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Foreword

Mitchell et al. present guidelines for creating, administering, and promoting a national byways system and discuss many of the issues related to the endeavor. Smith and Smith discuss the following issues: scenic quality, road safety, scenic bypass designation, and scenic bypass signing and information, which are important for a successful scenic byway program. Hoel and Perfater present a description of the scenic byway program in Virginia and discuss the key factors to be included in road design. They also point out that special design considerations and elements are not provided for scenic roads. Sardarov discusses the design of roadways in a museum environment and points out that the approach must ensure coordination not only with the natural but also with the cultural and historical content of the environment.

Suggested Applications by Seaway Trail, Inc., for a National Scenic Byway

TERESA H. MITCHELL, VINCENT J. DEE, AND CHAD DAWSON

The potential for a comprehensive and well-organized national network of designated highways with scenic, historical, cultural, and natural resource values demands attention. Such an expansive character may also require a nomenclature other than "scenic" byways. The guidelines suggested here for creating, administering, and promoting a national byways system have been compiled from Seaway Trail, Inc.,'s 13-year history and its ongoing study of byways on an international scale. Seaway Trail, Inc., promotes the longest national recreational trail in the United States, 454 miles of highway along New York State's freshwater shoreline. The key to a well-organized network of specifically approved highways may be found in a three-level organizational structure with unified standards. Because the highway is the common element linking all state-contained byways, the Federal Highway Administration (FHWA) would appear to be the logical federal agency to oversee a national network. At the state level, offices within the departments of transportation would coordinate consolidated efforts for their own byway systems. Local and regional agencies would have a greater diversity of character, mixing public and private resources for administration, funding, and promotion. A possible organizational structure with responsibilities including establishment of criteria for routes identified for nomination to join the national byways network is outlined in this report. Seaway Trail, Inc., offers its history as an encompassing example of the development and promotional opportunities available to byways everywhere. Signage, safety and environmental impact, and funding and economic impact are addressed, and nine suggestions are made for the creation, administration, and promotion of a national scenic byways system.

A three-level, cooperative organizational structure is suggested for the creation, administration, and promotion of a national scenic byways system. The FHWA appears to be the logical federal agency to head this structure and to establish the criteria by which state-nominated byways would be judged for inclusion in a national network. Standards might be set for safety, design, and highway maintenance, and guidelines suggested for funding, promotion, and ongoing monitoring procedures to assist evaluation and planning.

RESPONSIBILITIES OF ORGANIZATIONAL STRUCTURE

Offices within each state's department of transportation would supervise their own state's consolidated efforts, having established any state-specific criteria for their byway system. These offices would offer technical assistance. Promotion of each state's particular and unique resources would serve to spur greater regional and national travel. Local and regional agencies could then combine this nationally established familiarity—particularly through consistent signage—with statewide diversity to maximize economic growth and community pride.

The outline that follows suggests the basic responsibilities of this three-level structuring.

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Federal Highway Administration

1. Establish criteria for member highways,
2. Review applications for state-nominated byways to join national network,
3. Administer federal funds for projects relating to byways,
4. Act as a clearinghouse for information, and
5. Provide technical assistance.

State Department of Transportation Byways Offices

1. Establish any state-specific criteria for member highways,
2. Review applications for locally and regionally nominated byways to join a statewide byways system,
3. Prepare applications for state-nominated byways to join national network,
4. Administer state funds for projects relating to byways,
5. Act as overseer of statewide signage programs,
6. Act as a clearinghouse of information, and
7. Provide technical assistance.

Local and Regional Agencies

1. Unite public and private resources along a byway,
2. Prepare resource inventory and mapping for byway route,
3. Prepare applications for byways to join statewide byway system,
4. Prepare site-specific signage and facilities,
5. Conduct planning and development studies,
6. Conduct marketing and promotion studies,
7. Conduct ongoing monitoring and evaluation studies, and
8. Develop and publish byways publications and guidebooks.

CRITERIA FOR DESIGNATED NATIONAL BYWAYS

The initial responsibility of the FHWA, with states' input, might be to create criteria by which state-nominated highway systems can be judged for inclusion in a national network of byways. These criteria, and applications by states, might address the following factors:

Physical Design and Safety Standards

1. Logical terminuses (beginning and ending points),
2. Pavement and shoulder widths,
3. Guiderail (self-oxidizing),
4. Geometrics,
5. Landscaping,
6. Utility placement, and
7. Maintenance standards.

Resource Theme Inventory (may include one or more of the following):

1. Outstanding or representative scenic quality;
2. Traversing or connecting historic points of interest;
3. Traversing significant architectural neighborhoods;
4. Traversing important areas of natural resource value;
5. Current or potential thematic development opportunities (e.g., Pennsylvania's Amish country, New York's War of 1812 route);
6. Outstanding or representative parkway (e.g., New York's Taconic Parkway); and
7. Significance as a recreational or tourist route.

Organizational and Funding Resources

1. State level offices
   a. Within departments of transportation and
   b. Funding through grants.
2. Local and regional agencies
   a. Mix of public and private resources and
   b. Funding
      - Grants,
      - Membership, and
      - Advertising income of publications and guidebooks.

Planning and Development

1. To include present and projected plans,
2. Detailing present and projected usage patterns and tourist travel trends,
3. Detailing data-collection procedures and ongoing monitoring systems,
4. Detailing attention to environmentally sensitive areas and fragile sites of historical and cultural significance needing protection, and
5. To include promotion and marketing short- and long-term planning with particular orientation to tourism.

Signage Standards

1. Color coding,
2. Theme coding,
3. Placement, and
4. Maintenance.

Ongoing Monitoring, Evaluation, and Review Standards

1. Nationally consistent procedures;
2. Information to be supplied to state and federal information clearinghouses; and
3. To include safety, tourism, and byway business statistics.

Within these federally established criteria, each state can develop its own resources to encourage travel. Although the greatest percentage of highway travel in the United States is done by families traveling by automobile, attention might also be directed to resources relating to travel by other socioeconomic groups and by other means of transportation (e.g., bicycle, foot, recreation vehicle, and motorcoach. In addition to the enjoyment of travel, its educational value might also be promoted by highlighting historical sites along a byway.

STATE LEVEL RESPONSIBILITIES

A byways office within each state's department of transportation could serve to establish and oversee compliance with any state-specific criteria for highways included in its statewide byways system. This office could review applications submitted by local and regional agencies for routes to join the statewide system and submit them to the FHWA in application to join the national network. The state offices could check locally and regionally prepared resource inventories and mapping for cohesiveness with state and federal byways criteria, provide technical assistance, and act as a clearinghouse of information valuable to both federal and local levels.

LOCAL AND REGIONAL AGENCIES

Local and regional agencies interested in promoting byways will be diverse in their character and resources. Seaway Trail, Inc., offers its format and programs with its 13-year record for consideration.

Seaway Trail, Inc., formed in 1978, is an agency for the development of a national recreational byway. Its 454-mi stretch from Rooseveltown to Ripley in New York State forms the longest National Recreational Trail in the United States.

Organizationally, Seaway Trail, Inc., is a private sector, not-for-profit, 501-c-6 with bylaws, authorizing officers, and a board of directors. The board, composed of one representative from each of the 10 counties traversed by the trail, meets quarterly. A staff of seven administers programs.

Seaway Trail, Inc., has received an annual New York State appropriation since 1986. These funds are administered and reviewed by the New York State Office of Parks, Recreation, and Historic Preservation. The private sector contributes ad-

vertising and membership funds.The highest annual budget figure on record is $700,000.

Physically, the Seaway Trail is a mix of state and county two-lane highways and is recognized for mixed usage by automobile, bicycle, recreational vehicle, motor coach, and vehicles towing boats and snowmobile trailers. It is a greenway offering public access to 38 state parks, 13 wildlife management areas, 37 fishing access sites, and 21 public beaches.

Eight resource themes have been developed to date for the Seaway Trail. These are coastal recreation, history of the coast, people of the coast, natural resources, coastal agriculture, commercial fishing, water-related industry, and international coastline.

A resource inventory conducted by Seaway Trail, Inc., in 1987 collected data for determining possible resource themes for development and helped identify sensitive resources, both natural and manmade, in need of protection. Potential tourism and recreational development opportunities were thus identified and base maps were created for each of the 10 counties traversed by the trail.

Scenically, the Seaway Trail is unique in that for its full length it parallels four waterway systems along New York state's freshwater shoreline: Lake Erie, the Niagara River, Lake Ontario, and the St. Lawrence River.

Historically, Seaway Trail, Inc., has developed a strong War of 1812 theme with 42 well-placed signs along the trail and with site-specific interpretive signage at tourist stops along corridors of travel just off the trail. A War of 1812 guidebook was published, sectioned to correlate with these 42 stops. The Village of Sackets Harbor, found in a corridor just off the trail, celebrates an annual War of 1812 re-enactment weekend festival.

Other guidebooks, published with Seaway Trail, Inc.,'s assistance, feature architectural, geological, bicycling, and lighthouse resources. The Lighthouse Assessment and Tourism Feasibility Study that prompted the Seaway Trail lighthouses guidebook was timed to capitalize on the potential tie-in with the bicentennial celebration of the American Lighthouse Act of 1789.

Seaway Trail, Inc., has developed an ongoing merchandising program that includes paid advertising in regional, state, and national publications and in its own consumer magazine, *Journey*, targeted to a North American audience. A hospitality awareness campaign for image-building has been created using "Ask Me About the Seaway Trail" buttons distributed to private businesses and through Seaway Trail members along the trail.

Cost-effective image building for each scenic byway in the national system could serve to promote travel across the nation. A mix of paid advertising, public relations campaign promotions, and publications can be important vehicles to increase public awareness of resources. Coordination with existing promotion agents might also be helpful. Target market studies can be useful in determining potential markets by geographical, life stage, socioeconomic, purpose of trip, and recreational activity factors. Conversion studies and evaluations might also serve as useful tools.

Seaway Trail, Inc., conducts a continual Tourism Monitoring Study, collecting short- and long-term data. These data include international bridge crossings, boat registrations, fishing licenses recorded, attendance figures for coastal parks, travel and tourism employment statistics, and lodging taxes. This type of study helps identify development opportunities in addition to assessing organizational progress relating to economic improvement.

Other Seaway Trail, Inc., studies include a shoreline analysis, a two-year, trail-wide action plan, and tourism development plans for two cities and one trail sector. The 14-person planning committee for the Tourism Development Plan for the Oswego-Eastern Shore Communities study is an example of the kind of cooperative representation needed at the local and regional level. This committee included members of the governments of two counties, a city's tourism and waterfront departments, two chambers of commerce, a county legislature, mayor's office, state college, foundation, festivals organization, and the New York State Department of Transportation. This committee exemplifies the diversity of individuals and organizations that can work together to promote travel along a byway.

Corridors of travel moving away from the main byway route might be researched for possible development in conjunction with byway theme opportunities. One Seaway Trail corridor augments the coastal recreation theme by encouraging travel to sites of inland fishing, cross-country skiing, and snowmobiling opportunities. The War of 1812 theme draws visitors to more than 40 sites of historical interest off the trail.

SIGNAGE

The single most important factor contributing to a byways system's success might be signage to establish consistent, easily recognized, and high-quality directional information to reassure travelers. Supplementing these guideposts might be well-placed informational kiosks offering travelers sites of specific interest. Color coding might be a means of designating areas as historically, culturally, scenically, or environmentally significant.

The Seaway Trail has more than 1,500 green-and-white trailblazer signs alongs its 454-mi route. There are also 56 informational and display kiosks as well as 42 War of 1812 theme signs. Interpretive signage at specific sites provides travelers with a contact point in areas where staffing may not be affordable. Installation of rest areas providing a variety of facilities such as restrooms, restaurants, information booths, and gift shops might be considered. These could be maintained by the states' departments of transportation, an Adopt-a-Highway sponsor, area chambers of commerce, or local garden clubs.

SAFETY AND ENVIRONMENTAL IMPACT

A top priority as FHWA determines the criteria for highways to join a national byways system will likely be safety concerns. These often go hand-in-hand with addressing environmental impact. Governmental officials could work closely with engineers, landscape architects, and utility companies to balance driver safety issues with environmental impact.

Criteria may address the intrusive location of utilities and excessive signage, which can block driver vision or create distraction. Latitude might also be provided to accommodate pedestrian and bicycle travel. A system for monitoring safety

via police accident reports and routine maintenance checks is recommended with a nationally consistent procedure.

In all likelihood, highways that currently meet the criteria for consideration as a scenic byway will be environmentally friendly. These highways blend with topography, vegetation, landscaping, and architecture. Sightlines are not compromised and nor is scenic value.

These safety and environmental concerns indicate that the FHWA and state departments of transportation may be the best agencies to oversee a byways system. Their access to and expertise with safety studies can correlate several factors and the impact on environment. These studies consider population areas, types of highways, pavement and shoulder widths, signage and other visual distractions, intersections, travel patterns, accident records, and traffic control methods (e.g., lights, signs, and speed limits). This information can also assist with placement of scenic overlooks, rest areas, and possibly even new businesses. Careful and appropriate highway design minimizes the need for guide rail and other barriers and warning or cautionary signage.

FUNDING AND ECONOMIC IMPACT

A carefully balanced mix of public and private funding is suggested to support local and regional byway agency administration. Incentive or local and regional matching fund sources are suggested for new model programs and to spur economic development in recognized economically depressed areas. This would ensure local interest in and commitment to the success of the project. Outright grants of government funds might be directed to proven successful organizations providing user services to the public. Membership dues and advertising income generated by agency publications may be available to provide financial resources as well.

The organizational and informational resources of local and regional agencies can greatly enhance the economic opportunities of businesses located along a byway. Statistical and monitoring studies may provide valuable information on travelers' wants and needs, indicating past patterns and potential opportunities. Access to these studies, correlating economic growth and potential, could directly affect efforts to obtain support from loan institutions traditionally reluctant to support small byway businesses. Local and regional promotion agencies along the byway can also help with cooperative advertising and promotion efforts. Development of off-byway corridors of travel may offer additional funding resources.

CREATION AND ADMINISTRATION OF A NATIONAL SCENIC BYWAYS SYSTEM

The following suggestions are offered:

1. A national byways system might be administered through a three-level organizational structure composed of the FHWA, byways offices within each state's department of transportation, and local and regional agencies.
2. A more appropriate and encompassing nomenclature for a national byways system with scenic, historical, cultural, and natural resource values might be considered to replace "scenic" byways. An active awareness campaign for any system name might serve as a promotional tool.
3. Criteria for judging byways for inclusion in a national system might be established by the FHWA with states' input. Comprehensive resource inventory and mapping could be helpful application requirements.
4. Nationally consistent guidelines for signage programs could be especially important to ensure travelers' directional familiarity and security.
5. An ongoing and nationally consistent procedure for data collection could be established to assist planning and evaluation at all levels of organization.
6. Special attention might be given to developing resources for all socio-economic groups, various modes of transportation in addition to automobiles, and to resources of tourist, recreational, cultural, and historical value in addition to scenic quality.
7. Installation of rest areas of various facilities such as restrooms, restaurants, information booths, and gift shops might be considered.
8. Off-byway corridors of travel might be developed relating to byway themes with an appropriate plan of management.
9. A unity of vision and a spirit of cooperation among private and public individuals and organizations can be encouraged for the purpose of promoting byway travel locally, regionally, statewide, and nationally.

Scenic Byways: Their Selection and Designation

BOB L. SMITH AND WILLIAM L. SMITH

A successful scenic byways program in a state or region should address the following issues, a study of which in the states of Iowa, Kansas, Missouri, and Nebraska is described. (a) *Scenic quality* is measured by the quality of the type of view (panorama, scene, or focal point) and adjusted for ease of viewing. A system on board a vehicle consisting of a laptop computer and a video camera connected to a distance measuring-device is used to collect information about a potential byway. Computer programs provide scenic quality ratings for the route. (b) *Road safety*. Potential byways should be evaluated for driver expectancy violations (potentially hazardous locations) and predicted accidents per mile per year (AOMY). The safety information is collected while driving on the road with an on-board video camera, laptop computer, and distance measuring device. Computer programs produce roadway AOMY from the collected information. (c) *Scenic byway designation*. Summaries of four papers developed for the Federal Highway Administration's 1990 National Scenic Byways Study are included. The topics range from how four states established new scenic byway programs to suggested scenic resource protection techniques. (d) *Scenic byways signing and information*. For those wishing to drive scenic byways, there should be maps and other information listing the location of the byways, their scenic and historic attributes, and amenities such as food, fuel, and lodging. It is essential that the byway be signed so that the user does not inadvertently leave it. The design of a specific scenic byway guide sign is suggested.

A scenic road or byway has roadsides or corridors of aesthetic, cultural, or historic value (*1*). There is a great deal of interest in establishing or designating scenic byways in Iowa, Kansas, Missouri, and Nebraska. The transportation departments of each of the four states and the Midwest Transportation Center, the U.S. Department of Transportation-funded research center for the four-state region operated by Iowa State University and the University of Iowa, sponsored a scenic byways research project at Kansas State University. The research project, "Scenic Byways: Their Economic Benefits/Selection/Designation/Projection and Safety" (Byways Project), was started in August 1989 and the engineering segment (i.e., the selection/designation/protection and safety portion of the project) was completed in October 1990 (*2*).

If there is to be a successful scenic byways program in a state or region, the following issues should be addressed:

- Scenic quality: criteria and methods for assuring some minimum level of scenic quality and doing so in a uniform, consistent way.
- Road safety: criteria and methods for evaluating critical road safety matters.
- Scenic byways definition: nomination of potential byways, appropriate conditions for byway designation, and scenic corridor protection and enhancement.
- Scenic byways signing and information: signing, maps, interpretation of items of interest, marketing a byway, and information needs of the byway driver.

These issues, as well as the research methodology and results, are discussed in the following sections.

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SCENIC QUALITY

Background

In order to achieve consistency in the selection of future designated scenic byways, some minimum level of scenic or historic quality must be promised. It is generally believed that many groups will want their road to be one of the designated scenic byways, primarily because of the perceived economic benefits of byway designation. All groups should therefore be treated consistently relative to designating their road a scenic byway. Some organizations such as a state or local road agency or state byway committee must be able to accept or reject the request for scenic byway designation for a given road. The organizations responsible for designating scenic or historic byways need quantitative criteria to ensure minimum acceptable levels of scenic or historic quality. Quantitative criteria for byway designation (*2,3*) were developed in the byways project, as were methods of data collection and analysis. They are the bases for the following recommended study procedure.

Recommended Study Procedure

The quantitative approach used in the byways project and subsequently recommended for use in selecting and designating scenic byways is summarized in the following paragraph from Smith (*2*) and Smith and Smith (*3*).

> A system consisting of a lap-top computer and a video camera connected to a distance measuring device (DMD) is used on-board a vehicle to collect information about a potential byway. A commentator (usually the driver) describes the following: the type of view (panorama, scene or focal point); the quality of view with a numerical rating from "1" (excellent) to "5" (poor or highly detracting); the quality of presentation based on the relative ease of "seeing" the various views as the road is driven. The views are given a quality of presentation rating from "1"

straight ahead to "5" out the side window; how long (distance) one sees a particular view or element; the types of activities along the road and a 1 to 5 rating of the visual character of the roadway itself. The information from the commentator is stored in the computer using a specially coded and colored keyboard. Certain keystrokes poll the DMD to collect distance, speed, and time. The video camera is panned to record the view being described by the commentator and it captures the verbal comments as well as the instantaneous distance, speed and time.

Quality of View

As noted by Smith (*2*) and Smith and Smith (*3*), and repeated here for clarity, the following quality of view ratings (1 to 5) for each type of view were used:

1. Excellent;
2. Good;
3. Average, or So-So (typically a 3 rating is not identified in driver commentary);
4. Less than desirable—detracts, distracts; and
5. Poor—highly detracting.

Quantitatively, if ratings were to be compared, the following numerical ratings could be used:

Excellent	+2
Good	+1
So-So	0
Less than desirable	−1
Poor—highly detracting	−2

Using this scheme, the quality associated with what is seen as the road is driven could easily be plotted.

As a practical matter, the 1 to 5 ratings were used because the existing basic computer program for handling the data was programmed for ratings 1 to 5, not +2, +1, 0, −1, or −2. Note that as the quality ratings are "normalized" by subtracting them from 3, the previously noted numerical ratings are obtained:

Recorded Quality of View	*Normalized Quality*
Excellent = 1	3 − 1 = +2
Good = 2	3 − 2 = +1
So-So = 3	3 − 3 = 0
Less than desirable = 4	3 − 4 = −1
Poor—highly detracting = 5	3 − 5 = −2

Quality of Presentation

A quality of presentation or display of view rating (1 to 5) for each type of view was used (*2*,*3*). The quality of presentation is based on the relative ease of seeing the various views as the road is driven. As shown in Figure 1, those views that are straight ahead are easiest to see and are therefore given a score of 1. Curving roads offer the most opportunities for presentation ratings of 1. As the road curves, the views straight ahead coincide with the tangents to the curve as the driver moves along the curve. These tangent or straight-ahead views, as shown in Figure 2, are given presentation ratings of 1. Those views that can be seen only by looking out of the side window, the most difficult to see, are given a 5.

Advantages of the Data-Collection System

The collection and recording of information gathered during the evaluation of a potential scenic byway can be very complex and time consuming (*2*,*3*). The laptop computer/DMD/video camera system makes the complex task of collecting and recording the field information a fairly easy one.

In addition to the relative ease of collecting the field data, a further advantage of the computerized system lies in the use of the computer-recorded data for developing a rating number for any road being considered for scenic byway designation. The development of the rating number will be discussed later in this paper.

MEASURING VISUAL QUALITY

A measure of the visual quality of a route can be observed by plotting for each viewed item or event, the normalized quality of the view (3 minus quality of view), adjusted for the presentation quality (the ordinate) versus the distance (the abscissa), over which the item is viewed. A measure of the quality at any point is the total height of the cumulative plot for all viewed items or events, and a measure of the quality of any section of the route is average height of the cumulative plot for the length of section being considered. The quality of view (range 1 to 5) and the quality of presentation (range 1 to 5) for any event (i.e., various items viewed for panoramas, scenes, and focal points) are shown in Table 1. Note that the distance over which the item was in view was also recorded automatically.

In Table 1 the events are listed in order by time of entry into the computer (i.e., the time the view is first seen). Consider the 12th event: the code for the event is 176, the quality of view is 2 (good) (1 is best, 5 is poor, highly detracting) and the quality of presentation is 3 (about 40 degrees left or right of straight ahead) (Figure 1). The view was first seen at a distance of 15,605 ft from the beginning of the route and disappeared from view at 17,406 ft. It was in sight for 1,801 ft. (17,406 − 15,605 = 1,801). The speed at the time of first view was 33 mph and the time was 10 min. 39.6 sec. after the start of the run. The event activity description column shows that the type of view was a scene (*S*) and the item was a vegetation edge. Note that the first letters *P*, *S*, or *F* stand for panorama, scene, or focal point, respectively.

As noted earlier, in order to plot the quality of a view against the distance over which it was seen or observed, the quality of view must be normalized (i.e., subtracted from 3). The normalized quality of view must then be adjusted for its quality of presentation. Recall from Figure 1 that the quality of presentation ratings (1 to 5) (straight ahead to out of the side window) are a measure of the ease of seeing a particular view.

The following are factors that were usually used to adjust the presentation quality:

Presentation Quality	*Presentation Adjustment Factor*
1	1.00
2	0.90
3	0.80
4	0.70
5	0.60

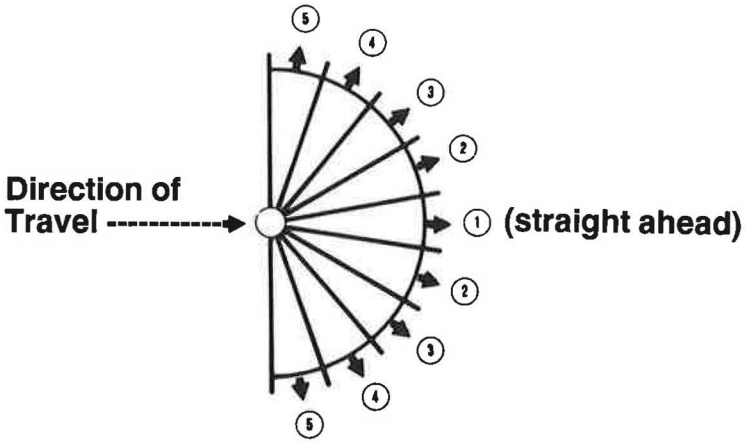

FIGURE 1 Quality of presentation rating scheme.

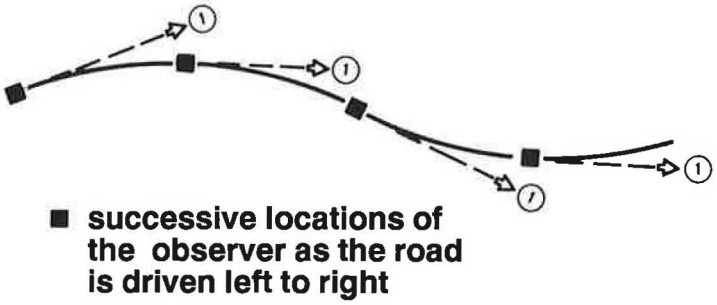

FIGURE 2 Plan view of a curving road showing opportunities for presentation ratings of 1.

TABLE 1 Printout of Data

Event Seq	Note	Event Code	Quality of View	Quality of Presentation	Distance (ft) Begin	End	Speed (mph)	Time	Event Activity Description
001	*	211	2		000000	031281	00	00:01:06:44	Road ribbon = [Shift] 0
002	*	176	2	3	000000	009956	00	00:00:47:56	S:Vegetation edge = t
003	*	152	2	3	001153	001390	2*	00:02:05:03	P:Water = 3
004	*	170	2	3	002827	003224	19	00:03:12:26	S:Cliff/Bluff/Draw/Depression = 4
005	*	170	2	3	003700	004024	3*	00:03:59:36	S:Cliff/Bluff/Draw/Depression = 4
006	*	216			005870	005870	19	00:05:36:93	Parks/Recreation areas = [Shift] 7
007	*	176	2	3	010256	015102	32	00:07:13:05	S:Vegetation edge = t
008	*	172	2	1	011290	012963	7*	00:08:02:69	S:Unique land form = 6
009	*	190	2	1	011415	012890	9*	00:08:12:61	F:Rock, rock pattern = 0
010	*	172	1	1	012976	015906	4*	00:09:08:44	S:Unique land form = 6
011	*	190	2	2	013399	014085	21	00:09:56:14	F:Rock, rock pattern = 0
012	*	176	2	3	015605	017406	33	00:10:39:62	S:Vegetation edge = t
013	*	204	5	5	016856	031281	32	00:11:04:10	F:Man made color/pattern/symbol = .
014	*	182	4	3	017539	019218	18	00:11:19:21	S:Agricultural structures = g
015	*	172	2	1	020607	022105	25	00:12:46:75	S:Unique land form = 6
016	*	170	2	3	021195	021945	8*	00:13:03:17	S:Cliff/Bluff/Draw/Depression = 4
017	*	170	2	3	022161	022356	1*	00:13:51:03	S:Cliff/Bluff/Draw/Depression = 4
018	*	170	2	3	022383	022954	9*	00:14:15:28	S:Cliff/Bluff/Draw/Depression = 4
019	*	172	2	1	024657	027839	25	00:15:23:66	S:Unique land form = 6
020	*	176	2	3	026511	031281	34	00:16:00:66	S:Vegetation edge = t
021	*	172	1	2	027900	029391	28	00:16:28:18	S:Unique land form = 6
022	*	179	2	3	028134	030989	27	00:16:33:53	S:Crops and crop patterns = i

The computations ranging from normalizing the view quality to determining the value of the ordinate and the area for the event (i.e., ordinate x distance) are illustrated in Table 2.

If all the ordinates versus the distance throughout the route are plotted and the areas under the curve are summed for, say, the first mile, the quality rating factor would be the summed area ÷ 5,280 ft.

Computer programs BYWAY PLOTS were developed to plot the view quality, adjusted for presentation, versus distance along the route. These programs allow the user to change the presentation adjustment factors. Other computer programs, BYWAYS, were developed to compute the visual quality rating for selected segment lengths (usually 1 mi) as well as the average rating for the entire route.

The program will plot (Figure 3) each item for which data were recorded. It also plots a summation graph. The plots are helpful in determining, almost at a glance, the elements contributing to very high or very low ratings.

FIELD STUDY DATA COLLECTION

Each of the four sponsoring states was asked to nominate 15 to 20 potential byways for use as study byways in the research project. To assure consistency in the field study, one four-person study team was designated to carry out all of the field work. One person from each state served on the team. The team was responsible for selecting, in each state, five study routes from the 15 to 20 potential byways.

The team also selected approximately 10 mi of each study route for detailed study. A 10-mi sequence of "nothing" route, generally nearby, was also selected for detailed study. This ensured that there would be a fairly wide range in visual quality (i.e., outstanding to boring). A range of visual quality was necessary if the quality ratings were to be meaningful.

The team spent about a week in each state collecting the scenic data on the selected 10-mi segments of the five study routes and the five "nothing" routes. The team also made a safety run on the entire length of each study route. The safety runs will be described later.

ANALYSIS OF FIELD STUDY DATA

The summation or cumulative quality curves (i.e., the quality ratings versus each item viewed) for the study routes and companion nothing routes were originally plotted by hand on highway cross-section sheets. Later the plotting was done using the computer program BYWAY PLOTS (Figure 3). The plots with large areas under the quality curves were of the good-quality routes and plots with small areas were the average and boring routes.

The study team had ranked each route, qualitatively, as outstanding, good, average, or boring. The ratings were recorded when the field survey of each route was completed. The data and plots were spot-checked by viewing the videotapes. The videotapes were helpful in confirming quality and presentation ratings. The videotapes closely simulated being there. The commentary recorded on the tape, coupled with the quality of views and presentation quality of views, enabled the data file to be changed as necessary. It is feasible—although not easy—to make a data file entirely from a video with commentary, distances, and panned views.

The data files were corrected for obvious discrepancies. The editing of the data files was greatly aided by an excellent commercial editing program.

The scenic quality ratings required only minutes for computer calculation and printing, whereas hand calculations required virtually hours and mistakes were quite frequent. For example, Missouri Route 4A was rated outstanding by the team but was a bit low (3.10) in computer-generated rating. An examination of the videotape indicated a substantial number of high-quality views that were missed or were commented on but not rated and entered into the computer.

The likely reason for the missed views is that this route was rated during the second day of the field study and the team was still feeling its way with the commentary-laptop computer system. In one instance a route was rated good by the team but the computer-generated rating was quite low. In viewing the videotape, it was apparent that the route was a good-quality one. The survey team had not given a rating to "road flows with terrain" when in fact the road quality was quite good. The rating change was made in the data file, reanalyzed in minutes, and the new quality ratings were well up into the good area.

The computer-generated quality ratings were calculated for each route and the ratings were compared with the qualitative survey team rating for the routes. Routes with average quality ratings of 4.0 or higher were recommended for scenic byway designation.

Recommendations on scenic quality were as follows:

- The described data collection and analysis techniques should be used for the scenic quality evaluation of a potential byway.

TABLE 2 Sample Computations Using Data from Table 1

Event Seq.	Quality of View	Quality of Presentation	Normalized View Quality	Presentation Adjustment Factor	Ordinate: Normalized View Quality x Presentation Factor	Distance: Begin Dist. Minus End Dist.	Area for Event: Ordinate x Distance
010	1	1	3 - 1 = +2	1.00	+2 x 1.00 = +2.00	2930	+5860.0
011	2	2	3 - 2 = +1	0.90	+1 x 0.90 = +0.90	686	+ 617.4
012	2	3	3 - 2 = +1	0.80	+1 x 0.80 = +0.80	1801	+1440.8
013	5	5	3 - 5 = -2	0.60	-2 x 0.60 = -1.20	14,425	-17,310.0
014	4	3	3 - 4 = -1	0.80	-1 x 0.80 = -0.80	1801	-1440.8

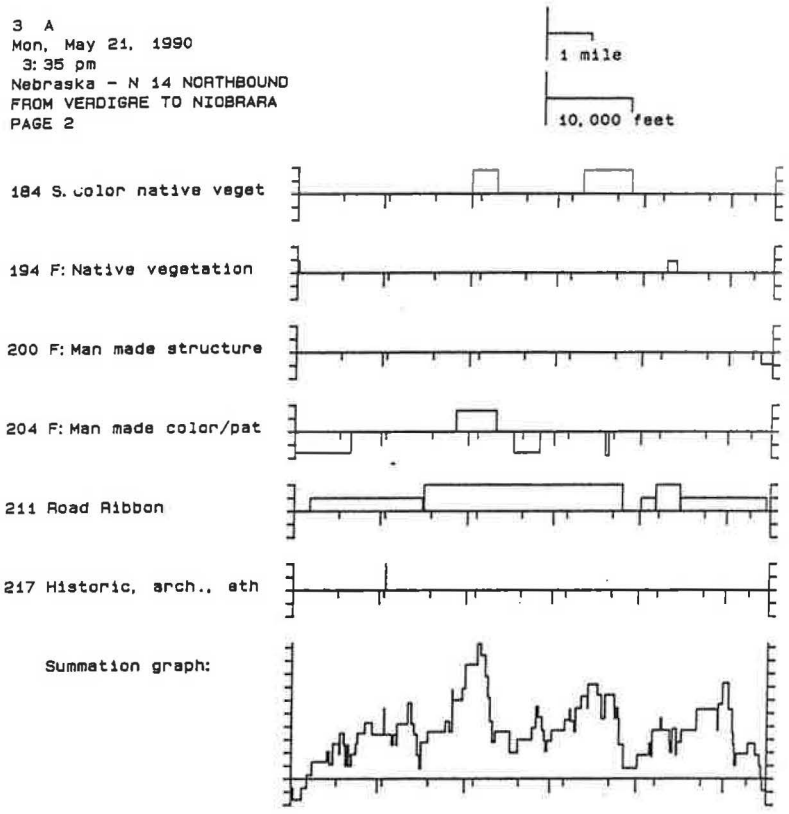

FIGURE 3 Plots for various scenic items (partial listing).

- The route and corridor should be studied before formal scenic evaluation to determine the location of scenic or historic sites or districts and the need for scenic overlooks, turnouts, or selective clearing.

Many of these items will probably be specified in documentation submitted by groups that have nominated a given route for scenic byway designation. This will allow the rating team to anticipate locations in which to use suggested special techniques (*2*) for evaluating historic or ethnic sites or districts and special techniques for turnouts, overlooks, and selective clearing.

- It is recommended that routes with average quality ratings of 4.0 or higher be considered for scenic byway designation. As each state gains experience in byway designation, they may want to adjust the threshold quality rating. Each state should build a data bank of data collected on rated byways and use it for retaining or changing the 4.0 quality rating. The qualitative rating of a route by a good, experienced rating team is an important adjunct to the quantitative rating.

SAFETY EVALUATION

Safety Evaluation Requirements

Before giving any route a scenic byway designation, there should be a safety evaluation of the route. Potentially hazardous locations should be identified and improved as necessary. It will also be helpful if numbers of future accidents are predicted and especially helpful if the effects of changes in traffic volume, shoulder type and width, and other items on estimated numbers of future accidents are determined.

Potentially hazardous locations can be identified using the Expectancy Commentary Driving Technique (*4,5*), commonly called Commentary Driving. During Commentary Driving, drivers state their expectancy for the road and comment on locations that violate this expectancy. Any location that violates drivers' expectancy is a potentially hazardous one (*4,5*).

The prediction of future numbers of accidents can be made using the procedure described by Smith (*2*) and Zegeer et al. (*6*).

Safety Evaluation Procedure

The safety evaluation procedure (*2,6*) was used on five selected potential byway routes in each of the four states. The survey team, driver, keyboard operator, and equipment operator conducted a safety evaluation on the entire length of each route in both directions. The team used the Commentary Driving Technique (*4*) and gathered field data for use in the accident-prediction equation cited by Zegeer et al. (*6*).

The scenic byway equipment (video camera/DMD/VCR/laptop computer) (*2,3*) was used but with different software and computer-key designations.

Analysis of Safety Data

For expectancy violation locations, the analyst will first identify the potentially hazardous locations from the printout of

safety evaluation data. The videotape will be examined at these locations for recorded comments on the nature of the expectancy violation. The video camera should have been panned across the site so that the problem area would be clearly shown on the tape. Following the study of the videotape, it is likely that a trip to the site will be necessary to make a detailed study of the expectancy problem. Contained in Hostetter et al. (*4*) and *Commentary Driving Procedure—A Supplement to the LVR Handbook* (*5*) are sets of helpful worksheets for use in ameliorating expectancy problem locations.

A computer program (BWSAFETY) was developed to calculate the related accidents (i.e., single-vehicle, plus head-on, opposite-direction sideswipe, and same-direction sideswipe AOMY). The program, using the field data recorded via the laptop computer and the section-by-section average daily traffic (ADT) edited via the keyboard will calculate the average AOMY using the accident predictive equation given by Zegeer et al. (*6*). The program, using the field data recorded via the laptop computer and the section-by-section ADTs entered via the keyboard, will calculate the average AOMY as well as the AOMY for each mile of the route. It is expected that a highway agency wishing to use the technique would develop relationships between the predicted AOMYs and that agency's current accident file on similar types of roads. The program allows a number of "what if" games to be played easily and quickly. For example, what if the ADT were to double because of increased traffic caused by byway designation? The ADT could be doubled on each section, thus generating new mile-by-mile AOMYs as well as the average AOMY; the route average ADT could be doubled, giving a new average AOMY for the route. This might be helpful in allaying the fears of a county engineer that designating a county road a scenic byway would rapidly increase the accident rate because of added traffic.

Other "what if" games could be played, such as (a) paving the unpaved shoulders, or (b) widening the roadway by encroaching on the unpaved shoulders (increase lane width while decreasing unpaved shoulder width).

The primary purpose of Zegeer et al.'s accident-predictive equation is to assist in making economic benefit analyses of various road improvements. This allows benefits (i.e., cost savings caused by reduced numbers of accidents) to be compared with the estimated improvement costs.

It should be noted that the accident predictive equation (*6*) was developed for paved roads. It is suggested that the equation be used in the safety evaluations of gravel roads because it is the best accident predictor available. It would be expected that the predicting equation probably underestimates the AOMY on gravel roads.

Safety Recommendations

The following safety recommendations are made:

- The safety evaluation procedure, data collection, and analysis techniques should be used for the safety evaluation of a potential byway.
- Routes that have qualified for byway designation under the scenic quality criteria should have a commentary driving and safety evaluation to identify potentially hazardous locations and related AOMY. A route should be driven in both directions in the safety evaluation because expectancy violations in particular can be considerably different depending on the direction of travel. The commentary driving should be done at typical roadway operating speeds.
- The highway agency, probably the state, should develop relationships between the predicted AOMYs and that agency's current accident file on roads of similar type and volume. Thus a good indication could be obtained from the predicted AOMYs on whether the road is (a) low in number of accidents, (b) about average, or (c) high in number of accidents.

This comparison could work well with the accident-predictive equation in making decisions about whether safety improvements should be made on a route.

DESIGNATION

Nomination of Potential Byways

If there is to be a scenic byway program, then nominations of roads for scenic byway designation can be expected from many groups.

1. Groups or individuals who want their road to be one of the designated scenic byways primarily because of the perceived, and often real, economic benefits of byway designation.
2. The state or a scenic byways task force (private or government entity) could decide it is in the best interest of the citizens to search out, nominate, and designate scenic or historic byways and mark such routes on state maps, as a minimum.
3. There might even be some citizens who have found a lovely scenic road on leisurely sightseeing trip and would like others to know of the route. They would hope that others with similar interests would share their discovered roads so all could easily find the scenic roads in the region.

A well-defined mechanism for receiving and reacting to such nominations should be available.

Byway Designation: Suggested Procedures and Conditions

The Federal Highway Administration (FHWA) under a mandate from Congress conducted a 1990 National Scenic Byways Study. FHWA will use the results of the study in the presentations to Congress on including a scenic byway program in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). A number of case study reports were submitted to FHWA as a part of the 1990 National Scenic Byways Study (*7–12*). Twenty-seven case studies were undertaken and the results are available from FHWA. A summary of *Common Elements of State and National Scenic Byways Programs* (*7*) follows.

Case Studies

How Four States Established New Scenic Byways Programs

State scenic byway programs developed since 1987 in Colorado, Maryland, North Carolina, and Utah are analyzed in this study and the forces that led to their development and shaped their key features are identified. The most successful aspects of each program are highlighted for the future guidance of other states.

In other reports (*8–11*), a number of corridor protection techniques currently in use across the United States are described. A summary of each one follows.

Scenic Resource Protection Techniques and Tools (8)

This study is a primer on scenic resource protection tools for scenic roads. Representative scenic resource protection programs are identified and a range of protection approaches reflecting a broad range of scenic environments are analyzed, developed, and evaluated. The result is an identification of the most effective tools based on broad experience and application.

Protection Techniques for Scenic Byways: Four Case Studies (9)

Devices presently available to protect and enhance historic resources and vistas along scenic byways are identified, described, and evaluated in this study. These techniques involve a wide spectrum of tools ranging from fee simple acquisition to land-use controls. For each of these tools, examples of their application and a determination of their effectiveness are provided. Four scenic roads were selected, based on established criteria. These included the Blue Ridge Parkway in Virginia and North Carolina; Route 75, Sawtooth National Recreation Area in the Sawtooth National Forest, Idaho; Route 5 connecting Richmond and Williamsburg, Virginia; and Route J40, in Van Buren County, Iowa.

Roles of Local Planning Agencies in Programs (10)

Identified in this study are key relationships between local planning authorities and statewide or regional scenic byway programs and informal guidance and information for local planning authorities in support of these programs are provided. Representative scenic byway programs are reviewed as they affect local planning authorities, and key elements are highlighted. Based on these elements, the study indicates effective local planning authority participation in a scenic byway program. Included are an inventory of significant features, scenic corridor preservation and protection management, and related elements.

Creative Landscape Design Solutions in Scenic Byways (11)

Identified in this study are examples of landscape design that accommodate development while enhancing scenic highway environments. Described in the study are design and planning considerations that can help scenic road planners incorporate creative landscape design solutions in scenic byways. Effective landscape design approaches for scenic byways are those that enhance positive and mitigate negative scenic values. Case examples reviewed include Arkansas SH 7 (Harrison to Hot Springs); U.S. 285 (Morrison, Colorado, to Taos, New Mexico); the Colorado Peak-to-Peak Highway (Estes Park to Central City); Oklahoma/Kansas Prairie Route (Pawkuska to Manhattan, Kansas); Texas Seawall Boulevard in Galveston; Texas Hill Country (U.S. 281–290); and Vail Pass (I-70, Dillon to Vail) in Colorado.

Signing and Information

Those who purposely drive scenic byways do so for the pleasure of recreational driving as opposed to trying to get from one point to another.

There are two general categories of scenic byways users, sometimes called byway recreationists:

1. Those who want to find scenic roads in their region for weekday or weekend pleasure driving; and
2. Those who would like to plan a cross-country trip with all or portions of the trip on scenic byways.

These drivers need the following information:

- Road map or guide showing the location of scenic byways;
- Information about the route's scenic, historic, cultural, geologic, vegetative, and other attributes and their level of excellence;
- Whether the road has a paved or gravel surface and how smooth the surface is;
- Whether the route is operational all year or closed in the winter;
- Whether it is suitable for all vehicles or whether larger recreation vehicles or tour buses are excluded;
- Whether it requires a 4-wheel-drive vehicle (there are probably not many such roads in the four-state region for which the study was made).
- What amenities are available along or near the route (e.g., food, fuel, lodging—especially bed and breakfast inns—and historic sites or districts).
- The user will assume that the road is safe enough for reasonably prudent drivers and will expect adequate signing with no expectancy violations, even for a stranger to the road.

Additional Comments

It may not be sufficient to simply mark the byway on a map or brochure. The user must be able to find the route on the map or in the brochure and must be able to locate it while driving in unfamiliar country. Trailblazers could indicate the way to the byway and the beginning of the byway should be marked. The route itself should be clearly marked so that once drivers are on it they do not inadvertently leave it. The end of the route should also be marked and trailblazers placed to help strangers return to major roads. One Byway Project

FIGURE 4 Proposed scenic byway sign.

Advisory Committee member suggested that the mile marker symbols could be little replicas of the scenic byways signs.

Stated on the brochure or map should be the length of the route, surface type, restrictions to travel, and so on, but it should be borne in mind that not everyone gets on the route by preplanning and those who do may not have the brochure or map handy. These may have been left at the last gas stop or in a suitcase in the trunk. In any case, information about the route, any restrictions, its attributes, and so on, should be provided at the beginning of the route by sign at a pullout or by radio. One group promoting the San Juan Scenic Byway in Colorado has prepared an audiotape as a part of their byway marketing program.

If the route restricts the use of larger vehicles, be certain that there is a properly designed and marked turnaround area for such vehicles.

For an excellent brochure on these subjects, see *Utah Scenic Byways and Backways* (*12*).

In a July 1990 conference a consensus was reached, as follows: a nationwide byway sign should have a common background, shape, and other characteristics. Such a sign should meet generally accepted criteria for target value and conspicuity. Each state should be able to contribute its own design to some portion of or supplement to the nationwide byway sign. It is important that a scenic byway sign be immediately recognizable as such. It would be highly desirable if scenic routes and historic routes could be distinguished by a variation in the logo. The authors urge the four states, Iowa, Kansas, Missouri, and Nebraska, to develop one basic logo that is acceptable to all of them (*2*).

Thanks to Joe Mickes, Missouri Highway and Transportation Department, there is a prime candidate: a print of a sign proposed for Missouri's adoption (see Figure 4). Note that Missouri's state bird and flower are depicted. A similar procedure—to use the state bird and flower but leave the rest as it is—could be followed in each state.

Summary

During the byways study, it was tacitly agreed that scenic byway designation of a road would probably be made only after its nomination by some group with a special interest in the road. A primary impetus for developing the quantitative techniques for evaluating byway scenic or historic quality was to ensure that all requests for byway designation be evaluated in a uniform, consistent way to ensure a minimum level of scenic quality. The following recommendations are based on the assumption that a state agency such as the highway department, or perhaps a scenic byways task force, would make the final decision on whether any route receives scenic byway designation.

Suggested Process

The following procedures are suggested:

1. The designating agency should develop criteria and a process for scenic or historic byway designation and also for de-designation if the resources of the corridor are compromised or destroyed. The agency would make the information available to local groups and would provide guidance in preparation for scenic byway designation requests. The criteria should include scenic or historic quality requirements as well as the requirement of a management plan for protecting the resources of the byway after designation.
2. On the basis of the designated criteria, the local group nominating a byway (nominators) would prepare preliminary documentation in support of the route. This should include the description of scenic or historic elements and a proposed resource-protection management plan.
3. The designating agency should review the preliminary request in a timely way. At this time a formal scenic quality study using the procedures described earlier should be made to determine whether the scenic quality rating meets a threshold quality level of, say, 4.0.

If the quality rating does not meet the requirements and there is apparently little that can be done to raise the quality rating or level—for example by cleaning up or screening eyesores, clearing trees for vistas, or providing scenic overlooks—then the designation process would stop. The road would not be designated a scenic byway. The process to this point would be relatively inexpensive to both the nominators and the designating agency. If the quality rating did not meet the requirements but the potential was there for improving the quality to meet them, the designating agency should inform the nominators of the likely effort needed. At this point the designating agency should assist the nominators by suggesting improvement or enhancement techniques, funding sources, or other ways to accomplish the needed improvement. At this point the nominators could decide to continue to pursue designation or withdraw the application.

If the quality was acceptable, or could be made acceptable as noted in the preceding paragraph, then the process would move to the next stage.

4. At this stage the nominators must decide if they can or still wish to implement the required local management plan to protect the scenic and historic resources of the nominated byway.
5. At about this stage in the sequence, a safety study of the proposed route should be made. If the road is local, a safety study should probably have been made just after determining that the scenic quality requirements were met. The costs and methods of financing any necessary safety upgrading could

determine whether the nominators choose to continue to work for byway designation.

6. Assuming that the project continues, a guide signing system should be developed clearly showing that the road is a scenic byway. The costs, who will bear them, and who will design the sign system are important considerations.

7. A byway marketing plan is now necessary. As a minimum, the potential byway user

- Must be informed of the existence of the route,
- Must know enough about the route and its quality and amenities to decide to drive or not drive it, and
- Must be able to find the route and stay on it until deciding intentionally to leave it.

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Designing Scenic Byways in Virginia

LESTER A. HOEL AND MICHAEL A. PERFATER

Presented in this paper is a description of the scenic byways program in Virginia, which was initiated in 1966 and by 1990 consisted of 629 mi of designated roadway in 28 counties. Included is the legislative definition of scenic byways and the procedures used by the Commonwealth in designating certain roads as scenic. The key factors to be included in road design and the principal elements considered in the design process are examined in this paper. Also discussed are existing design standards, including American Association of State Highway and Transportation Officials guidelines, Transportation Research Board studies, and Federal Highway Administration requirements. It is pointed out that although Virginia has adopted an approach for geometric standards similar to that recommended in Transportation Research Board *Special Report 214: Designing Safer Roads*, special design considerations and elements are not provided separately for scenic roads. A team approach (that includes traffic, highway, and landscape professionals) is recommended in this paper to ensure proper implementation of a design process for scenic byways.

Virginia has a program that provides for the designation of certain scenic roads as a "Virginia Byway." This program does not require the application of any special technical requirements for these roads to be designated, maintained, or modified.

Presented in this paper are the results of a study designed to determine whether special design considerations should be required for Virginia byways by virtue of their use, and if so, what highway elements would be affected if special design considerations were found to be appropriate. The study also considered the degree to which current standards provide for special design considerations. The scope of the study was limited to roads that meet the criteria for designation as Virginia byways (i.e., roads with a low traffic volume and a low speed limit that also have a particular aesthetic, historic, or cultural value). The design elements considered were restricted to the travelway and the adjoining right-of-way.

In 1964, the Virginia Outdoor Recreation Study Commission was formed. In 1965 it published a report entitled *Virginia's Commonwealth*, which recommended the establishment of a long-range outdoor plan and a state scenic roads network. The General Assembly considered the recommendations of the commission and enacted legislation, including the Virginia Byways Act. Unlike the proposed federal scenic roads system, the legislation imposed no restrictions on existing land use, as is evidenced by the following excerpts.

> *S.33.1-62 Designation.* The Commonwealth Transportation Board is hereby authorized to designate any highway as a scenic highway or as a Virginia byway. This designation shall be made in cooperation with the Director of Conservation and Historic Resources. Prior to designation, the local governing body and the local planning commission, if any, in each county or city wherein the proposed scenic highway or Virginia byway is located shall be given notice and, upon request by any of the local governing bodies, the Commonwealth Transportation [Board] shall hold a hearing in one of the counties or cities wherein the proposed scenic highway is located. (Code 1950, S.33-43; 1966, C.11;1970. c.322; 1974, c.739).
>
> *S.33.1-63. "Virginia Byway" defined; preference in selecting.* For purposes of this article, a "Virginia Byway" is defined as a road designated as such by the Commonwealth Transportation Board having relatively high aesthetic or cultural value, leading to or within areas of historical, natural, or recreational significance. In selecting a Virginia Byway, the Commonwealth Transportation Board and the Director of Conservation and Historic Resources shall give preference to corridors controlled by zoning or otherwise so as to reasonably protect the aesthetic or cultural value of the highway. (Code 1950, S.33-43.2; 1966, c.11; 1970, c.322; 1984, c.739.)

The legislation did not specify standards or criteria to be applied in the selection of scenic byways. The Commission on Outdoor Recreation (now the Virginia Department of Conservation and Recreation [VDCR]) developed selection criteria and procedures, which were adopted by the commission in December 1972 and by the Virginia Highway Commission in January 1973 (*1*).

CRITERIA AND PROCEDURES FOR DESIGNATING A VIRGINIA BYWAY

Virginia contains approximately 629 mi of officially designated byways located in 28 counties (Table 1). In order to be considered for designation as a Virginia Byway, a segment of road must substantially meet the test of the following eight criteria (*1*):

1. The route provides important scenic values and experiences;
2. There is a diversity of experience as in transition from one landscape to another;
3. The route links together or provides access to significant scenic, scientific, historic, or recreational points;
4. The route bypasses major roads or provides opportunity to leave high-speed routes for variety and leisure in motoring;
5. Landscape control or management along the route is feasible;
6. The route is susceptible to techniques to provide for user safety;
7. The route contributes to good distribution within elements of the Virginia byway system; and
8. Preference shall be given to those corridors with controlled (or other) zoning so as to reasonably protect the aesthetic or cultural value of the highway.

L. A. Hoel and M. A. Perfater, Virginia Transportation Research Council, Box 3817, University Station, Charlottesville, Va. 22903-0817.

TABLE 1 Virginia Byways

Date of Designation	Route	County	Length (Miles)
1974			
June 20	193	Fairfax	12
August 21	5	City of Richmond, Henrico, Charles City, James City, City of Williamsburg	54
1976			
August 19	20	Albemarle	17.0
August 19	6	Albemarle, Nelson	35.0
August 19	151	Nelson	18.0
August 19	56	Nelson	18.0
1977			
January 27	39	Rockbridge	20.0
October 27	39	Rockbridge, Bath	36.0
1979			
June 21, 1979	623	Tazewell	10.0
July 14, 1979	723	Frederick, Clarke	10.0
1983			
December 17	250	Albemarle, Nelson	17.0
September 15	802, 245, 626	Fauquier, Culpeper	25.0
1986			
May 15	785	Montgomery, Roanoke	18.0
1987			
January 15	6, 650	Henrico, Goochland, Fluvanna	60.0
January 15	130	Amherst, Rockbridge	32.0
July 16	601, 676, 614	Albemarle, Orange	11.0
November 19	20, 22, 231	Albemarle, Orange	36.2
1988			
May 19	15, 665, 662, 719, 704, 690, 734	Loudoun	71.0
August 18	231	Orange, Rappahannock, Madison	39.0
1989			
July 20	659	Halifax	16.0
1990			
February 15	617, 673, 711	Chesterfield, Powhatan, City of Richmond	25.0
May 17	624, 652, 621, 633, 620, 652, 655, 628, 622, 627, 608, 612, 626, 255	Clarke	37.5
May 17	606, 628, 641, 647	Rappahannock	11.0

VDCR and the Virginia Department of Transportation (VDOT) are jointly responsible for designation of scenic byways. First, a study of a potential Virginia Byway is initiated, which either implements the Virginia Outdoors Plan or responds to a request from a local governing body. Second, an onsite inspection of the route is made by VDCR and VDOT to determine if it meets the previously listed criteria. Third, a resolution or other assurance is then requested from the local governing body that states their interest in being granted a scenic designation.

If the criteria for designation appear to be met, then each agency has specific responsibilities for coordinating with other organizations and localities; requesting approval for designation; and finally for conducting annual inspections of maintenance and improvements. The responsibilities of each agency are as follows:

- VDCR coordinates with VDOT, the Virginia Outdoors Foundation, and other appropriate state agencies to determine the location and significance of historic sites or other natural resources in close proximity to the corridor in question.
- VDCR ascertains whether local zoning and comprehensive planning programs of the locality and the planning district commission in which the road proposed for designation lies are consistent with the management objectives established for Virginia byways.
- VDCR recommends to the Commonwealth Transportation Board through the Commissioner of the Department of Transportation that the proposed road or road segment be designated a Virginia Byway.
- The Commissioner's office submits the proposal for byway designation to the Commonwealth Transportation Board for their action.
- Once the Board takes action on the designation request, VDOT advises the Director of the VDCR of that action.
- VDOT works with local governing agencies to achieve its objectives. When the road is designated as a scenic byway, VDOT conducts annual inspections of the maintenance of and improvements to the route.

The characteristics of scenic byways considered in this study are derived from the wording of the legislation that created Virginia's scenic byways (*1*).

> The route bypasses major roads or provides opportunity to leave high-speed routes for variety and leisure in motoring and the route links together or provides access to significant scenic, scientific, historic or recreational points.

Thus, scenic byways are low-speed, low-volume roads that serve as alternative routes among or to points of interest. The legislation requires that the designated roads "substantially meet the tests" of the eight criteria listed previously, but they do not have to meet all of them (*1*). Thus, even within the limited scope of this single program, there will be a variety of types of scenic road.

KEY FACTORS TO BE CONSIDERED IN DESIGNING SCENIC BYWAYS

Design is only one element of the scenic road picture (*2*). The road itself is a necessary, although not sufficient, condition for a scenic byway to exist because without it there would be no vehicular traffic. Scenic byway enthusiasts often take the roadway for granted while concentrating on other issues such as aesthetics, easements, and economics. Scenic byways can be viewed as ordinary roads in extraordinary settings deserving of no special engineering consideration in themselves, or as roads that deserve special consideration by virtue of their form and function in order to ensure that they serve their intended purpose well and safely.

Four factors need to be considered when scenic byways are being designed: (a) the driver, (b) the vehicle, (c) trip purpose, and (d) the potential for conflicts with nonmotorized transport. It is the combination and uniqueness of these factors that causes scenic byways to differ from other low-volume roads in the state.

Drivers

If the scenic byway is a leisurely paced alternative to a high-speed major route, most through commuter and commercial traffic will usually select the major route, and some vacationing visitors will select the byway route. Although differences in the demographics of the driver population on scenic roads are likely (e.g., older drivers tend to travel on weekdays during the school year, whereas younger drivers travel on weekends), the major difference among the driver population is their familiarity with the road. The first-time visitor typically does not know what lies ahead with grades, clearances, passing zones, and other features of the road, whereas a driver who lives in the area will be accustomed to the route. The familiarity issue does not tend to be as prevalent on primary routes because roads within this system are fairly consistent in their design. On scenic roads, however, the familiarity issue can be major because these roads often tend to vary significantly in design, use of signs, geometrics, and speed limits.

Vehicles

The increasing popularity of recreational vehicles, both self-propelled and towed, also has implications for scenic road design. The increased eye height of the driver provided by most of these vehicles benefits sight distance, which helps the driver who may be unfamiliar with the route. However, the difficult geometry often encountered on scenic roads can provide some degree of difficulty to the oversized recreational or tourist vehicle. Narrow lanes and bridges, hairpin turns, low or unpaved shoulders are often extremely difficult for such large vehicles to negotiate. Although the low-speed limits and indirectness of the routes tend to cause trucks to avoid using them, the same avoidance cannot be expected from tourists, no matter the size or type of vehicle in which they are traveling.

Purpose of Trip

Many travelers on a scenic byway will be driving specifically to enjoy the trip and the environment. These travelers typically wish to travel at a speed that enables them to comfortably view the features that make the route scenic or historic. Thus, periodically, drivers on scenic roads will tend to divert their attention from the road itself to these features; however, sightseers traversing the scenic byway at a leisurely pace are usually not the only travelers on the road. Because scenic roads are not classified as parkways (except in a few instances), they are are not functionally restricted and thus must also serve motorists who use them for access to homes, farms, and commercial centers. It is these conflicting trip purposes that can cause difficulty for both the nontourist and the tourist driver. The nontourist or local driver wants to travel without incurring excessive delays created by tourist traffic and without being subjected to artificially low speed limits that are created for tourist traffic. On the other hand, the tourist driver wants to travel at a leisurely pace and is often focused on the scenic corridors rather than getting from one point to another quickly.

Conflicts With Nonmotorized Transport

In urban settings, the planner primarily seeks to eliminate conflicts between vehicles as well as those between vehicles and pedestrians. On scenic byways, especially those in rural settings, the conflict tends to be between vehicles and bicycles, farm equipment, and logging and coal trucks. Although such conflicts can be found on all rural roads, they tend to be even more prevalent on scenic roads. These conflicts are difficult to resolve because additional investments in shoulders, bicycle paths, sidewalks, and pedestrian overpasses may be required. As a minimum, lane striping and warning signs may be used.

DESIGN ELEMENTS FOR SCENIC BYWAYS

Scenic byways appear to represent a special category of road and thus warrant special design considerations that must be translated into substantive design elements. There is no single or unique set of design considerations suitable for all scenic roads. Each road must be evaluated individually, and the design considerations must be translated into elements that

are appropriate and practical. The principal elements planners should consider are as follows:

1. *Informational signage*. Signs that furnish information to visitors on scenic byways should be consistent and adequate. Informational signage on newly constructed Interstate and arterial highways is usually adequate and follows established guidelines; however, it is often nonexistent on old (especially historic) roads, where complete and accurate information is especially important. Also, in view of the fact that a significant proportion of scenic road users are older drivers, special attention to letter size and brightness is needed.
2. *Oversized vehicles*. The size of vehicles traversing the road will influence design features such as lane and shoulder width, pull-off design, and passing opportunity, because these vehicles are wider, have less power for acceleration, and have a tendency to off-track on short curves. Even though sight distance might be enhanced by the increased eye height of the drivers of oversized vehicles, if roadway cross section or grades are difficult, it may be necessary to restrict access to certain scenic roads or sections of them to classes of vehicles that can maneuver on them safely. Roads that carry such restrictions would have to be identified and signed accordingly.
3. *Suitability of the road for the purpose of the trip*. To allow the driver to achieve the purpose of the trip, that is to enjoy the features that render the road scenic without sacrificing safety, certain design considerations appear necessary. Posted speed limits appropriate for the road geometries, pull-offs, passing opportunities, overlooks, and clearing of vistas are important elements to consider. Historical markers, area information signs, and other items that contain written material should be placed where there is sufficient room for drivers to stop and read the message without interfering with moving traffic.
4. *Bicycles and pedestrians*. It is especially difficult to accommodate nonmotorized traffic on many low-volume historic or scenic roads with narrow lanes; low, unpaved, or narrow shoulders; and limited sight distances. In the case of Virginia Byways, it is often not practical economically or aesthetically to widen lanes and add shoulders. Although the need to accommodate pedestrians, bicycles, and farm equipment traveling on scenic roads is universally recognized, the appropriate design elements to do so are very much a matter of debate.

ADOPTION OF DESIGN STANDARDS IN VIRGINIA

Geometric design standards are provided in VDOT's *Road and Bridge Standards* (*3*), which is based on the American Association of State Highway and Transportation Officials' (AASHTO) design guide, *A Policy on Geometric Design of Highways and Streets* (*1984*) (*4*). The AASHTO guide (referred to as the Green Book) is the nationally recognized and accepted standard for new construction or reconstruction of highways. These standards are particularly appropriate for major reconstruction projects of existing roads.

The difficulty with the application of these standards to both scenic byways and other existing roads became clear at the time the Federal Highway Administration (FHWA) authorized the use of Federal-aid funds for resurfacing, restoration, and rehabilitation (RRR) projects in 1983, Part 625 of Title 23 CFR (23 CFR 625) was revised to permit the use of lessor standards if these standards had been developed and adopted (47 ER 25263). Reconstruction had long been authorized with these funds. States found they could ill afford to use Federal-aid funds for RRR projects because of the requirement that the entire project would have to be brought up to current design standards if such funds were used. Because current design standards are employed for new construction projects, the aforementioned requirement created a situation in which relatively minor repairs or improvements had to become major reconstruction projects. What many states did was to use their own funds and apply Federal-aid funds to other highway projects.

The nation's state transportation officials, the FHWA, and Congress were aware of the difficulties generated by the RRR funding requirement. In 1977, AASHTO published the so-called Purple Book of RRR standards, which were opposed by safety organizations and the FHWA Office of Highway and Safety because they were considerably less stringent than AASHTO policies for new construction. Consequently, they were never adopted. In 1978, the FHWA proposed a more conservative set of RRR standards (*5*), which again were not adopted. In the 1982 Surface Transportation Assistance Act, Congress directed the National Research Council to examine the question of appropriate standards for RRR projects. This work was performed by the Transportation Research Board (TRB) and was published in 1987 as *Special Report 214*, *Designing Safer Roads* (*5*). Examined in the TRB report were the safety implications of a series of design elements and an approach was proposed that maximized the cost-effectiveness of investments in road improvements. In many respects, the standards recommended in *Special Report 214* are modifications of the proposed 1978 FHWA standards. Two findings brought forth in the TRB study are relevant for Virginia: (a) it was stated in the TRB study that the standards are not absolute and that every project must be examined on its own merits, and (b) the threshold for the low-volume (or more exactly, the lowest-volume) road category was raised from 400 to 750 average daily traffic, thus more mileage of rural and scenic roads became included in this category in Virginia. Recommended in the TRB study were minimal standards for low-volume roads and higher standards for higher-volume roads, on the principle that investing in improvements that will enhance safety on high-volume roads is most cost-effective.

The FHWA had consistently been able to grant exceptions to standards where justified on specific projects, and as early as 1983 had suggested to officials in each state that they propose (for FHWA approval) special standards for RRR projects in their state. In October 1988, the FHWA issued a technical advisory on the subject of RRR standards (*6*). This advisory promulgated what is, in effect, a condensed version of the TRB report (*6*). It suggested to the states that they adopt one of the following courses of action for RRR project standards: (a) the states could continue to use new construction standards, (b) they could adopt the standards contained in the technical advisory, or (c) they could propose different standards.

In Virginia, until recently, the principal design criteria applied to rural low-volume roads were based on traffic volume, roadway width, and surface type. Highway geometrics were taken into account when repairs or improvements were being considered (*1*) and had been applied subjectively by VDOT inspectors on minor projects and by the project engineer on major projects. In December 1988, however, VDOT appointed a committee to look into the question of appropriate standards for RRR projects. This group met regularly and proposed that a set of standards similar to those in the TRB report be adopted. They went into effect on June 1, 1990.

CONCLUSIONS

In order to serve their purposes safely and effectively, scenic byways require consideration of a number of operational characteristics. These characteristics include the presence of a significant segment of drivers who are unfamiliar with the road, a high proportion of over-sized vehicles, and the desire to travel at leisure and take in the features of the road that classify it as scenic. These characteristics can be dealt with (or addressed) by the inclusion of specific design elements, such as wider-than-normal lanes on tight turns, paved shoulders, overwidth shoulders for safety pull-offs, increased passing opportunities, special informational signage, and appropriate posted speed limits.

Neither the special characteristics of these roads nor the respective design elements that address them are provided for in the standards currently used for construction, improvement, or analysis of scenic roads by Virginia. Further, no current state or federal scenic roads program addresses the design and evaluation requirements for a scenic byways program such as Virginia's.

Regarding geometric standards for low-volume scenic byways, the RRR standards contained in *TRB Special Report 214* are relevant to such roads undergoing minor improvement. When any road is improved, if it conforms to these standards, it is also considered adequate for the given level of service, volume, speed, and truck mix. Similarly, an existing road segment that meets the same RRR standard is considered adequate and acceptable. However, not every road or every scenic byway must be evaluated in terms of RRR standards. Nonetheless, the TRB study is an appropriate reference for those evaluating a road segment with special design considerations in mind or if standards for certain geometric and cross-sectional factors are required.

RECOMMENDATIONS

The following recommendations were presented to VDOT management regarding the design of scenic roads in Virginia (*8*).

> The special design considerations described herein should be taken into account in the analysis, evaluation, modification, or maintenance of existing or proposed Virginia scenic byways. To ensure proper implementation, traffic engineers, planners, and design engineers involved in evaluating, planning, and designing Virginia's scenic byways should be instructed as to what these considerations are and how specific design elements that deal with them should be employed. VDOT procedures should require the input of landscape architects when changes to the road or roadside are contemplated on a designated scenic byway. This requirement need not restrict the responsible engineer from making needed changes or improvements, but it will ensure that preferred alternatives from an environmental/scenic view perspective are considered.
>
> Special informational signage should be used to inform visitors in advance about both upcoming scenery and the characteristics of the road itself (i.e., geometrics, grade, speed limit, surface conditions, etc.)
>
> The RRR standards recently implemented by VDOT should be examined by other states as to their usefulness as a tool for the evaluation of existing scenic roads. They could be used as the standard for scenic byways and modified as necessary to reflect special design considerations that may arise.
>
> In late 1990, the FHWA released 26 case study summaries from a National Scenic Byways Study. These reports became available subsequent to completion of the Virginia study. Since several of them appear to contain information that could be relevant to Virginia, they should be reviewed by those involved in work on Virginia's scenic roads program.

ACKNOWLEDGMENTS

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The opinions, findings, and conclusions expressed in this report are those of the authors and not necessarily those of the sponsoring agencies.

Road in the Museum Area

ARMEN S. SARDAROV

The design of roads in a museum environment with its historical image requires that attention be paid to some specific features. Experience with this kind of work in the Byelorussian ethnographic park showed that it was necessary to study not only the natural environment but also the historical regional principles of road design and the formation of the road's environment. The alignment of the road was designed both in correlation to its profile and as the borderline corresponding to some landscape forms, for example separating the cultivated plots of land. Use was made of the historical types of pavements, planting, and installation of traditional road signs. The investigation shows that the environmental approach must ensure coordination not only with the natural but also with the cultural and historical context of the environment.

A folk architecture and life park museum is being created at the present time not far from Minsk, the capital of the Republic Belarus. It is an ethnographical open-air museum in the tradition of the Scansen Park in Sweden. Original country buildings, articles of everyday life, and masterpieces of applied art are being brought from different regions of Belarus to this museum.

Because of the deficit of well-organized recreation zones around Minsk and in proximity to the center of the city (30–40 minutes away by automobile), this place will be of interest to both citizens and tourists. After the declaration of independence, Belarus is seeking a national identification with its traditions of folk art and everyday life.

With the historical expansion of Russia and Poland, Belarussian national culture was mainly preserved in a conservative rural environment. It influenced the special attention paid to the development of the territory by governmental and nongovernmental circles.

The park area adjoins the Minsk circle highway (3 miles away) and has access to it throughout a local road. The amount of traffic on the circle road is high (according to local standards) and amounts to 10,000 to 12,000 vehicles per day. The local road serves only a small dwelling area in the suburbs of Minsk and some industrial and trade storehouses. Approximately 1,000 vehicles per day travel on the local road.

An access road in the museum area connects the local road with the entrance to the museum. The museum territory consists of 370 acres. On these grounds will be grouped old buildings of mainly wooden construction with intervals of 200 to 300 yd between each group. This grouping is based on the principle of correspondence to the scientifically adopted subdivision of Belarus. There are six of such zones.

After the principal plan of the territory development had been designed, specialists in landscape architecture in the field of road design were engaged for the project (Institute Belremdorproject, Architectural and Landscaping Design Bureau).

The purpose of landscape design in the park area was to

1. Create the design for an access road,
2. Design a parking zone,
3. Create the design of roads for mixed use (for pedestrians and sporadic automobile traffic),
4. Design roads between the groups of buildings,
5. Introduce plantings, and
6. Create some landscaping.

The work was divided into two main aspects: first, the special landscape character of the roads had to be designed and the roads fitted into the existing and future landscape; second, the design of the roads had to be correlated with the historical image of the whole territory. Both aesthetic and historical criteria will determine the future visual qualities of the museum area. The museum environment must serve the purposes of knowledge and recreation.

HISTORICAL OBSERVATIONS

Study of the road's history in Belarus made it possible to specify certain features of its genesis. Organized construction of roads had been carried out sporadically since the 17th century. This process was influenced by the events in Europe, mainly in France and Poland. Before this period, roads had only been kept in condition or repaired. Since the 16th century, road maintenance was included in the juridical state documents (statutes) and feodals were obliged to supervise the process. The width of main roads was juridically determined to be the same as "a width of two big carts."

The principal road network was formed during the centuries as a communication system between big cities: Grodno, Wilno, Polotczk, Vitebsk, Orsha, and Mogilev. Road repair meant filling in holes, cutting through bushes and woods, and laying of logs in boggy places. Roads do not dominate the landscape by their embankments or cuttings, they follow the main forms of relief by a "wrapped line."

In the 16th century, stone pavement appeared in some sections of streets in big cities and across the main road settlements. The application of this technique became widespread because of the availability of a large number of boulders of glacial origin. The technique was used until the third decade of the 20th century (Figure 1).

Road plantings played an outstanding role in the history of the road. Plantings have been widely used since ancient times as a means of marking roads (especially in snowy conditions).

Architect and Landscaping Design Bureau, Belremdorproject Institute, Bronevoi per.d.4,kv.24, Minsk 220034, Republic Belarus, Russia.

They were also used for drainage of wet places and, especially after the Renaissance period, for decorative purposes. Avenues of birches, oaks, pines, and fir and lime trees were planted on the approaches to cities, roads leading to residencies of the aristocracy, and churches and monasteries (Figure 1).

Sacred and ritual traditions also influenced the roadsides. Christian crosses or small chapels (Kaplitchka) were erected on the crossroads, road forks, and at the approaches to settlements. As places of worship and prayer, they were also special kinds of road signs used for marking specific places and their form served this purpose well (Figure 2). Crosses had stretched proportions and large height and the chapels were usually painted white. Sometimes there was a small space inside the chapel where a carved statue of Jesus was placed (Figure 3). Most of these monuments were destroyed during the communist period.

There were some special traditions in the alignment of country roads. In many cases roads appeared as borderlines between settlements and cultivated land (Figure 4). Some roads followed the river coastlines. Heaps of stones gathered from the fields were placed along the roads. They were also prototypes of road signs.

Historical analysis made it possible to formulate five traditions in road construction and road landscape that had in common:

1. Close correspondence of the roads to landscape,
2. Plantings,
3. Stone pavement,
4. Use of different kinds of road signs, and
5. Using roads as a borderline.

There existed other local traditions. For example, it was customary to build inns with rooms and stables for horses under one roof. These buildings were often large. In some cases when the road went through the settlement it led to the church, with its vertical spire or high roof.

FIGURE 2 Roadside Christian chapel.

ANALYSIS OF THE EXISTING LANDSCAPE

Environmental analysis revealed the complicated natural relief of the museum territory. The gap of vertical points at the distance from 0.5 to 0.8 mi constituted 130 ft.

The determining part of a landscape was the narrow River Ptich (7.5 to 9 yd wide) crossing the museum territory from

FIGURE 1 Old road with stone pavement and alleys.

FIGURE 3 Carved statue of Jesus from roadside chapel.

FIGURE 4 Road as a borderline between cultivated and uncultivated lands.

north to south. The river had a rather wide valley with a higher western (right) bank. Here the small village Strochitzy with about 30 houses and other buildings is situated. The village plan retained its historical drawing with the main (and only) street running parallel to the coastline. Because of this feature and its picturesque look, the village became an integral part of the museum area.

The eastern bank of the river is more sloping. It rises to 75 to 90 ft at a distance of 180 to 200 yd and converts into a rather flat plateau. Further to the east, the landscape becomes sloping and hilly fields of corn. On the eastern side of the river valley on the plateau are situated groups of historic museum buildings.

The banks of the river exhibit the characteristic green of the reeds, willow-trees, and alders. On the mainly open territory of the east side, separate small groups of bushes and trees are scattered. The river is also a traditional nesting ground for various aquatic birds. Most parts of the territory that were previously cultivated now have thick grass.

Designed and already placed buildings are arranged in small groups (12 to 15 objects) of free design. Only some of the houses and buildings have a geometric connection to the plan. A church, with a vertical steeple roof and bulbous head, is placed in the center of almost every group. Windmills are situated separately.

Traditional in character, village architecture is distinguished by the use of natural materials such as wood, cobblestone, and reeds (as roofing), which give a special touch of simplicity to the landscape.

Visually accessible landscapes to the southwest and northwest are mainly of natural character. Depths of visual perspectives are from 1 to 3 mi. To the east and northeast, silhouettes of a city are seen on the horizon. To maintain the natural character, more landscaping and planting work will be needed in future.

METHODS OF DESIGN

The first section of the road design is the main access road (N*1) from a local road to the entrance of the museum (Figure 5). About 0.4-mi long, it crosses the rather flat relief. Taking into account the character of the road as a representative approach and also the type of landscape, it was decided to trace the road with two straight sections with one angle and a short curve.

The middle of the road must be paved with durable asphalt. It was taken into account that there exist heavier transport loads in this part of the road system (Figure 6a). In Belarus, where public transport is well developed, sight-seeing tours are carried out mainly by large tourist buses and not by private automobiles.

In the construction of the access road, it was decided to use a specific historic detail. The carriageway is framed with narrow ditches made of cobblestones. This not only creates a hint of tradition but also makes a precise edge for the asphalt pavement. The embankments here are no more than 3 ft high and the slopes have smooth curvings.

Along the access road, regular plantings of birches have been designed with dense groups in the gaps. Here the following points were taken into account: the tradition of plantings along the entrance roads and the necessity of visual curtains at this part of the museum territory, where auxiliary services are to be placed in the future (Figure 7).

A special road sign marking the museum entrance is designed where the access road joins the local road (Figure 8). The first section ends in a crossroad (the junction of four roads). The main parking area is situated at the end of road N*1, to the right. Taking into account the previously mentioned character of the traffic, its capacity is rather small (5 buses and 20 cars). Additional parking areas can be arranged at the beginning of the access road. Groups of trees and bushes around the parking area are placed at the north side. The first landscape panoramas can be seen from this area.

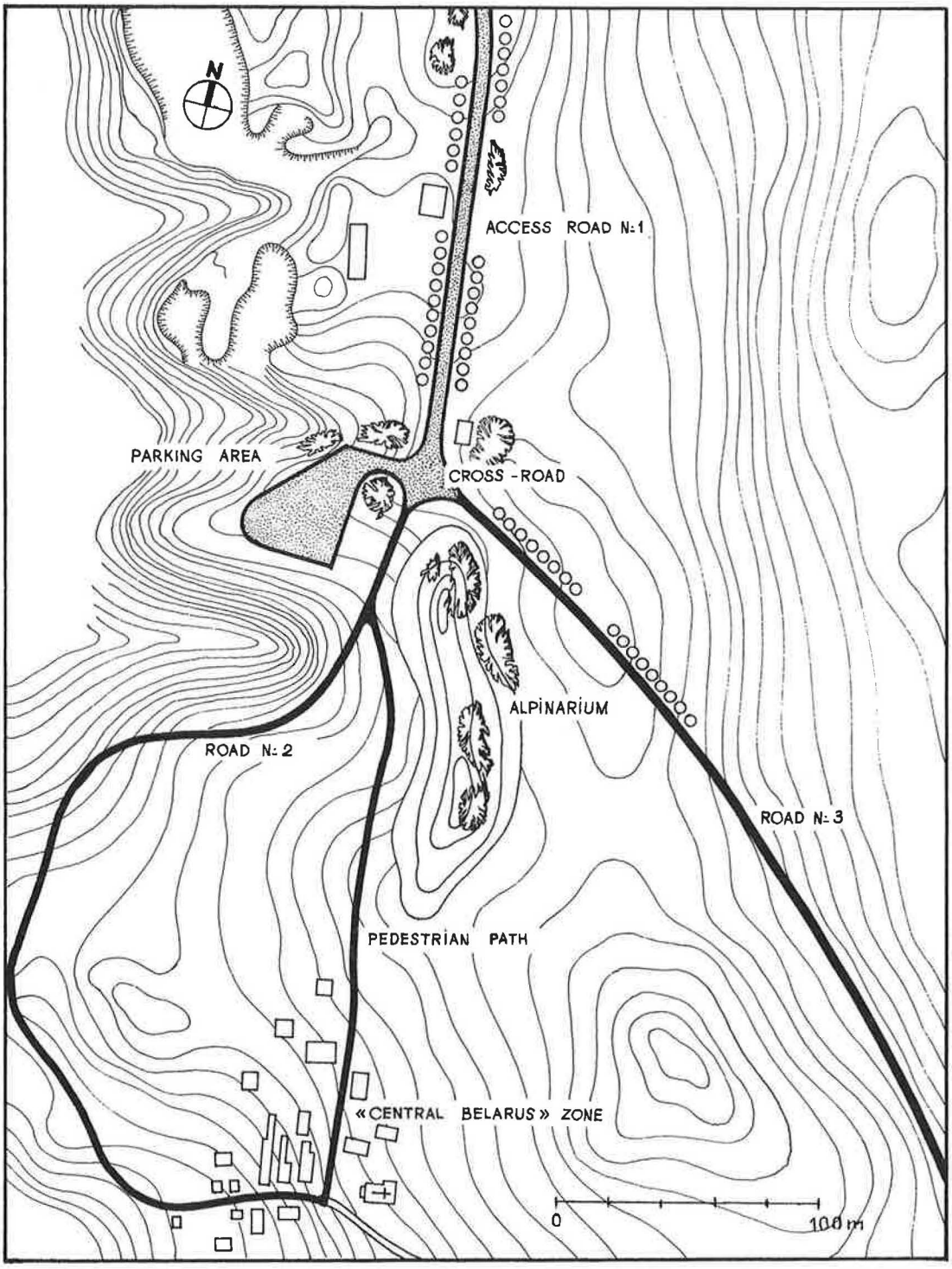
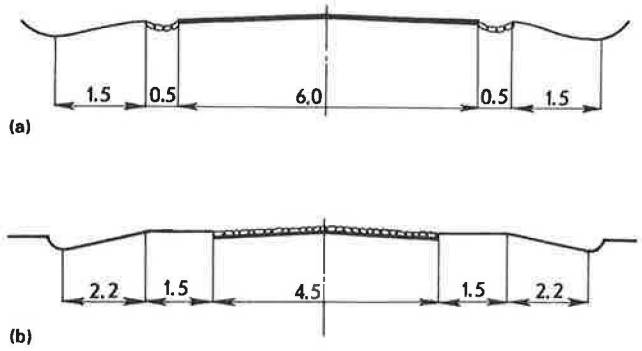


FIGURE 5 Part of a principal plan for museum territory from northern (entrance) side.



Note: Dimensions in meters.

FIGURE 6 Types of pavements.

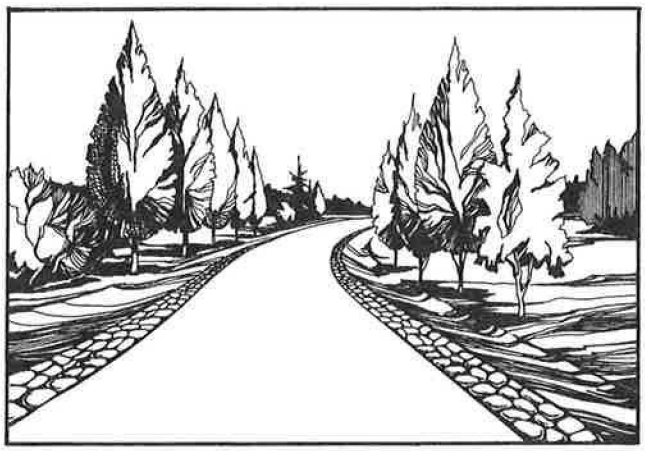


FIGURE 7 Perspective of access road.

Further on from the crossroad the automobile traffic may be divided in two directions. There are two roads of mixed function (pedestrian and sporadic automobile) and the main pedestrian road to the museum zone, Central Belarus.

Road N*2, which routes to the west, is traced along a steep slope to the river valley. It is close to the alignment of the field road that previously existed here. The road is 0.5 mi long and has six turning angles. After the first 0.3 mi it turns almost at a right angle and enters the zone Central Belarus. It is interesting that the first village building that meets a newcomer is a smithy. These are usually placed at the outskirts of villages.

Road N*3 was the main roundabout way of special functions connecting all the museum zones. Here the road was treated as a kind of borderline that divides two types of landscape: cultivated and uncultivated lands.

Computerized perspectives were used in the design of roads N*2 and N*3. After every 20 yd, photographs of landscapes along the planning road axis were taken. Combinations of photographed and computerized perspectives of the future road were used to create maximum integrity of the road and landscape. The exceeding of the point of view on display in

FIGURE 8 Road sign in traditional form.

the computerized perspectives was accepted to be about 6 ft. Thus it corresponds to a pedestrian's glance.

The alignment and profile were designed with maximum fit into existing relief and minimal embankments and cuttings. Road constructions (N*2 and N*3) are of two types: cobblestoned pavement of carriageway (Figure 6b), and gravel and sand mixture. For the cobblestoned pavement, stones that remained on the old roads were used. Some of these roads are under reconstruction now.

Besides the necessity of maximum integrity into the landscape, both roads have been designed for the observation of the museum area by pedestrians. Special observation places were designed to correspond both to the logic of the tourist route with its move-and-stop rhythm and to the merits of visual panoramas. No special arrangements have been made for bicyclists, but most parts of the road system can be used for bicycling.

The main pedestrian path is paved with washed off and consolidated gravel with ditches of tiny stones (Figure 9). In some cases the designing of specific forms of microrelief and additional plantings were necessary to underline features of the routes. Between the roads on the road fork near the crossing, therefore, a small artificial embankment of soil, boulders, and plantings was designed. It was a kind of park alpinarium in the regional tradition of ground and stone works used during cultivation of the fields. The embankment is underlined by bushes of junipers and dotted with flowers.

RESULTS

The experience of designing roads in the museum area clearly showed the necessity of studying not only the natural but also the cultural environment of developing territory. Its complex

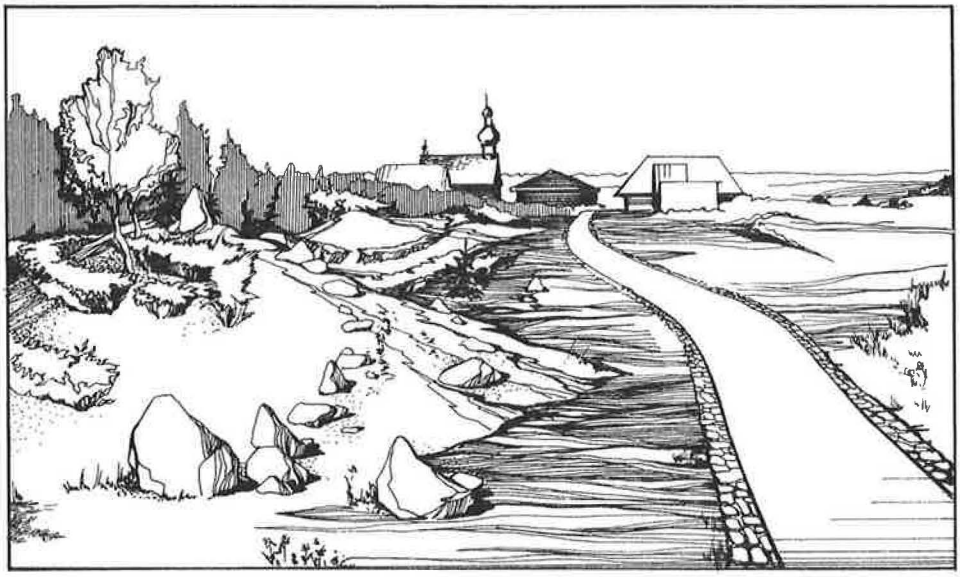


FIGURE 9 Main pedestrian road to the Central Belarus zone.

context includes such factors as traditions of land cultivation, plantings, civil and memorial architecture, and road and roadside development.

The study of historical anthropogenetic influence on the environment, together with natural factors, contributes to a satisfactory design result. It could be said that the area described in this paper presented an ideal situation for a museum territory where natural and historical features must be combined. However, the design process revealed and emphasized the necessity of such study during routine work in road landscape and environmental design. It is important because in every type of environment two kinds of balance are needed, one between the natural and the artificial and the other between the new and the old. If balance is maintained, the human side of life and the linking of the past and the future can be preserved in the design.