LOWER ST. CROIX SCENIC CORRIDOR STUDY

THE DETERMINATION OF WHICH LAND AREAS CAN BE VIEWED FROM THE ST. CROIX RIVER

ST. CROIX VALLEY LEAGUE OF WOMEN VOTERS
MINN. / WISC. BOUNDARY AREA COMMISSION
DEPARTMENT OF LANDSCAPE ARCHITECTURE
CENTER FOR URBAN AND REGIONAL AFFAIRS
UNIVERSITY OF MINNESOTA SPRING 1973

HIGHEST = 60 = 82 TIMES SEEN
HIGH = 30 = 59 TIMES SEEN
MEDIUM = 10 = 29 TIMES SEEN
LOW = 1 = 9 TIMES SEEN
NONE = THESE AREAS NOT SEEN

DATA GRID

VALUE SYMBOL   CELLS  ACRES  PCT. OF SITE
   1 (SSSSS)   4240   11321   13   32.1
   2 (CCCCC)   4305   11489   13   32.7
   3 (SSSSC)   3829    1224    12   29.8
   4 (-----)    700     169     2    5.4
   5 (----)    3194     828     10   ----
   6 (-----)    1010     273     3    10.0
   7 (SSSSS)   14960    3951    47

LEGEND FREQUENCY  (32168 CELLS)
LOWER ST. CROIX SCENIC CORRIDOR STUDY

"THE DETERMINATION OF WHICH LANDS CAN BE VIEWED FROM THE ST. CROIX RIVER"

SPONSORED BY: MINNESOTA-WISCONSIN BOUNDARY AREA COMMISSION

ASSISTED BY: ST. CROIX VALLEY LEAGUE OF WOMEN VOTERS

CONDUCTED BY: UNIVERSITY OF MINNESOTA
CENTER FOR URBAN AND REGIONAL AFFAIRS
DEPARTMENT OF LANDSCAPE ARCHITECTURE
ALAN ROBINETTE, PRINCIPAL INVESTIGATOR

PROJECT OBJECTIVES

The general purpose of the study is to define the geographic limits of the lower St. Croix Valley Corridor in terms of its visual limits rather than fixed setback dimensions. Such a definition of the scenic corridor can hopefully be a critical factor in determining the boundary for development controls.

The "VIEW" analysis used to determine the scenic corridor is a computer-aided method for establishing the "intervisibility" between various points in the landscape. This means that two points are intervisible if a clear sight line can be drawn between two points without interruption by other landforms. This method can therefore be applied in two ways:

1. To determine what lands can be seen from a point of interest, an overlook, or a particular building (observer oriented) and,

2. To determine from what lands a point is observable (object oriented).

It is possible therefore to use the information to locate activities to take advantage of scenic views as well as to control development to preserve scenic views.

Project Summary

The computer has been used in this study as a calculational tool to check the site lines between various points on the landscape. In order to do this some information must first be collected for the study area. The area considered is from Prescott, Wisconsin, to Taylors Falls, Minnesota, and an east-west dimension ranging from 2 to 5 miles depending upon the distance between bluff tops. Both sides of the river were considered.

Step 1: First a base map is prepared using U. S. Geological Survey maps at scales of 1" = 2000'.

Step 2: The study area is subdivided into small parcels of 2.67 acres each which represent the points of consideration in the landscape. Each of these
"cells" is approximately 440' by 260' in size. They are rectangular because the computer printer that is used has characters which are rectangular in a 6:10 proportion. This allows for computer maps to be displayed which have a uniform scale of 2" = 1 mile in all directions. This grid of cells is overlaid on the USGS base map as the study area boundary and cell definition reference. There are approximately 32,000 cells or 86,000 acres in the study area.

Step 3: The information from the USGS maps must be recorded for each of the 32,000 cells in the area. Two types of information are required:

1. Site map - This information describes the pattern of the St. Croix River, land with tree cover, and open land.
2. Elevation map - This information describes the topography of the site by indicating the elevation to the nearest 10 feet for each cell.

This information serves as the data for the study. It is recorded on a grid map and then key punched onto computer cards for processing.

Step 4: After the information is collected and key punched there are several processes for the computer:

1. The elevation data is amended to yield treetop elevation by adding 40' to all cells which have tree cover;
2. The site data is evaluated to isolate all cells which are on the water shoreline of the St. Croix; these cells become the observer points for the study assuming that the maximum view is obtained by looking in all directions from each shoreline;
3. The view analysis is then done by assuming that each shoreline point is an observer location, that the radius of the view is two miles in all directions, and that the landscape that is viewed is the treetop elevation. This is physically accomplished for each observer point in the following way -
   a. A two mile radius around the observer point established a circumference of view, and
   b. lines are established between the observer point and each point on the circumference, and
   c. a sight line begins with the observer point elevation and establishes a trajectory through the first cell on the sight line; subsequent cells on the sight line are checked to determine whether they are below the trajectory (not seen) or above the trajectory (seen) in which case a new trajectory is established, and
   d. this process continues to all cells on a sight line, all sight lines from an observer point and all observer points in the study area, and
   e. a total count is recorded for each cell indicating the number of times seen from the observer points within a two mile radius giving the "relative visibility" of each cell.

The magnitude of the task can be best understood knowing that within the
study area of 32,000 cells there are approximately 1,000 observer points (shoreline cells); each view of two miles has approximately 300 sight lines; each sight line has approximately 24 points. Therefore the approximate number of cell evaluations is 72 million. The total computer time to do this is approximately 8 minutes at a cost of $9.00 per minute and therefore about $72,000. Of course, the preparation of data maps and computer processing is an additional time/cost factor. The project was conducted over a six-month period at a total cost for development and application of $3,000. Considerable time was donated by the St. Croix Valley League of Women Voters in the coding of the computer data maps. This was estimated at 300 man hours. Future scenic corridor studies are estimated to cost $60.00 per mile.

SUMMARY OF CONCLUSIONS

The major objective of this project is to define the geographic limits of a scenic corridor. A relative visibility map shows the various areas along the river which have very high, high, medium, and low visibility. These areas should be interpreted as general zones with an accuracy of 2.67 acres rather than isolating individual cells for specific reference. A summary of the entire study areas' visibility is as follows:

<table>
<thead>
<tr>
<th>Visibility</th>
<th>Times Seen</th>
<th>Area (acres)</th>
<th>Per cent of Study Area</th>
<th>Per cent of Visible Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>60-89</td>
<td>1,869</td>
<td>2</td>
<td>5.4</td>
</tr>
<tr>
<td>High</td>
<td>30-59</td>
<td>10,224</td>
<td>12</td>
<td>29.8</td>
</tr>
<tr>
<td>Medium</td>
<td>10-29</td>
<td>11,489</td>
<td>13</td>
<td>32.7</td>
</tr>
<tr>
<td>Low</td>
<td>1-9</td>
<td>11,321</td>
<td>13</td>
<td>32.1</td>
</tr>
<tr>
<td>Not Seen</td>
<td>0</td>
<td>14,806</td>
<td>47</td>
<td>0</td>
</tr>
<tr>
<td>River</td>
<td>-</td>
<td>8,528</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Shoreline</td>
<td>-</td>
<td>2,713</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

The pattern of visibility varies from region to region throughout the valley. This is due to the profile of the valley cross-section and the degree of curvature of the river. The type and location of visual control should respond to this differing pattern of visibility. There are four regions to the valley:

The Gorge - Afton to Prescott

The visibility in this region is generally restricted to the valley walls. The river is not wide enough to extend the visibility beyond the rim of the bluff. Several tributary valleys extend the visible area farther inland.

The critical features in this region are the bluffs at bends in the river. Because the Gorge Region is made up of a series of straight segments connected with gentle bends the outside edge of these bends are visible from more points upstream and downstream than the normal bluff. These areas are analogous to curves in a highway where billboards are frequently placed for high visibility. These areas are therefore very important
areas for visual control

Lake St. Croix - Afton to Stillwater
This region is characterized by a wide expanse of river bounded by generally uniform bluffs. Visibility is generally high throughout the bluff and onto the rim. Special areas again occur on outside bends of the shoreline but to a lesser extent than in the Gorge Region. This region has the highest visibility rating because of the straight and wide character of the river. The width allows visibility to extend farther over the rim.

The Islands - Stillwater to Interstate Park
This region is characterized by a wide valley, many islands, and a meandering river pattern. The visibility pattern is generally one of high exposure of the rim and lesser exposure of the bluff and floodplain. This is a significantly different pattern since the highest visibility does not occur closest to the water. This pattern occurs because the foreground tends to screen the islands and bluff and the rim can be seen at a distance from many different points.

Taylors Falls - Interstate Park to Taylors Falls
The visibility in this region is generally low due to the steep cliffs and the angular river pattern. This does not mean that it is not scenic but only that no area is highly invisible with a large extent of the river. Visual controls in this area should be based upon factors other than visibility.

The general conclusion can be made that visibility is one important factor among many that can help to shape the location and extent of public acquisition and control. The map produced allows for a geographic reference for the various visibility zones. This visibility rating indicates which areas are more critical for acquisition or control. The pattern of visibility for each of the four regions indicates a strategy and pattern for control. Other factors such as land parcel pattern, land cost, physical features, distance from the river, and incorporation limits along with this analysis will establish the final Scenic Corridor in the Lower St. Croix Valley.

FUTURE APPLICATIONS

The VIEW analysis to date establishes the relative visibility of the valley from the river. This is a general, area-wide application of the VIEW technique. A more specific application would be to select a point of interest within the valley and to evaluate its intervisibility with the surrounding river and land. Such an application could be made for proposed highways, utilities, or housing developments.

In addition to the VIEW application, computer-aided studies can be conducted for the St. Croix Valley that would consider other constraints to development such as degree of landform slope, soil suitability, type of tree cover, proximity to existing development and roads, current zoning control,
etc. This would allow for a more comprehensive land use study. The computer framework is established for such an extended study. It would be necessary to add more information to the computer storage and to formulate a set of planning questions to consider.

The computer maps to date are plan views of the valley. Other techniques to consider include aerial perspective views of the valley as it is and with the addition of alternate proposals. Such a display would describe both the location and the character of a proposed development.

All of these considerations suggest means of assessing the implications of development before it is approved. It is assumed that such steps are required to maintain the St. Croix Scenic Corridor.

APPENDIX

The attached maps are samples of the procedure and product of the St. Croix Scenic Corridor Study.
CREDITS

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