Looking beyond the trees

Visual Stewardship of the Working Forest

Visual Resource Management Conference

Compendium

Kamloops, British Columbia, Canada
April 17 to 19, 2001

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British Columbia Ministry of Forests and Forestry Continuing Studies Network
Looking Beyond the Trees:
Visual Stewardship of the Working Forest Conference

Compendium of Papers
Presented

Compiled by Jacques Marc A.Sc.T and Darcy Hill
Ministry of Forests
Forest Practices Branch

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**Introduction**

One of the challenges facing today's forest managers is trying to find ways to carry out timber harvesting activities while ensuring that the range of ecological and social values of the forest are maintained. Research suggests that as much as 87% of our perception of the landscape is based on visual stimuli. As a result we routinely make judgements about the condition and desirability of our environment on the basis of visual information. If the change looks bad, we tend to judge it negatively. The larger, the more dramatic, and the less aesthetic the change in the environment, the more people tend to assume that the environment has been damaged.

Visual Resource Management is about managing perceptions by making human made intrusions look as natural as possible, while meeting other forest management objectives. Many jurisdictions around the world manage for aesthetics and have developed procedures, policies and technologies for managing this resource.

The desire for information on the subject of Visual Resource Management is greater than ever before, from all players, agencies, industry and contractors.

The British Columbia Ministry of Forests and the Forestry Continuing Studies Network hosted a conference as a means of sharing experiences, technology and information. The name of this conference was *Looking Beyond the Trees: Visual Stewardship of the Working Forest*. It was held at Kamloops, British Columbia April 18 & 19 2001.

This conference brought together leading experts and researchers, from around North America and the United Kingdom.

Through a mixture of plenary and break out sessions, speakers proposed technological solutions, answered operational issues and shared research findings on seven subject areas:

- Public Perceptions
- Visualization Technology
- Silvicultural Systems
- Stewardship/Certification
- Visual Design
- Economics
- Policy Influences

In all 27 different papers were presented. These are printed in their entirety or in a shortened form in the compendium.
About the Compendium

This compendium of papers was produced as a means of providing participants with a record of papers presented and issues discussed at the Looking Beyond the Trees: Visual Stewardship of the Working Forest conference. It is not meant to be a formal published proceeding. There is no set word count, nor has a single style been set for the collection of papers. While the compendium contains some formal papers, complete with references, many papers are simply power point presentations, reproduced as Microsoft word documents.

Some limited editing was carried out. This was done primarily to ensure that spoken text read like written text and to ensure that the title/author name/contact information at the opening of each paper was consistent.

Readers will find that speaker papers are not arranged in the order of presentation or under the seven topic areas used during the conference. In order to make the printing and compilation of the compendium as easy as possible, papers have been grouped into two sections: those papers with colour, and those without. The first 15 papers (pages 1-128) have been reproduced in colour. The remaining 12 papers (pages 129-235) have been reproduced in black and white. Within each of these grouping, the papers are arranged alphabetically by author.

Speaker contact information is provided at the beginning of each paper for easy reference.
Forest Stewardship and Visual Quality:  
The Adams Lake Experience

Marino Bordin, RPF  
Planning Forester, International Forest Products Ltd.  
RR#2, Chase, BC, V0E 1M0  
Phone: (604) 679-3234 Fax: (604) 679-3545 Email: marino_bordin@interfor.com

Adams Lake Lumber has been in operation since 1942. This business is the largest employer in the area (nearly 300 people depend on Adams Lake Lumber for employment). Half the wood supply needed for the mill comes from an operating area contiguous to the lake.

- ICH leading
- Ground-based harvesting dominates
- 30% of area is visually sensitive

Adams Lake Experience
Up front planning
MOF involvement

Visual Mgmt History
Biodiversity Concept
Visual Tours
Leadership

Staff Training
Logger “Buy-in”
Operational Flexibility  
Logger Discretion

Retention Strategy  
Maximize effectiveness  
Minimize volume /costs

“Retrievable” Patch

Fir Beetle Salvage  
Area 10.3 ha.  
Retention VQO

Cable Blocks: Area 15.3 ha; PR VQO
CP 56-4: Area 9.8 ha.
PR VQO

Before Helicopter Harvest PR VQO

After Helicopter Harvest

Monitoring
High environmental standards are required to maintain or enhance this wood supply. We have been certified under ISO 14001 and are pursuing other forms of certification. The Adams River Sockeye Salmon run is world-renowned.

Keys to success:
- Cooperation
- Minimal impacts
- Improves Timber Supply.....But

Sometimes... Visual landscape design objectives are difficult to achieve. We are currently finalizing a proposal to increase the cut.
Introduction

Good Morning. I’d like to first thank the Ministry of Forests and the Continuing Studies Network for inviting me to share with you some of my experiences in visual resource management.

I am a landscape architect for the Bureau of Land Management, shared with the U.S. Forest Service. My first exposure to visual resource management issues was while working with Brian Orland as a research assistant at the University of Illinois. At that time I produced several photo-realistic simulations for Terry Slider and the Deschutes National Forests. After graduation I took a job working for the Malheur National Forest in Eastern Oregon. Since then, I have spent the last six years working on projects for both the Forest Service and the Bureau of Land Management (BLM). In that time, I’ve learned a lot about scenery management, landscapes, and people’s relationships to each.

During my talk today, I’d like to share with you a quick overview of the Forest Service and the BLM, then a brief history of each agency’s visual management system. I’ll follow this with a discussion of some of the emerging issues and trends, each agency’s responses to these trends, and the methods being used to implement their systems. Finally, I’ll take a look into what the future might hold.

Agency Backgrounds

This map illustrates the forested regions of the United States. It is a good map with which to talk about exactly where the BLM and Forest Service lands are located in the U.S. for those who might not be familiar that. The BLM and the Forest Service are the two...
primary land management agencies in the U.S. Both operate on a multiple-use mission (overseeing timber, grazing, mining, recreation, wildlife, etc.). As we’ll see in the next couple of slides, the Forest Service lands are located primarily in the areas shown as forested regions on this map, while the BLM lands are in large part located in the wide open areas in between the forested regions.

This difference in land allocation geographically also correlates with some distinctions between the agencies’ cultures. For example, the Forest Service is divided into many more individual field units than the BLM, but each is much smaller in acreage. The BLM, in contrast, has fewer individual units, but each comprises larger acreage given the vast open spaces in which each is situated. These BLM lands have had the image of being the lands that Americans drive through to get somewhere else (i.e., a national forest). However, with the rapid population growth in the west today, coupled with an increasing desire by recreationists to get away from the masses, these last remnants of true wild, open spaces are becoming the sought-after “Wild West” of yore.

For those who are unfamiliar with the U.S. landscape in the context of these two agencies, the images below should help. In general, Forest Service lands are forested, whereas the BLM lands, with a few exceptions, are mostly open, arid, backcountry landscapes. While these photographs are gross generalizations, they drive home the point that one is more likely to find the forested alpine lakes and meadows in Forest Service lands, whereas the vast, open, high desert, sage-and-tumbleweed experience is going to be found on BLM lands.

**Visual Management Chronology**

Now it’s time for a quick history lesson. I’ll describe briefly how each agency has dealt with visual resources in the past. Prior to 1970, visual resource management was really limited to use along highways and within special recreation areas. Then, in the late sixties, adverse visual effects were becoming obvious. An increase in clearcutting was occurring in the nation’s forest as a result of providing necessary lumber that fed the post-war construction boom. The Forest Service responded with a system designed to mitigate the visual effects of harvest. This point really marks the birthplace of both agencies’ visual resource management systems. The work of Burton Litton and Sylvia Crowe was melded together with work of Warren Bacon from the Forest Service to produce the Visual Resource Management System in 1974. This same decade saw the passage of many of our environment laws, mandating the management of the scenic resources within both agencies:
Forested Lands Policy and Management Act (1976) FPLMA:
“... public lands will be managed in a way to protect the quality of the scenic (visual) values of theses lands.”

National Environmental Policy Act (1969) NEPA:
“... assure for all Americans, aesthetically pleasing surroundings …” and “… utilize a systematic, interdisciplinary approach which will ensure the integrated use of environmental design arts in the planning and decision making.”

The Forest Service adopted the Visual Management System, or VMS, in 1974. The BLM used the VMS to create the agency’s own version, the Visual Resource Management System, or VRM, in 1984. Both systems were based on the premise that visible evidence of human activity is considered a deviation from the “natural-appearing landscape,” which is the ultimate scenic experience goal. Both assumed that fundamental design principles (form, line, color, texture) could be used to quantify resource values via taking inventory, setting objectives, and evaluating effects. The reality of these systems is that they both attempt to quantify an inherently qualitative resource and they both are reactionary only in use. Landscape architects were considered to be the custodians of the programs originally, as these were the individuals trained in the landscape design principles.

Emerging Issues

Since then, a new set of issues has been emerging and challenging the implementation of these systems and their existing premises and assumptions. Through 100+ years of fire suppression, forested lands in the U.S. have developed into densities and compositions that are inconsistent with historic fire disturbance patterns. As a result, stands are dying and at risk of larger and more intense fires than would normally occur. Yet, many of these stands do not show the visible effect of human alterations and would, in each system, be ranked as having a high scenic quality regardless of their poor ecosystem health.

The increased risks of fire posed by this imbalance in the forest are more significant with the increasing development in the rural-wildland interfaces. Millions of people live in or adjacent to forested areas that are at extremely high risk for catastrophic fire. As the agencies try to deal with these increased fuel loads, the use of prescribed fire and other fuel treatments becomes necessary. So the question becomes, if fire is used as a treatment, are its visible effects still
considered natural-appearing? The Forest Service and BLM systems don’t have a good way of dealing with these types of situations. From a scenery context, should removal by fire be treated any differently than removal by logging?

As the use of federal lands for commercial logging continues to decrease in scope, the types of prescriptions used on these lands continue to be modified. No longer are the large-scale, clearly noticeable types of harvest occurring—those that both visual management systems were designed to react to. Instead, we are now seeing treatments that have very subtle changes in texture such as thinning, density management, and fuel reduction prescriptions over much larger, less concentrated areas.

Another emerging trend is that of native oak woodland restorations. Our vegetative treatments are no longer limited to those which produce a commodity. Past fire suppression has allowed for open oak woodlands to become crowded by encroaching conifer species. So another ecosystem out of whack has emerged here. In this case, removal of timber species is not for commodity, but for restoration of the native deciduous species. This means that a potential conflict is developing where the necessary treatment for restoring the landscape to a natural-appearing one is to harvest a visually significant component of the adjacent conifer.

Today’s management must consider what a forested area comprises. Is it just a regeneration area for future timber production, or is it a patchwork of connecting habitat for elk and deer? Is a tree considered timber or habitat? Can it be both? Does the removal of a tree for habitat’s sake mean the same visually as its removal for commodity?

All of this is sandwiched in the middle of a growing west, a west of new communities of educated people from other parts of the country, settling into towns rich in traditional uses and values. Forested areas are now as likely to be valued as scenic backdrops as for anything else. In many cases, small, isolated western communities once dependent on timber for their economic vitality are turning to recreation as a source of sustainability. In these areas, the scenic value of the forest surrounding these towns may, in fact, be becoming more important than the value of the timber itself. This growing west is placing increased demands on other resources, such as water. The drought conditions facing us all this year are a reminder of this significance. Reservoir lake levels are at all-time lows. Should the scenic quality of the forested area surrounding a lake decrease with the scenic quality of the lower lake levels? Do we rate the forested ecosystem just down to the shoreline? Or do we include the effects associated with reservoir lakes and the recreation experiences they provide?
All of this leads us to the cultural values of the people living in the landscape. These values might be spiritual or historic in nature. The types of activities people participate in will effect their expectations of scenery, and therefore, the relative degree of alterations that would be acceptable. We’re talking about a sense of place. What’s the sense of place of the reservoir lake? Does it include a low-water level image? What about the oak woodland being encroached by douglas-fir? Or the area burned by a wildfire versus an area changed by a prescribed fire? Is it a ski slope or a clearcut? Does it make a difference?

**Agency Responses**

How have the two agencies responded to these new challenging issues? Well, the Forest Service embarked on a mission to update its VMS. The result was the Scenery Management System (SMS), which Terry Slider has described in detail. Rich with landscape architects, the Forest Service chose an inclusive approach—an outside-in premise in which these other resource values (habitat, ecosystem health, cultural values) could be integrated into what constituted scenery. The assumption was thus modified to include more than just what was visible.

The BLM instead chose to stay with its original system, but modify the way in which it was implemented. Now shy of landscape architects to be custodians of the program, the BLM felt the most pragmatic approach was inside-out, in which the visual resource message would be spread to other resource specialists. The assumption here is that the planning processes would then account for the inclusion of these other resource issues (habitat, ecosystem health, cultural values, etc.). The responsibility for visual considerations in surface-disturbing activities was shared with all specialists, including management and staff. By default, the recreation staff became the custodians of the VRM program.

In disseminating the message, the BLM thus thrust itself into a mission of training non-landscape architects in the techniques of design. Regional and field unit coordinators were assigned for advice and counsel. Training in VRM is now conducted yearly. Designed as a five-day, hands-on, process, attendees work in groups on real-life projects. The training is targeted to any employee involved in surface-disturbing activities.

The BLM created a “contrast-rating form” in an effort to make the quantification of the visual resource easier for non-design professionals. Sectioned off into form, line, color, and texture, this rating form is intended to be a fairly straightforward way of quantifying the features of the existing and proposed landscapes to determine discord or harmony when compared.
In addition to support by geographic information systems, a website was set up to provide additional support and information on the VRM program. A visual resource simulation course is also now being offered to aid specialists with techniques in simulating expected effects of surface-disturbing activities. A VRM database is also being developed (eventually to be web-accessible) to enable specialists to query specific project situations and get examples of the good, bad, and ugly solutions.

**The Future**

How effective have the two different approaches been? The Forest Service is still in the process of transition into the new SMS, with many foresters still hanging on to the old ways of the VMS. The BLM is just beginning its training of others in the VRM systems as well. So, bottom line now, is that the jury is still out. Regardless, there are some opportunities for making the most of these systems. I’ll discuss a few of my pulpit points, if you will ...

We wouldn’t use a single photo to represent our children, but we are quick to do so with scenery. If we were trying to show someone what our child looks like, we’d pull out the whole wallet with a whole slew of photos from when they were a baby, in grammar school, off to college, etc. I’d recommend that be the same thought when we discuss scenery. The landscape should be described in terms of the processes that created it, not just the snapshot visible today. It’s dynamic, and we should describe it as such. **Process, not snapshot.**

Along similar lines, technology should be used to educate and communicate rather than to be simply a tool for displaying potential visual effects. Three-dimensional rendering software is extremely effective in showing the geography of an area in a format that the public can more easily understand than a two-dimensional map.

Simulation software can be used to help describe the dynamic quality of an ecosystem, to actually illustrate the process, not just the snapshot. It could be used to show the effects of different management alternatives over time. Simulations should be used in concert with each other. Abstract, scientifically based models can be shown next to photo-realistic images to share
in communicating the philosophy behind forest management, while at the same time helping the public to better understand what the abstract simulations represent. Simulations could also be linked with more advanced models and decision support systems, as Brian Orland discussed. In any situation, it’s important to remember that the more realistic (true to life) a simulation appears, the more significant its deviations from reality (inaccuracies) will be to the public.

So, I’ll leave you with a few parting words from a wise old man named Leopold, who seems to have had a pretty good handle on the sticking intangibles of “visuals”, “natural-appearing”, “ecological health”, “recreation uses”, and “cultural values”, long before we developed systems to deal with them.

“...the motorist who exclaims about the flowing contours that lead the eye upward to far summits is unaware...It does not occur to him that the hills, too are covered with ecological face powder.”

“The outstanding characteristic of perception is that it entails no consumption and no dilution of any resource.”

“Recreation is not the outdoors, but our relationship to it.”

Aldo Leopold
Abstract

This paper discusses an experiential study of landscape from the perspective of inhabitants of a region. While the dominant conceptualization of landscape aesthetics in resource management emphasizes the visual, this study revealed that in addition to the visual and visible dimensions of landscape, aesthetic sensibilities take in “more than meets the eye.” In particular, for inhabitants of the Cariboo region in central British Columbia, sense of place—both character of place and attachments to place—was significant to aesthetic experience of landscape. The methods used to obtain inhabitant perspectives and the place-based and other outcomes of the study are discussed and compared to outcomes of conventional visual assessments. Implications for the practice of landscape assessment and environmental management more broadly are also presented.

Overview of Landscape Assessment in Environmental Management

• 1960s - environmental legislation: Consideration of aesthetic values systematically in resource management is generally cited as emerging in the 1960s. At this time, environmental protection legislation was introduced in response to concerns over environmental quality, one aspect of which was the aesthetic dimension, conceived of as “beauty.”

• 1970s – methodologies develop: Throughout the 1970s, methods and techniques for landscape proliferated rapidly, building on methods from earlier times and undergoing use in a variety of contexts, from environmental impact assessment to resource planning and urban design.

• 1980s - reviews of the field; attempts to integrate: By the 1980s, researchers began to examine the myriad of literature, studies and application accumulating in the field, and identified a number of different approaches to landscape assessment. As well, attempts were made to integrate approaches and develop overarching theories of landscape aesthetics.

• 1990s – entrenched approach: By the 1990s, methods for assessing aesthetics in landscape, especially as “scenic beauty” or “visual quality” had become institutionalized, even entrenched, within government programs.

Approaches to Landscape Assessment

Reviews identified consistently categorizations of at least three distinct approaches to landscape aesthetics and assessment:

• “Expert”: In the professional or “expert” approach, the arrangement or design of visual landscape elements determine overall visual-aesthetic quality. These attributes, identified and
judged by trained professionals, become the basis of management. This approach has led to (and is based on) aesthetic management focused on the designed landscape and an “objective” observer. This approach dominates the practice of landscape assessment (e.g. BC Ministry of Forests Visual Resource Management (VRM) program).

- “Experimental”: In this approach, landscape is conceptualized as a “stimulus” to which humans respond. Predictive landscape dimensions, where ratings of beauty are correlated to variations in measured landscape dimensions, are developed. Policies and management maintain landscapes that have features positively related to, or predicted by, perceptions.

- “Experiential”: The third model, the experiential, is based on the understandings of participant-observers who attend to meaning and context in landscape. This approach has received the least attention in resource management, because its methods have been considered to be too individualistic and subjective. However, because of the attention to context and meaning, it has been suggested that this approach offers greater validity than other approaches.

**Objectives of Research Study in the Cariboo**

The study has two objectives:

- To develop a method based in the “experiential” approach.
  - this involved consideration of at least four characteristics identified in the literature: beyond the visual (a broader range of landscape entities and incorporation of other sensory experience); an “insider” perspective (that is through the eyes and thoughts of inhabitants of a place); everyday landscapes (ordinary and everyday, not just spectacular, places); and methods that are reflective (allow thinking about landscape, values, assessing)
  - to consider the method and its outcomes for informing the practice of landscape assessment (as practiced in British Columbia’s VRM program).

**Comparative Case Study Design**

Using a qualitative two-part case study, landscape assessment was analyzed in the Cariboo region of BC

*Experiential Approach*
- Develop and apply experiential method
- Analyze and interpret landscape images

*Expert Approach*
- Review landscape assessment policy and procedures
- Examine applied outcomes
Participant-Directed Landscape Imaging (PDLI)

Participant-Directed Landscape Imaging was used. This is an interactive method involving three data collection components: self-directed photography (participants were given single-use cameras to capture landscapes photographically); journals (participants wrote notes of reflection upon seeing the photos, describing meanings and context); and in-depth interviews (carried out with participants to further detail their images and discuss landscape).

Outcomes of Cariboo Study Image Analysis

The results of the image analysis are shown in the table below:

<table>
<thead>
<tr>
<th>Focus themes</th>
<th>Significance themes</th>
<th>Type of assessment</th>
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<tbody>
<tr>
<td>landscape elements</td>
<td>important because...</td>
<td>instrumental evaluations</td>
</tr>
<tr>
<td>locales</td>
<td>it is characteristic</td>
<td>affective appraisals</td>
</tr>
<tr>
<td>experiences</td>
<td>it is special</td>
<td>sense of place descriptions</td>
</tr>
<tr>
<td></td>
<td>I'm attached...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>it connects...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>it is ecological...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>it is beautiful...</td>
<td></td>
</tr>
<tr>
<td></td>
<td>it makes me feel...</td>
<td></td>
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</tbody>
</table>

Summary of Cariboo image analysis: Focus themes – what did participants focus on in their images?; and Significance themes – why were the images important, significant, meaningful?

Place and Sense of Place

Place has long been a key concept in human geography. It has been variously defined: as “a portion of space experienced by people,” for example. Generally, geographers consider three overlapping, interrelated elements:

- Location: expressions of absolute or relative position
- Locale: a setting or context for social action and interaction
- Sense of place: associations, feelings of meaning and identity people hold
• Character of place
  - memorability, distinctiveness
    - “genius loci”

• Attachment to place
  - to specific place or type of place
    - “topophilia”

Sense of Place in the Cariboo

• Landscape as “nature”: natural process or “organic” human change
• Landscape as “heritage”: significance of past to present in the Cariboo
• Landscape as “a way of life”: Cariboo as a place to live, work and play

“… rolling golden hills, typical sky on the road to Spring Lake, to my favourite spot…”

“… the creek moves slowly here, and there are always ducks around and trout…”

… nature
“…reflecting the sky, containing it gently in the land…”

“…a spiritual dimension to the lakes of the Cariboo … the ‘essence’ of water…”

… heritage
“… our history…a mining town in its present day setting.”

“… a change from mining to forestry…”

“… the others are gone, and people want some connection to the past…”

… heritage
“… the Marguerite ferry. … People fought hard to keep this old system of crossing the Fraser … some connection to the past …”

“ … the beauty of the rain on the river …”

… way of life
“…an original Crown grant in HBC times…”

“… fall plowing at Bouchie Lake, my place…”

“…the pastoral scene … tells me … there is stability in it all …”
“… peaceful scenery where people choose to live…”

“… significance in the mix of park, local history, growth and development… over time…”

“… home
“…part of the reason I chose to live in the Cariboo …”

“… on the way to work … less stressful than time in traffic…”

**Informing the Practice of Landscape Assessment**

There are two approaches to this:

- Supplemental to “expert” methods
  - for example, as public input
    - scale: region or sub-region? Cost-effectiveness? Follow-up?
  - Reorienting landscape assessment
    – for example, attention to sense of place

**Reorienting Landscape Assessment**

The experiential method and its outcomes support the following emerging trends in resource management:

- Recognition that ecosystem management includes place – Shared aspects of place, especially attachment, can serve as a starting point for planning.

- Recognition of the value of subjectivity and qualitative methods – Despite the importance of science and measurement, there is increasing importance on qualitative information and on intangible, unquantifiable values.

- Changing forms of participation and management – There is no single “public,” but rather a variety of interests to be included. The focus of resource management as a state-centred, technocratic activity is changing to a “bottom-up,” participatory and pluralistic endeavour.
Calibrated Images
Visualizing Forest Landscapes for Public Choice Surveys

Dr. Wolfgang Haider
Assistant Professor, School of Resource and Environmental Management
Simon Fraser University,
8888 University Drive, Burnaby, British Columbia, V5A 1S6
Phone: (604) 291-1306 Fax: (604) 291-4968 Email: whaider@sfu.ca

Wolfgang Haider, REM, SFU; Brian Orland, Penn State; Terry Daniel, U. Arizona; Donald Anderson, StatDesign, Co; Michael Williams, Advanis, Edmonton; Len Hunt, OMNR

Overview

- Remote tourism in Northern Ontario and the research context
- Choice surveys
- Calibrated images
- The survey instrument & sampling
- Results
- Decision support tool

Remote Tourism in Northern Ontario

Lodges
Outposts
Favorite Activity is Walleye Fishing
Logging is the Second Land-Use
Aquatic Guidelines require 30m buffer

The Research Context

  - expert based approach
- Class EA 1987-1994
- research on the effects of timber management on tourism
- research on the effectiveness of the guidelines

- CNFER (Centre for Northern Forest Ecosystem Research) est. 1990

**Research Challenges**

- A widely dispersed tourism industry
- Approx. 1300 locations
- Little systematic data available
  - about tourism industry and clients
  - about the forested environment

- Challenge: How to link research to tangible management concerns?

**Fundamental Research Directions**

- Focus on client (tourist) perspective
- Approach the problem in its multivariate nature
- Include visualization

--> Stated choice surveys
--> Calibrated images

IDEALLY COMBINED IN ONE STUDY

**Choice Surveys**

The multivariate nature of a simple recreation experience

<table>
<thead>
<tr>
<th>Harvest</th>
<th>Slots</th>
<th>Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 6 fish / day</td>
<td>&gt; No restrictions</td>
<td>&gt; mostly small</td>
</tr>
<tr>
<td>&gt; 3 fish / day</td>
<td>&gt; 30 - 40 cm</td>
<td>&gt; mostly medium</td>
</tr>
<tr>
<td>&gt; CAR only</td>
<td>&gt; 25 - 45 cm</td>
<td>&gt; mostly large</td>
</tr>
</tbody>
</table>

3 * 3 * 3 = 27 possible combinations

**Possible Response Tasks**

Lake A:        Lake B:

6 fish / day    CAR
30 – 40 cm      no restrictions
mostly medium   mostly small

- On a scale from 1 to 10 how much do you like to fish Lake A? (*Conjoint Analysis*)
• If Lakes A and B were the only types of lakes available for fishing in Area X, which one would you choose? (*Discrete Choice Experiment*)

**Discrete Choice Experiments**

• Experimental design (fractional factorial design)
• Method of analysis (discrete choice model = random utility model)

**Methodology**

Discrete Choice Experiment
• an alternative to revealed (observational / actual) preference data
  • going beyond attitude and opinion research
  • one form of trade-off analysis
  • evaluation of non-existing alternatives
  • decision support tool

**Attribute List**

- **Accommodation**
  - outpost camp (running water y/n)
  - lodge (American Plan or Housekeeping)
- **Price of Package** ($$)
- **Wildlife Viewing**
- **Crowding**
  - no other anglers
  - occasional fly-in
  - another outpost camp
- **Distance from Home to Airbase**
- **Fly-in**

**Attribute List - Timber Management**

- **Noise at the Lake**
  - none
  - occasional,distant
  - occasional, near lake
- **Forest Type**
  - Conifer
  - Mixedwood
- **Road**
  - none
  - 50-100m
  - 500m
  - 2000m
- **Size**
  - 15% of eligible area
  - 50% of eligible area

- **Quality of Fishing**
  - Walleye (excellent / good)
  - Northern (excellent / good)
  - Lake Trout (good / na)
  - Bass (good / na)
- **Limits**
  - 6 fish/day, no size restriction
  - 6 fish/day, only 1 trophy
  - 3 fish/day, only 1 trophy
  - catch & release only
- **Size of Fish**
  - mostly moderate, occasional trophy

- **Buffer**
  - 100m
  - 500m
  - 1000m
  - 3000m
- **Shape**
  - Regular
  - Irregular
- **Blocks**
  - single
  - multiple
- **Age**
  - fresh brown
  - greened-up
Digitally Calibrated Images

Digitally Calibrated Images (Describing Attributes Visually)

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<th>Attribute</th>
<th>Level</th>
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<tr>
<td>Residuals:</td>
<td>None</td>
</tr>
<tr>
<td>Road:</td>
<td>No Road</td>
</tr>
<tr>
<td>Forest Type:</td>
<td>Conifer</td>
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<tr>
<td>Size:</td>
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<td>Shape:</td>
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<td># Blocks:</td>
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<tr>
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<table>
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Steps in Calibration of Landscape Images

- Develop list of attributes & attribute levels
- Define a prototype ‘scene’
  - oblique aerial view (400 - 600 m above ground)
  - shoreline in the foreground
  - horizon in the background
- Collect a sample of images
- Standardize images
- Generate image according to design plan
Preparation of Images

Before

After

Calibration of Images (2)

- Use actual scenes to verify distances and appearances
- Validate scenes with experts
- Revise
- Test scenes with naïve subjects
- Include scenes into choice sets
The Survey Instrument

128 Choice sets
8 booklets, 16 choice sets per booklet
No image appeared twice in any booklet
1/4 pristine scenes

The Survey

Sample of 1,000 respondents
Interviews at 7 trade shows in US - midwest
Task - Choose among:
  - left
  - right
  - fish outside Ontario
  - do not fish
Results

Catch Expectations by Species

Price for an Outpost with Running Water

4 day Accommodation

7 day Accommodation

Relationship between Buffer Width, Size and Age of Cutover