual resources are shown here. Categories not illustrated include spatial definition landform, vegetation patterns, wildlife visibility and manmade forms.

Figure 3--*Visual resources before and after development.*

Figure 4--*Selected visual impacts.*

VH	1	Very High
H	2	High
MH	3	Moderately High
M	4	Moderate
ML	5	Moderately Low
L	6	Low
VL	7	Very Low

TOTAL VALLEY

		LENGTH OF VALLEY AFFECTED (mi.)	CHANGE IN VISUAL CHARACTER: Space	Landform	Water	Vegetation	Wildlife	Manmade Forms	TOTAL CHANGE IN VISUAL CHARACTER (Av.: Water weighed x3)	VISUAL QUALITY (From Figure 7): VQ BEFORE	VQ AFTER	RATIO OF CHANGE IN VQ	RATIO OF CHANGE 1 - 7 *
Existing Conditions										31	Mod. High		
COPPER CREEK DAMS													
High Road and Lake	High Transmission Line	10 mi.	M	H	VH	H	MH	MH	High		31	0	None
	Mid. Transmission Line	10 mi.	M	H	VH	H	MH	MH	High		35	-.13	- Very Low
	Low Transmission Line	10 mi.	M	H	VH	H	MH	MH	High		34	-.12	- Very Low

VIEW FROM ROAD

		CHANGE IN VISUAL CHARACTER	VISUAL QUALITY: Vividness	Intactness	Unity	VISUAL QUALITY (AV.)	VQ 1 - 100		RATIO OF CHANGE 1 - 7	VIEWER RESPONSE: Viewer Awareness	Viewer Expectation	VIEWER SENSITIVITY	Water	Road	Transmission Line	VISIBILITY OF ALTERATION	VIEWER RESPONSE
Existing Conditions			3	3	2.3	2.76	30	Mod. High		MH	H	H	MH	ML	H	MH	High
COPPER CREEK DAMS																	
High Road and Lake	High Transmission Line	H	2.5	2.3	2.0	2.3	23	+.23	+ Low	H	H	H	M	ML	L	ML	Mod. High
	Mid. Transmission Line	H	2.5	2.6	2.6	2.7	27	+.10	+ Very Low	H	H	H	M	ML	H	M	Mod. High
	Low Transmission Line	H	2.5	2.5	2.4	2.46	25	+.20	+ Low	H	H	H	M	ML	L	ML	Mod. High

Figure 5--*Summary of visual impacts.*

NOTE: Not all alternatives are tabulated here.

SUMMARY OF IMPACTS

COPPER CREEK DAMS		TOTAL VALLEY: CHANGE IN VISUAL CHARACTER	CHANGE IN VISUAL QUALITY	VIEW FROM ROAD: CHANGE IN VISUAL CHARACTER	Ratio of Change in VQ	Viewer Response	IMPACT ON VIEWERS	VIEW FROM WATER: CHANGE IN VISUAL CHARACTER	Ratio of Change in VQ	Viewer Response	IMPACT ON VIEWERS
High Road and Lake	High Transmission Line	High	None	High	+ Low	Mod. High	+ Moderate	Very High	- Very Low	Mod. High	- Mod. Low
	Mid. Transmission Line	High	- Very Low	High	+ Very Low	Mod. High	+ Mod. Low	Very High	- Mod. Low	High	- Mod. High
	Low Transmission Line	High	- Very Low	High	+ Low	Mod. High	+ Moderate	Very High	- Moderate	High	- Mod. High
Middle Roads and Lakes	High Transmission Line	High	- Very Low	Very High	+ Low	High	+ Moderate	Very High	- Moderate	Mod. High	- Mod. High
	Mid. Transmission Line	High	- Very Low	Very High	+ Very Low	High	+ Moderate	Very High	- Mod. High	High	- High
	Low Transmission Line	High	- Very Low	Very High	- Very Low	Very High	+ Moderate	Very High	- High	High	- High

categories: Spatial Definition, Landforms, Water and Shoreline (shown here), Vegetation, Wildlife Visibility and Manmade Forms. The degree of visual expression of each resource within each landscape unit is indicated by a gray scale.

The change in visual character of the Narrows as a whole for some of the alternatives is given in figure 4. Under the heading of Change in Visual Character, the degree of change in each major component of the landscape for each alternative combination of dam, road and powerline was summarized as seen both from the road and from the lake, and judged on the conformity of its patterns and the blend of its character with its surroundings.

The valley floor would be almost completely flooded, but the south wall barely affected except at the dam. The upper north wall could best be spared encroachment if the road and powerlines were sited along the visual seam of the lakeshore edge. The major visual loss would be of the intimacy and diversity of the lowland valley floor, the river and the rapids, which would be replaced by the lake with its drawdown edge and the new structures, road and powerline units along the shore or north valley wall. This loss would be somewhat offset by the visual advantage of a lake, increasing the openness of the view, the drama of the enclosing walls and the unity of the valley. The high Copper Creek reservoir would have a similar effect to the low, except near Newhalem where it would flood about 200 acres more of the valley floor. The Damnation Creek reservoir being smaller would change the character of a proportionately smaller area, and would preserve one last series of rapids just downstream from the damsite.

VIEWER RESPONSE

While there are infinite variations in individual responsiveness to the landscape, by and large groups of viewers can be identified according to their activities, movement patterns, and conditioned expectations. The five viewer groups previously discussed can be associated with one or both of two main viewing positions: view from the road (SR 20) and view from the water (river/lake surface and campground).

Primary measures of a viewer's response to landscape include his sensitivity to it and its visibility to him. *Viewer sensitivity* is comprised of two factors: the viewer's awareness and expectations (Vaughn, N.D., Hendrickson 1974).

Viewer awareness depends on viewer activity and location. Performing a certain activity will affect a viewer's ability to perceive the landscape, bringing him to focus on it or distracting his attention. Location also may affect a viewer's awareness, especially at overlooks, "first view" points and in transitional landscapes such as the Narrows, the gateway between an open valley landscape and mountainous gorges.

Viewer expectation is a measure of a viewer's preconceptions about a landscape's character or quality. In the Narrows, the reputation of the rapids, the area's designation as NRA and national park with a major campground, and the state scenic and recreational highway designation for Route 20 will elicit higher viewer expectations than would undesignated areas.

Visibility of Alteration depends on the degree of exposure the alterations would have from the main viewpoints, and includes consideration of the number of viewers present and the duration and proximity of the view of such alterations as reservoir, road and transmission line realignments. In this study the view from the reservoir paralleling the highway is accorded equal weight with the view from the road.

In the excerpt quoted in figure 4, overall Viewer Response is obtained by combining the scores for Viewer Sensitivity and Visibility of Alteration, expressed on a four-point scale.

VISUAL QUALITY EVALUATION

An established procedure for visual quality assessment, first developed by the authors and applied successfully to a wide range of projects and landscape settings (Jones April 1975), was applied to the Narrows to determine changes in visual quality that would result from each combination of project alternatives. Rather than depend on a single overall appraisal of visual quality (which can often be affected by individual preferential bias), three specific criteria are rated separately which, when averaged, yield visual quality scores which are stable and diminish preferential bias. These scores closely correlate with the mean visual quality ratings of design professionals (and by inference, the general public[4/]) for a given landscape scene, and are useful in determining the qualitative strengths and weaknesses of a scene or a design alternative.

[4/]See Blair (1976) for comparison of visual compatibility scores across various viewer groups.

The criteria used to evaluate visual quality are Vividness, Intactness and Unity.

Vividness (Litton 1971 and Jones April 1975) is a measure of the memorability and distinctiveness of the landscape as experienced from the visual diversity and contrasts expressed in its main components, spatial form, landform, water, vegetation, wildlife and manmade form.

Intactness (Jones 1973 and Zube 1973) is a measure of the apparent visual integrity of the natural and manmade orders in a landscape: its freedom from visual encroachments.

Unite (Litton 1971 and Jones April 1975) is the measure of the degree to which natural and manmade elements of the landscape are compatible and form a harmonious and coherent visual whole.

Each criterion is applied to a landscape or view and can be measured on a scale from 1 (very high) to 7 (very low), summed and averaged to give an evaluation of visual quality:

$$\text{Visual Quality} = \frac{\text{Vividness} + \text{Intactness} + \text{Unity}}{3}$$

For easier comparison the scores from this equation are converted to a scale of 1-100. The ratio of change in visual quality is also given, bracketed into seven ranges of scores from very low to very high. See figure 4 for examples of visual quality score tabulations.

CHANGES IN VISUAL QUALITY IN THE VALLEY AS A WHOLE

For the valley considered as a whole, the existing visual quality of the Narrows (averaged along its length) is on the high end of the moderately high range (31 on a 1 to 100 scale, 1 being highest). This overall rating would decline only slightly to 31.7 with the Damnation Creek dam, and to 34.5 with the Copper Creek dam. On the whole, the vividness of the lake would be higher than the existing river but the intactness of the valley would decline due to structures, right-of-way corridors, drawdown and cuts and fills. The visual unity between manmade and natural features would be somewhat less for the same reasons, but the vivid lake would compensate by enhancing the overall visual unity of the valley. Damnation Creek dam would preserve about a third of the existing valley and river as well as provide a lake, so the overall visual quality of the valley with this alternative would be somewhat higher than with the Copper Creek dams.

The differing visual effects of the alternative roads and powerline locations are summarized for the valley as a whole. Both corridors would form a vivid line on the hillside, more marked with the midslope corridors and separated right-of-ways, less so if one corridor were high and the other at the foot of the slope. If the corridors were sited at the slope foot, the valley wall would be unaffected at the cost of visually encroaching on the shoreline and the lake, with traffic noise and movement, and of continually seeing the powerlines overhead from the road. The combination of causeway riprap with drawdown would aggravate this condition.

CHANGES IN VISUAL QUALITY IN THE VIEW FROM THE ROAD

The visual quality of the view from the new road (in comparison to the view from the existing road) would be improved for most alternatives, except for the lakeshore roads where they run under powerlines, and for the middle road with powerlines located between it and the water. Vividness would increase with exposure to the valley and the lake, especially from the middle roads, the high road being more screened and the low roads having less variety of scene. The intactness of the view from the road would decrease where roads are seen to cut across the hillside, where powerlines interrupt the view to the lake or, especially, where powerlines and the road's cuts, fills and causeway encroach on the shoreline. The unity of the scene would be best preserved where transmission lines are screened by topography, trees, or distance, especially in the high location, least well along the lakeshore.

Viewer expectations would be high for each road alternative, peaking at both ends of the valley. Viewer awareness would be highest where long views are most evident. With Damnation Creek dam, the view from the road would be more diverse, less impacted by transmission lines and thus of higher visual quality.

CHANGES IN VISUAL QUALITY IN THE VIEW FROM THE LAKE

The visual quality of the view from the proposed lake (compared with the existing view from the river) would decrease markedly because of the higher degree of encroachment from roadcut and transmission lines. The vividness would still be very high, especially with the lakeside road. The intactness would decrease where roads or powerlines impact the lakeshore or gash the hillside, more so with the middle than with the high alignment, which is screened by distance, topography, and vegetation. The unity of the view from the lake, owing to these intrusions, would be less than that of the existing view from the river. Alternatives which preserve the visual integrity of the hillside and the shoreline (the upper road and transmission line positions) would provide the highest visual unity as viewed from the lake. Both the expectations and awareness of the viewers from the lake would be high. With Damnation Creek dam, the view from the remaining river would not be badly impacted but would not be made accessible, so that the view from the lake would remain the main viewpoint.

SUMMARY

The project would destroy the visual diversity of the existing valley floor, but would provide some visual compensation for these losses in the creation of a lake. There would be dramatic changes in the visual character of the valley, but its visual quality would be only slightly diminished. As experienced as a whole and as seen from the proposed lake, visual quality could be somewhat lower, depending on the selected location of the road and transmission lines; the visual quality experienced from the relocated road could be higher than the view from the existing road.

Final decisions on which alternatives, if any, should be built, are still pending. However, the thoroughness of this examination and the illustration of alternatives proved very useful in presenting potential impacts with credibility to both client and public, and in dispelling prejudice based on lack of information. The study demonstrates the parity of visual assessment with assessments of other major impacts. It also demonstrates that the quantified application of visual criteria to a wide range of illustrated simulations is an accessible, fast and comprehensive way to generate, summarize, evaluate and select alternative solutions to a complex problem.

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