

ROANOKE RIVER CORRIDOR STUDY

volume
1

Inventory and
Recommendations

June 1990

ROANOKE RIVER CORRIDOR STUDY

**VOLUME ONE
INVENTORY AND RECOMMENDATIONS**

June 1990

This report is a joint effort of policy, technical and citizens committees, consisting of representatives from Montgomery, Roanoke, Franklin and Bedford Counties, Roanoke City, Salem, Vinton, Smith Mountain Lake Policy Advisory Board, Fifth Planning District Commission, New River Valley Planning District Commission, Central Virginia Planning District Commission, West Piedmont Planning District Commission, and twenty-two local interest groups. It was funded by a grant from the Virginia Environmental Endowment with matching funds from the PDCs and local in-kind contributions.

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NOTE: INVENTORY MAPS ARE FOUND IN VOLUME TWO

I. INTRODUCTION

The Roanoke River and the corridor of land along its banks represent a unique and irreplaceable asset to the people living nearby and to the localities that depend on it for sustenance. Important policy decisions must be made almost daily by these localities -- decisions which demand adequate information and careful analysis. The importance of the river and the urgent need for information on it led to this study of the river from its headwaters in Montgomery and Roanoke Counties, through the Roanoke Valley to Hardy Ford Bridge at the upper reaches of Smith Mountain Lake in Bedford and Franklin Counties. The result of this two-year study is an inventory of existing conditions in the river corridor and a set of policy goals, objectives, and recommendations which local governments may use to guide their decision-making through the remainder of this century. Specifically, the study enables localities to utilize this information by amending their comprehensive plans and land development ordinances.

This study began at a time when interest in the river was widespread throughout the area. Proposals for flood control, major land use changes, and water storage facilities had been in the news and had alerted citizens to the special nature of the river corridor. Simultaneously, governmental officials and planners saw the need for increased river planning. Local planning commissioners expressed a desire to work jointly on a regional planning project in the Roanoke Valley. After the river was chosen as the topic for this study, it was soon decided to include nearby counties also. The result is an unprecedented cooperative effort involving the Fifth Planning District Commission, West Piedmont Planning District Commission, New River Valley Planning District Commission, Central Virginia Planning District Commission, Montgomery, Roanoke, Bedford and Franklin Counties, the Cities of Roanoke and Salem, the Town of Vinton, the Smith Mountain Lake Policy Advisory Board, special interest groups, the Council on the Environment, numerous other state and federal agencies, and a group of dedicated citizens. Special thanks to the Virginia Environmental Endowment for their partial funding of the study, for their excellent advice, and for believing in this effort. As the project has grown, it led to a Phase II, partially funded by the Virginia Water Control Board and due to be completed in September 1990. Phase II is a more detailed examination of how urban land development practices affect water quality in the corridor.

Need for the Project

In December of 1984, the Governor's Commission on Virginia's Future issued Toward A New Dominion: Choices for Virginians. In the section produced by the Environment and Natural Resources Task Force, the call is issued for "regional and statewide leadership and authority to protect and serve the citizens of the

Commonwealth." While strides have been taken in the direction of increased state and regional regulation of land use and water quality and quantity, it remains within the province of local government to make most decisions in these areas. This circumstance is not likely to change greatly in the next few years, and as the report points out, "regard for the proper exercise of authority at the local level [is a value] we must protect."

However, in the upper Roanoke basin as in nearly all river corridors, there is no single local government with the scope and authority to make definitive decisions regarding river corridor issues. Between its source and Smith Mountain Lake, the Roanoke River flows through or adjacent to seven local governments' jurisdictions. A decision made by an upstream locality can result, domino-fashion, in dramatic consequences for a downstream government. There is a clear need for a region-wide examination of the river corridor in its totality.

In making land-use and water-use decisions, local governments are often forced to focus narrowly on a problem, and this narrowness is necessarily topical as well as geographical. For example, rezoning of a forested parcel of land to residential use may increase runoff of petroleum residue into the river--possibly not only affecting a neighboring downstream jurisdiction but also posing a threat to a groundwater aquifer in the immediate vicinity. Such day-to-day land-use changes, small in themselves, can add up to a cumulatively large difference if made under pressure of incomplete information and inadequate long-range planning.

These issues are particularly critical in the case of the upper Roanoke basin. The Roanoke metropolitan area, the largest in Virginia west of the "urban crescent" from Washington through Richmond to Tidewater, is also the only major concentration of people and industry in the State to lie so close to the headwaters of a major stream. It is the only population center of consequence to be found in the mountainous region west of the Blue Ridge. This location results in a set of environmental, aesthetic, and land use factors unique to the area.

The Governor's Commission on Virginia's Future points out that "Virginia's water assets of rivers...constitute a network of physically related systems defined by geology and not at all by political boundaries." The same statement may be made about the land along the banks of those rivers; a beautiful view is not interrupted at the county line, and neither are the abrasive effects of floodwaters. This study provides a unique and timely opportunity to examine the upper Roanoke River corridor in its entirety, through the efforts of participating localities.

Statement of Purpose

The study's goals were to produce a report documenting existing conditions in the Roanoke River corridor and to recommend ways in which identified problems, opportunities, and protection needs can be addressed. Its objectives were to: (a) collect and analyze all relevant data under the categories of interest; (b) produce in one document this data in report and map form; (c) respond to the needs of local government in so doing; (d) give special interests and the public as a whole the opportunity for comment and involvement in river issues; (e) develop a set of policy recommendations for localities in the study area; and (f) provide localities with a firm background for future decision-making on river issues.

This report contains detailed recommendations for policy implementation by the local governments. These recommendations address questions specific to each individual locality and discuss points pertinent to the entire region. After due reflection, each participating locality may take what action it deems necessary to implement the study's recommendations.

Equally important with these immediately-applicable results are the long-range purposes of the study. A local planning commission or governing body, faced with a decision affecting land use or water quality, will no longer be relying on inadequate or short-range information, but instead can enjoy the benefits of a comprehensive analysis which takes all factors into account and strikes a reasonable balance among them. This study can guide policy-making for years to come.

II. METHODOLOGY

A. Study Area

The study area includes the entire length of the Roanoke River from its sources in Roanoke County and Montgomery County to the Hardy Ford Bridge connecting Bedford and Franklin Counties, where the river flows into Smith Mountain Lake's upper reaches. Each of the seven local governments defined the width of its own portion of the river corridor. The typical minimum width for any locality was usually all tax parcels falling within 750 feet from the edge of the 100-year floodplain (as defined by the Federal Emergency Management Agency) on either side of the river. In some areas, such as where bluffs meet the river, the study boundary may be more narrow. In a few cases, the locality may have chosen to enlarge the boundary slightly in order to include a particularly significant piece of property. Key Maps 1 and 2 summarize the study area boundary.

B. Committee Structure

Three committees worked on the study throughout the process. The Technical Advisory Committee (TAC) determined the technical parameters of the study (such as how to define viewsheds or code land uses, etc.). Each of the four PDCs, the seven local governments, and the Smith Mountain Lake Policy Advisory Board appointed one person to the TAC. All the TAC members were employed as professional planners or administrators. They usually met monthly to review work conducted in the interim by PDC staff members.

The Policy Advisory Committee (PAC) considered the study's policy issues (such as approving the scope of work and making recommendations). PAC representatives were appointed by the four PDCs, seven local governments, and the Smith Mountain Lake Policy Advisory Board. All the PAC members were either professional planners or citizen planners from groups such as local Planning Commissions. They usually met quarterly during the data collection phase of the study, then held more frequent meetings during the policy phase of the study.

The Citizens Advisory Committee (CAC) provided input on both technical and policy issues, with more emphasis on policy. The 25 CAC representatives came from a variety of interest groups; many proved to be a special asset to the study because of their first-hand knowledge of the river. Over 46 groups were invited to appoint representatives to the CAC. The following groups did so:

Salem Historical Society - David Foster, CAC Chairman
 Roanoke Valley Bird Club - Fred Cramer
 Float Fisherman - Barbara Green, Nelson Mackey, Jr.
 Friends of the Roanoke River - Bill Tanger, Juanita Callis
 Archaeological Society - Dan Vogt
 Nature Conservancy - William Bradley
 Clean Valley Council - Ann Weaver
 Sierra Club - Alan Heath
 Virginia Water Project - Jason Gray
 Wildlife Society - Peter Bromley
 Citizens Task Force - Jim Loesel
 Citizens Environmental Council - John Cone
 Chamber of Commerce of Salem/Roanoke County - Curtis Beach
 Shawsville Ruritan Club - George Smith, III
 Smith Mountain Lake Partnership - Ken Swain
 League of Women Voters - Grace Thomas
 Bedford Chamber of Commerce - Barbara Ring
 Montgomery County Forestry & Wildlife Association - Al Anderson,
 Joe Gorman
 Roanoke Regional Preservation Office - Tom Klatka
 Peaks of Otter Soil and Water Conservation - Craig Bell
 Smith Mountain Lake Association - John Barr
 Blue Ridge Soil & Water Conservation - Winton Shelor, Sr.

The CAC met every few months, with more frequent meetings during the policy formulation phase of the study.

C. Data Collection and Mapping System

The study includes two types of maps. The first are general maps (see Key 1), showing aesthetic and environmental factors by general location. The second type of map included in the study are the parcel maps (see Key 2), which show land use factors by tax parcel. All maps are found in Volume 2 of this report. The type of map selected for each variable was dependent upon whether or not the data were necessary, appropriate or available on a site-specific basis (e.g., viewsheds are better defined as general characteristics because of their partially subjective nature). If specific characteristics were not present in a certain portion of the river, that section map has been omitted for that characteristic only.

1. Aesthetic Factors - The data on viewsheds and access points were collected from field surveys by study participants. The Roanoke River Corridor Study (produced by the Land Planning Studio in the Landscape Architecture Program at VPI&SU, April 26, 1989) was consulted for additional information. The data on cultural features were obtained from the Roanoke Regional Preservation Office, with local input on undesignated landmarks (which are included because of their local significance as

(which are included because of their local significance as defined by study participants). The above referenced VPI&SU study was consulted also, as was the National Park Services' 1987 Reconnaissance Survey of the Roanoke River Parkway Corridor.

2. Environmental Factors - The data on habitats were obtained from the Natural Heritage Program, the Virginia Department of Game and Inland Fisheries, and local interest groups. The Geology map shows data obtained from the Virginia Department of Mines, Minerals and Energy, the United States Geological Survey (USGS) maps, and local inventories. Much of the water data came from the VWCB's 1989 Upper Roanoke River Subarea Water Quality Assessment & Plan Elements. Field surveys, local inventories, and the VPI&SU study were utilized for this section also. Soils and slope data were found on USGS maps and Soil Conservation Service materials.

3. Land Use Factors - Parcel-specific data were obtained for this section of the report. Land use, recreation, and water/sewer data were collected from each locality on a tax-parcel basis. The floodplain boundaries were transferred to the parcel maps from the Federal Emergency Management Agency's National Flood Insurance Program Maps. Information on major agricultural practices was provided by the Stabilization and Conservation Service or the County Extension Agents.

4. Ordinance/Plan Review - Each locality provided the details on their zoning ordinance, zoning map, and comprehensive plan. While the zoning is mapped on a parcel basis, the Future Land Use Map shows the general boundaries designated by localities in their plans. The Agricultural/Forestral District Map applies only to Montgomery County, which provided the data. No other jurisdiction in the study area has this type of officially designated district.

III. EXISTING CONDITIONS

A. Aesthetic Factors

1. Viewsheds/Access Points

Map 1 (all maps are found in Volume 2 of this report) shows public access points and viewsheds. Obviously, views are subjective, and some debate may exist as to what should or should not be included on this map. However, because the river is valued for its viewsheds, this study attempts to map the most prominent ones. Because of difficulty in obtaining access to all parts of the river, some remote viewsheds may have been inadvertently omitted.

Whether an urban or a rural view is more attractive is certainly a subjective question. However, there is widespread opinion that the upper sections of the river, in Montgomery and western Roanoke County, pass through exquisite countryside. Pasturelands and woodlands abound, as do both gentle and steep slopes. Several prominent mountains, such as Brush Mountain and Poor Mountain, are visible in the background. Near Lafayette in Montgomery County, Route 603 runs beside the river, affording many opportunities for scenic views.

Near Dixie Caverns in western Roanoke County, the river's first public wayside provides an excellent opportunity for fishing, picnicking, or strolling along the river. The river is again accessible as it flows through Salem, with numerous popular access points along Riverside Drive. In Salem, as well as in Roanoke City, the view is often an urban one, demonstrating how more intensive land uses and the river interact. In addition, a series of public parks utilize the river as a focal point in Roanoke City.

Moving eastward from Vinton, the river passes into a more remote, less developed area. The map for Reach IX shows a lengthy stretch of river with a view that is very scenic but difficult to access. This map also shows the Blue Ridge Parkway Bridge over the river, with a very popular and lovely view of the river. Moving into Bedford and Franklin Counties, views are limited because of the steep banks of the river. However, at Hardy Ford Bridge at the mouth of Smith Mountain Lake, both excellent views and public access to the river exist.

2. Cultural Resources

Cultural and historic resources abound in southwestern Virginia, and a number of these fall within the study area boundary as shown on Map 2. However, because of the sensitive nature of archaeological sites, they are not identified on this

map. The corridor has numerous such sites, many of which have been surveyed by the Virginia Research Center for Archaeology (which has further information on the sites).

In recent years, Montgomery County conducted an extensive historic survey which inventoried the County's rich cultural resources, many of which can be seen on Map 2 (Map 2 is not applicable for Reaches VI, VII, and X). Within the study area, the first of these cultural resources is the North Fork Valley Rural Historic District stretching from Luster's Gate to the Roanoke County-Montgomery County line. Two historic bridges are noted on the map for Reach III; one of these is a registered landmark. Along the south fork of the river, many registered landmarks have been identified on the map. The Piedmont Camp Meeting Grounds District is located near the source of the south fork of the river. A portion of the community of Lafayette comprises the Lafayette Historic District. Route 785 in Montgomery County and Roanoke County is a designated Virginia Scenic By-way.

Historic sites exist throughout the Roanoke Valley also. Roanoke City has most of the sites within the limits of the Roanoke Valley study boundary. These are shown on the map for Reach VIII. They include both registered and unregistered landmarks, as well as the extensive Southwest Historic District. Moving eastward out of Roanoke, the Niagara Power Plant, visible from the Blue Ridge Parkway Bridge over the river, is a well-known unregistered landmark (built in 1906).

B. Environmental Factors

1. Critical Habitats/"Important Habitats"

a. Rare, Endangered and Threatened Species

The river corridor is valued highly for its plant and animal life. For example, above Smith Mountain Lake, the river is unique in the variety (over 50 species) of fish among all the rivers on the east coast. Concern for protection of endangered and threatened species has become especially critical in planning efforts in recent years. Yet there is at present no source which may be consulted to gather data on the presence, habitats, and ranges of these plants and animals. Short of detailed, site-specific survey work, which tends to be time-consuming and costly, it is difficult to obtain information in this area. For a corridor-wide study such as this one, it is necessary to rely on data collected through secondary means, with the hope that indicating the potential presence and approximate location of a species will alert decision-makers to the need for a more intensive study should the need arise.

The Natural Heritage Program, a division within the Virginia Department of Conservation and Recreation, is the most accurate and complete repository of information on endangered and threatened species in the State. The Program maintains computer files of all reported observations of species, along with site-specific locations. These data are made available to local governments, planners, and others working in the development process. Information is provided at a suitably broad level for initial planning purposes -- e.g., the data collected for this study were provided within a geographical framework of one-minute blocks (latitude and longitude), or about 1.1 square miles. Similarly, the species identification is kept at a general level, with only a "category" specified (e.g., vertebrate animal, invertebrate animal). The use of general, rather than specific, data herein may help protect these valuable habitats. More precise identifications and locations are given for each data point by the Natural Heritage Program upon specific request from the local government.

It is appropriate to point out that the 1.1 square mile blocks do not represent the boundaries of species' ranges. Especially with animals, distributions may well be over much wider areas; conversely, there may have been only one small sampling point or area within the block. The blocks are meant to indicate approximate sampling areas where definite data have been obtained by Natural Heritage.

The Natural Heritage Program data on endangered and threatened species show that in only a few portions of the Roanoke River Corridor Study area have these species been

identified and located. Several areas in particular are indicated on the maps. (It should be noted that many areas for which Natural Heritage has information contain more than one endangered/threatened species. This is due to the fact that many of the Natural Heritage areas represent types of environments -- caves, for example -- which form unique ecosystems within the larger environment; moreover, these unusual environments tend to attract greater scrutiny from experts and thus greater levels of knowledge.)

Of the mapped locations, shown on Map 3, eight are in Montgomery County and two are in Roanoke County. (Map 3 is applicable for Reaches II, III, IV, and VI only.) Within Montgomery County along the North Fork of the Roanoke River, an area approximately one mile from its confluence harbors a plant species recommended for the status of Special Concern at the 1989 Virginia Endangered Species Symposium. Special Concern plant species have also been reported from an area near the Route 603 bridge crossing, and near Halls Church and the confluence of Flatwoods Branch. A significant natural ecological community type, the Mid-Appalachian Shale Barren (habitat for two Special Concern species and one recommended for Endangered status on the state level) is currently being protected just north of the town of Ironto at The Nature Conservancy's Ironto Shale Barrens. Further upstream are locations of more special status species at The Conservancy's Falls Ridge Preserve.

Also of concern are areas near the confluence of Mill Creek with the upper North Fork, and at the uppermost end of the South Fork near the Floyd County border. Each contains one or more special status species. The Mill Creek location contains both vertebrate and extremely rare invertebrate animals (as well as a significant cave resource), while the South Fork area features both plant and vertebrate animal resources. The latter location is also identified by Natural Heritage as a unique natural ecological community of some importance.

Both of the Roanoke County areas are found in the far western end of the County, between Glenvar and Lafayette. These two sites are both characterized by special status plant species.

Seven species of rare fish, two of which are rare throughout their global range, have been reported from several points along the North and South Forks of the Roanoke River (not mapped at the recommendation of the Natural Heritage Program). The species are as follows:

SPECIES NAME	FEDERAL STATUS
<u>Percina rex</u> Roanoke Logperch	Listed Endangered
<u>Noturus gilberti</u> orange-fin madtom	Candidate, category 2
<u>Percina roanoka</u> Roanoke darter	
<u>Etheostoma podostemone</u> riverweed darter	
<u>Moxostoma ariomum</u> bigeye jumprock	
<u>Hypentelium roanokense</u> Roanoke hog sucker	
<u>Ambloplites cavifrons</u> Roanoke bass	

b. "Representative" Areas and "Edges"

As with the endangered/threatened species, the Natural Heritage Program of the Virginia Department of Conservation and Recreation is the single best repository of information on these environmentally significant locations and areas. These concepts are defined according to specific criteria by the Natural Heritage Program. Natural Heritage indicates that there are no "edges" in the Corridor Study area. Natural Heritage personnel have records of two "representatives" areas in the study area (see Map 3). The Falls Ridge Preserve and the Iron-to Shale Barrens, both owned in fee simple by the Nature Conservancy's Virginia Chapter, are located near one another along the North Fork in Montgomery County. These two areas represent unique environments whose intrinsic merits are of such value that the Nature Conservancy has deemed their preservation important to its mission. A third "representative" area, just outside the Corridor Study area near the source of the South Fork, is the Bottom Creek Gorge at Poor Mountain. The Bottom Creek Gorge contains one of the two streams (Bottom Creek) which join to form the source of the South Fork proper.

c. Non-Tidal Wetlands

The federal government defines wetlands as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically

adapted for life in saturated soil conditions." EPA and the Army Corps of Engineers jointly administer the Clean Water Act, Section 404, regulations that apply to wetlands. For filling activities in non-tidal wetlands, a federal permit is required. In some cases, development on wetlands may require specific mitigation measures. The benefits of wetlands are numerous, including such advantages as provision of fish and wildlife habitats, groundwater discharge and recharge areas, floodwater storage areas, and water quality filtering.

In the study area, Map 4 shows that wetlands are present at scattered locations. The map shows these as small spots at various low-lying points along the river or its tributaries. It is interesting to note that wetlands still exist in the more urbanized section of the corridor. For example, several wetlands are located along the Salem-Roanoke boundary near the Veterans' Administration Hospital. In Roanoke City, wetlands are located near some of the City's riverside parks, such as Wasena Park.

d. Migratory Bird Congregation Areas

It is not uncommon to find populations of migratory birds along river corridor areas in many parts of Virginia. However, the nature of the Roanoke River in its uppermost branches, including the Corridor Study area, is such that congregations of these birds are considerably less likely than one would expect along, for example, the lower James River. The Roanoke River has very few places in which migratory species' preferred environments -- stretches of relatively calm, slow-flowing water, with few rapids and riffles -- are present.

There are, nevertheless, some places along the river corridor where one can find migratory species in small numbers. Especially during spring and autumn, when most species' migratory rates peak, numerous individual birds may be seen in vegetation along the riverbanks or on the water itself.

Data for the migratory bird inventory were collected through the help of the Roanoke Valley chapter of the Audubon Society, and of the New River Valley Bird Club. Field research conducted during August, September and October, as well as information from the Audubon Christmas counts of 1988 and previous years, supplied the majority of the observations.

Probably the most significant area along the Roanoke River corridor for migratory birds is at the Roanoke Regional Sewage Treatment Plant near the River's confluence with Tinker Creek. The sewage sludge sediment basins at the plant host numerous insects and larvae, which in turn provide sustenance for many birds. Over 180 species were counted at the sewage plant during the most recent Christmas count.

Other areas in and along the river attract migratory species on a more or less regular basis. Wading birds often stop at the Roanoke River, especially in the winter season. Near the Veteran's Administration Hospital in Salem is found a semi-permanent colony of yellow-crowned night herons. Great blue herons are seen at various points during the winter; in summertime the green-backed heron is a more frequent visitor, reaching concentrations of one or two birds every two or three miles. Kingfishers are also known to increase their numbers during the winter. The Christmas count discovered 27 kingfishers in 1988, compared with a normal summer average of two or three.

Several species of ducks found at the River include the hooded merganser and the mallard, wood, and black duck. However, no duck or closely-related species is found in particularly large numbers, due to the lack of areas of flat, slow-moving water.

Shore birds are also occasional visitors to the upper Roanoke River. Migrants over the past few years have included great egrets and several seagull species.

Land-based species are quite plentiful in the trees and lower brush along the riverbanks. Members of the New River Valley Bird Club conducted eight separate field surveys in September and October 1989 to compile a list of migratory species along the North and South Forks in Montgomery County. While not scientifically systematic and controlled for extraneous variables, these data are nonetheless as representative as any to show the variety and plenitude of bird life along the river.

Of special note are the warblers. These birds as a group tend to prefer river bottom lands, so it is not surprising that field data show them present in relative abundance. Water thrushes and prothonotary warblers seem prominent in the Roanoke Valley localities, while in the Montgomery County sections a number of fall migrants show up in the statistics, including the Cape May, Blackburnian, palm, and black-throated green warblers.

One additional species found in the study area which deserves special mention here is the loggerhead shrike. This bird, federally listed as an endangered species, has been seen at several points along the North Fork in Montgomery and Roanoke counties, most notably in the vicinity of the North Fork's source along State Route 785, and in the area of the Blacksburg Country Club. (The Endangered Species section above should be consulted for detail on the planning implications of these animals and plants).

2. Geologic Features

a. Karst and Caverns

The Valley and Ridge geologic province is characterized by extensive regions of limestone and dolomite rock. Under certain conditions, this rock may develop large networks of solutional features such as caves, sinkholes, fissures, and other conduits dissolved in the rock -- a phenomenon known as karst. In the portion of the Roanoke River basin which lies west of the Blue Ridge Mountains, there are large areas of karst topography (see Map 5).

The environmental importance of karst lies in the fact that the numerous solutional features often allow easy and rapid penetration of surface water into the groundwater reserves below. Thus, any contaminant in the surface water can also be carried into the water table through a sinkhole or other conduit, where it is difficult if not impossible to remove. Groundwater reserves in karst regions require careful planning and fairly strict protective measures in order to preserve the purity and quantity of this resource for future generations.

In Montgomery County, a large karst area in the northern part of the County covers over half of the North Fork's study area, including virtually all of the river corridor from Ellett upstream. In this area are several caverns, including most notably Old Mill Cave and Mill Creek Cave, found near the mouth of Mill Creek at Bennett's Mill (Section A). According to the Environmental and Cultural Features of Montgomery County map, "Mill Creek Cave has aesthetic, geologic and hydrologic significance while Old mill Cave...[is] biologically significant in addition to the aforementioned attributes."

b. Geology

In broad outline, the geology of the corridor study area is relatively straightforward in description. The Roanoke River traverses or touches upon two physiographic provinces between its headwaters and the Hardy Ford bridge: the Valley and Ridge and the Blue Ridge.

The Valley and Ridge province, which encompasses by far the greater proportion of the corridor study area, is characterized by long, relatively straight valleys, separated by steep mountain ridges trending northeast-southwest. Valleys are often floored by limestone or dolomite, whereas the intervening ridges are underlain by sandstone and/or shale. The Valley and Ridge occupies almost the entirety of Montgomery County's portion of the corridor except the upper South Fork, as well as the portion of the Roanoke Valley west of Vinton.

(The Valley and Ridge topography is responsible for one of the more interesting features of the North Fork: its almost "U"-shaped course in Montgomery County. This phenomenon is due to the fact that it follows the more easily-eroded limestone Catawba Valley around the southwest end of the Catawba/Paris/Hightop Mountain ridge, where it turns and flows through the next parallel valley, between Paris and Fort Lewis Mountains).

The Blue Ridge, found east and south of the Valley and Ridge province, consists of irregular mountains, upland plateaus, and valleys. Underlying composition is primarily igneous and metamorphic rock especially crystalline material such as granite. The upper South Fork in Montgomery County flows through the Blue Ridge province before entering the Valley and Ridge. The other major location where the Roanoke River intersects the Blue Ridge is found in eastern Roanoke County and western Bedford and Franklin Counties, where the river lies in a gorge as it cuts through the mountain chain.

Fault lines (fractures in the earth's crust) are major locations of surface and groundwater exchange. Where these cross the river, groundwater exchanges with the river; ground to river during dry periods, river to ground during wet periods. Numerous faults cross the Roanoke River's course or run parallel to it, especially in the Valley and Ridge part of the region. These are indicated on the Map 5. Most if not all of these faults are ancient, deeply-buried thrust faults whose genesis is associated with the Appalachian orogeny approximately 200-225 million years ago. Perhaps the most noteworthy of these is the Blue Ridge fault, which follows the boundary between the Blue Ridge and the Valley and Ridge provinces. All of these faults have been considered inactive in historic times, and none is considered to pose an environmental threat of any magnitude.

c. Mineral Resources

Map 5 shows significant active and inactive mineral resource sites within the river corridor as listed by the Virginia Department of Mines, Minerals and Energy (VDMME). Although not shown on this map, several clay material sample sites are located within the corridor. Further information on these is available from VDMME. Map 5 does not delineate those sand and gravel resources that are only intermittently present along the drainages of the river.

One of the more significant mineral resource sites is located along the North Fork between Ellett and Ironto. There, the Falls Hollow Travertine deposit, presently preserved by the Nature Conservancy, was used to produce lime in 1939 and 1940. A lime kiln and scale pit are still located there, which is the only site in Virginia where quicklime has been produced by the burning of travertine-marl. Elsewhere in Montgomery County,

several inactive sites are located. These include such resources as roadstone, gravel, and masonry sand. Three prospects (sites with potential for future mining) are found near the river in Montgomery County. The Tices Mill Prospect (Cu, Zn, Au, Pyr) is located near Piedmont and the Camp Kiwanianna Prospect (Zn, Cu, As, Au) is found north of Tices Mill on the S. Fork's headwaters (close to study boundary). The Langhorne and Wills Prospect is located south of Shawsville. At this site, zinc and lead prospecting occurred in 1880, 1905 and again in the 1960s and 1970s.

Moving into west Roanoke County and Salem, inactive limestone, sandstone, and siltstone quarries are found. Old Virginia Brick Company shale pits are found nearby also. The abandoned Arrow Sand Company (construction and asphalt sand) is located north of the river as it flows through Salem. In Roanoke City, an abandoned shale quarry is located near 13th Street and Bennington Road.

3. Water, Wastewater, and Groundwater Problems

NOTE:

The following sections summarize findings and discussions found in the Virginia Water Control Board's (VWCB) Upper Roanoke River Subarea Water Quality Assessment and Plan Element. The report was issued in January 1989 and is a 203-page document. Map 6, prepared by the Fifth Planning District Commission for the corridor study, is a graphic presentation of this VWCB data (as well as other data not included in the VWCB report). Map 6 is not applicable for Reach X.

a. General Water Quality Conditions Assessment

The following notes general conditions on various segments (sections) of the Roanoke River that relate to samples taken along the river at testing stations set up by the Virginia Water Control Board. The following sets out portions of the river and conditions.

North Fork Roanoke River

The watershed produces heavy inputs to the North Fork Roanoke River segments from agricultural non-point source runoff. For example, tests at mile 2.4 indicated bacterial counts that exceeded standards in half the samples, with agricultural activity the likely source. Violations have been reduced, but criteria are still exceeded; the area is not considered a major problem area at this time. Phosphorus levels have improved in the area; the area has had samples for metals--such as nickel -- that exceeded human health criterion for toxicity through drinking and fish consumption. Pesticide levels were not detectable in samples.

South Fork Roanoke River

Bacterial counts in fecal coliforms were high at the monitoring station used. The criteria are still exceeded; however, the frequency of violations for the area has dropped from 77 percent to 29 percent for the more recent samples.

North Fork/South Fork Confluence to Lafayette Monitoring Station

Tests of water from below the merger of the North and South forks of the Roanoke River indicate the criteria for fecal coliforms are not met, though the area is not considered a major problem. Arsenic in-stream sediments at the confluence station exceed criteria; a special study would be needed to determine if problems exist or if the criteria, itself, are inappropriate for streams above the station.

Natural Trout Stream Section: Montgomery County Line to Point 2.5 Miles Downstream

A natural trout stream is classified on the river segment from the crossing of the Montgomery County/Roanoke County line to a point 2.5 miles downstream; following this segment is Put-and-Take Trout waters which extend 5-10 miles downstream. Significantly, a public water supply segment designation coincides with this latter area; two City of Salem water intakes are on the segment.

Peters Creek, Tinker Creek, Small Tributaries to Roanoke River West of Urban Area River Segments

Peters Creek and Tinker Creek are classified as water quality limited and phosphorous limited. Along the length of the river, other area streams are effluent limited and phosphorus limited. There are 13 streams named as priority watersheds of concern and which are targeted for correction programs or future study. These areas are urbanized with heavy residential, commercial, and industrial land uses/activities.

On Peters Creek, the biological monitoring station above Roanoke Electric Steel's discharge indicates good water quality; below the discharge, water quality is suboptimal according to recent studies. On Tinker Creek, water quality at the monitoring station at the Route 672 crossing indicated good to fair conditions. Further downstream, samples were violated for bacteria count, and arsenic and lead found in sediments exceeded standards. The stream receives urban runoff and cooling water discharges.

Urban River Segments to Fourteenth Street Bridge Monitoring Station

There are a number of industrial dischargers above the 14th Street Bridge station location. The industrial activity plus basic urban land use activity such as residential, commercial, and transportation contribute pollution through storm water runoff to this river segment.

Back Creek, Confluence Below Urban Area

Back Creek has its confluence with the Roanoke River below the urban areas; the entire stream has been declared effluent limited. Municipal wastewater criteria and lead criteria were violated in Back Creek according to early studies. In more recent 1987 studies, lead criteria and zinc criteria were violated. Samples for bacteria counts also exceed state standards occasionally.

Urban Area to Hardy Ford Bridge

The Hardy Ford Bridge monitoring station measures a run of the river from the urban area to a point seven miles downstream. Standards and criteria have been executed for: fecal coliforms, lead, zinc, and ammonia at various times. Dischargers to this river segment include: the Roanoke Regional Sewage Treatment Plant and Norfolk Southern Railroad.

b. Surface Water Quality Results from Virginia Water Control Board Ambient Water Quality Monitoring Network

The Virginia Water Control Board has set in place a network of monitoring stations across the river basin to track background conditions and the impact of point and non-point discharges.

The following presents some of the findings from the monitoring program:

Nitrates. Distribution of nitrates in decreasing order of concentration indicates that problems might occur in the following areas: Tinker Creek, North Fork Roanoke River, and Blackwater River (below the corridor study area). Farming activity with heavy applications of nitrogenous fertilizers are typical sources.

Total Kjeldahl Nitrogen. This measure tests for organic and ammonia nitrogen which can contribute to an overgrowth of algal and other life forms in surface water known as the process of eutrophication. Areas with high total kjeldahl nitrogen usually coincide with those with high nitrate nitrogen; thus, Tinker Creek and North Fork Roanoke River would be potential problem areas.

Ammonia Nitrogen. The ammonia form of nitrogen can have a debilitating effect on aquatic life and low levels are preferable. Area stations with highest averages are the North Fork Roanoke River Station and the station at River Mile 192.55. High pH in the water, a measure of acids vs. bases, tends to reinforce the problems.

Phosphorus. Phosphorus in water provides a nutrient for aquatic growth. It is not a general problem in the corridor study area. Areas below the corridor that are of concern include Blackwater River in Franklin County and Smith Mountain Lake.

Fecal Coliform Patterns. Fecal coliform counts indicate how much pollution is received from fecal contaminants of animals and humans. Tinker Creek has experienced fluctuating high levels and there has been no indication that the problem is

diminishing or that remediation efforts have been successful. The North Fork Roanoke River has been a problem area but remediation seems to be more effective in reducing the bacterial counts there.

Groundwater/Surface Water Relationships and Water Hardness. Water hardness generally measures amounts of manganese and other metals in the water; higher concentrations mean hard water, and the converse, for soft water. The northwest segments of the river basin have hard groundwater that contributes hardness to the river surface water when measured. At points east of Roanoke City, and thus, southeast segments of the river, groundwater and surface water in the river decrease in hardness. For practical purposes, surfaces in the upper reaches of the river are permitted higher levels of metals that are associated with water hardness (examples include nickel, zinc, lead, and cadmium). Water hardness can be an advantage; Roanoke City industrial waste chemicals that might be discharged are more likely to be assimilated into the receiving stream under hard water conditions.

c. Pollution Response Emergency Program

The pollution response emergency program involves response to and recording of incidents that require investigation, clean up, and environmental assessment for spills and fish kills. Most of the incidents involve transport or storage of petroleum or chemical products. Roanoke City, Roanoke County, and Salem had the highest number of incidents; Franklin County had the lowest percentage of incidents. The following table details these statistics.

Pollution Investigations - Upper Roanoke River Subarea,
West Central Region (WCR)

County (included City)	Rank by Population in WCR	No. of FY'87 Complaints		Rank by Number Complaints	
		No.	WCR%	WCR	Subarea
Roanoke (Roanoke Salem)	1	38	20.5%	1	1
Pittsylvania	3	11	5.9%	7	4
Montgomery	4	22	11.9%	2	2
Bedford (Bedford)	6	12	6.5%	5	3
Franklin	7	4	2.2%	14	5
Botetourt	11	11	5.9%	7	4
Subarea:		98	52.9%		
West Central Region		185	(100.0%)		

Notes: Complaints are included for the entire county regardless of whether the whole county is in the Subarea.

Source: Virginia Water Control Board (West Central Region).

d. Toxic Management Program

This monitoring program develops information in order to establish water quality-based effluent limitations and assess the extent of effluent toxicity. As a result of findings, toxic management activities, including toxicity reduction, may be required in the permit of dischargers. Biological monitoring may be required of certain dischargers to assure compliance with the Toxic Management Program goals. There are fifteen (15) dischargers in the Toxic Management Program.

e. Biological Monitoring and Assessment Program

The Virginia Water Control Board has implemented an aquatic macroinvertebrate monitoring program to regularly sample selected river stations. The macroinvertebrate, or benthic species, community in river waters and their composition can be used to detect changes in water quality among a group of sites or at one site across time periods. Scores developed for study areas will be translated into a water quality rating that ranges from good, fair, to poor.

The following are assessments, by area, along the Roanoke River using the biological monitoring program:

South Fork Roanoke River - tests indicate good water quality.

North Fork Roanoke River - the station at the midpoint in this segment show fair to poor conditions.

Cedar Run Stations - Cedar Run has a confluence with the North Fork Roanoke River; two stations above and below the confluence are used to bracket the discharge from Federal Mogul Company. Good ratings were found for both stations.

Peters Creek - the station on the Peters Creek tributary showed good ratings in 1984. Later, in 1986, a study showed problems; quality below the Roanoke Electric Steel discharge was termed as suboptimal.

Regional Sewage Treatment Plant - this station showed a biotic community in fair condition in 1987 and fair to good condition in spring of 1988.

Tinker Creek - two stations are used to measure Tinker Creek; water quality was found to be good to fair in 1984.

Back Creek - three stations are used to biomonitor Back Creek; the stations show good water quality, with few discharges and a forested watershed along the stream.

4. Steep Slope

As one would expect in any mountainous area, the Roanoke River Corridor Study area contains a large variety of topographic conditions. Prime farmland is often found along the river banks. In some parts of the study area, the land lies relatively flat or is gently rolling; in others, often nearby, slope changes are sharp and abrupt. Steeply-sloping terrain is difficult to develop, and even when development is technically feasible, costs are often prohibitive. On the other hand, valuable public benefits are derived from letting this land remain undisturbed: watershed protection, wildlife conservation, and scenic vistas, to name a few examples.

In general, Map 7 shows that the uppermost and lowermost ends of the Corridor contain the highest proportions of steep land, whereas the central part -- essentially, the urbanized areas of Roanoke, Salem and Vinton -- are the flattest. As noted above (see Geology section), the downstream area east of Vinton in Roanoke, Bedford and Franklin Counties tends to be characterized by precipitous bluffs along the River itself, although the land atop the cliffs is plateau-like. From the Dixie Caverns area in western Roanoke County upstream, one finds a relative scarcity of level ground over long distances. Some parts of the upper North Fork, between Ellett and McDonald's Mill in Montgomery County, are more rolling than steep in the immediate vicinity of the water, but it is not uncommon in this stretch as well as along the entire South Fork to find that only floodplain land lacks steepness.

5. Erosion/Easily Eroded Soils

Soil erosion is a phenomenon with complex causes. Physical and chemical structure of the parent material, meteorological/climatic and topographical considerations, and biological activity, as well as any number of unique site characteristics, all combine to produce a huge variety of different soil classifications. Since soil survey data were not available for the entire corridor study area, and since erosion is a common and basic concern for land-use planning, it was decided to concentrate on collection of soil erosion information for the study area.

For the most part, the maps show that easily-eroded soils correlate strongly with steep slopes. This is explained in large part by a basic fact: the steepness of these slopes allows erosion to operate with gravity to weather them relatively rapidly, with only bare rock outcrops resisting strongly this action.

Map 7 of easily-eroded soils shows, as expected, a high degree of overlap with steep slopes. Exceptions occur in areas where bare rock is common, or, conversely, where the soil is so loosely consolidated or otherwise structurally weak that it is very susceptible to damage.

As with the steep slopes, most of the easily erodible land is at either end of the corridor study area. Particularly in Bedford and Franklin Counties, there is a scarcity of sites which do not fall into the "severe" category. Moreover, while much of this is attributable to the slope factor, even many more level locations in these two counties are underlain by erodible soils. In Montgomery County, and particularly along the South Fork, stable soils are also few, though here a prime cause is often the slope factor. The most favorable conditions for development are those in the Roanoke Valley, where soils seem to be relatively resistant to erosion. Nevertheless, site-specific conditions may still lead to particular pockets of poor soil conditions.

C. Land Use Factors

1. Existing Land Use

Land use is a traditional concern in the planning process. Baseline data on the uses of land, present and future, forms an important part of the decision-making context for localities. In the Roanoke River Corridor Study, land use is one of the four key data elements studied. Land use information, together with the rest of the maps and text in this study, allows planning for future uses and development in the different localities to proceed using a common language.

Montgomery County shares with Bedford and Franklin Counties the characteristics of having the most predominantly rural land use in the study area. Map 8, Section A through D, indicates that the vast majority of tax parcels in the Montgomery County portion of the corridor are used for agriculture or forestry purposes. On the Section A map, only a few scattered properties appear as residential, and no other non-agricultural/forestry use is represented. Section B, incorporating the small communities of Ironto, Fagg, and part of Ellett, as well as the land comprising the Blacksburg Country Club and its residential component, shows slightly more variety, but in general, the use here is still mostly agriculture or forestry. Section C, except for the small communities of Alleghany Springs and Piedmont, is similar to Section A along the upper North Fork in its almost completely rural character. The map for Section D indicates that along the lower South Fork in the vicinity of Elliston, Lafayette and Shawsville, one finds the greatest variety of land uses in Montgomery's part of the corridor, as residential, commercial, industrial, and public/semi-public uses compete with agriculture for available land along the river.

In western Roanoke County, vacant land and residential land dominate the land use map. A few more intensive land uses are found near Exit 39 of Interstate 81. The railroad is shown as a strip of industrial land moving west to east across the map. More mixed land uses are found north of the river between Stypes Branch and the Salem City line. There, industrial and commercial uses intermingle with a few residential and vacant parcels.

In Salem, a mixture of land uses are found in the study area. Large blocks of commercial, industrial and residential uses are located north of the river. Although some industrial and commercial parcels are south of the river, the land there is more often residential with some agricultural. Public/semi-public uses are scattered throughout the study area.

A wide mixture of land uses also are found in the Roanoke City section of the river corridor. The corridor variety is demonstrated by the wide range of uses, from less intensive ones,

such as public parks, to more intensive industrial sites spread throughout the city.

Map 8, Section I, details land use in the remainder of the corridor, from Vinton to Hardy Ford Bridge. In Vinton, less intensive uses exist along the river, with the exception of the railroad tracks. These tracks continue to the end of the study area north of the river. Aside from this, no other industrial land is found north of the river in the three counties. Agriculture/forest, residential, and vacant land characterize this part of the map. Similar uses are found south of the river also, with two primary exceptions, a sewage treatment plant and a landfill in Roanoke County.

2. Use of Flood-Prone Land

The land lying within the 100-year floodplain of the Roanoke River (and the mouths of its tributaries) is considered to be of major importance for the study. This is shown on Map 9. Zoning ordinances in a majority of the study area localities contain explicit provisions regarding building and development restrictions in the river's floodplain, while other jurisdictions have separate floodplain ordinances. The Federal Emergency Management Agency (FEMA), as part of its National Flood Insurance Program for subsidizing insurance costs, requires that explicit protection measures be adopted by the locality in order to maintain eligibility. Currently, in the absence of site-specific engineering studies for individual parcels or special-purpose studies such as those undertaken for Roanoke City's flood control project, only the FEMA Flood Insurance Rate Maps are available for determining floodplain boundaries (some of these FEMA maps are currently being updated). The FEMA maps are useful for rough approximations, but their small scale and lack of reference points make their use difficult, especially in conjunction with other mapped data. The River Corridor Study, in an effort to remedy at least this last problem, has transferred the FEMA map floodplain boundaries to the digitized database, so that the FEMA boundaries may be directly compared to other mapped information. This is, of course, no substitute for site-specific engineering studies, which are still required by ordinance in most localities. However, it is hoped this data will be valuable for comprehensive planning and studies at the scale of the entire jurisdiction(s) in question.

In Montgomery County, width of the river's floodplain varies as much as in any part of the study area. In the stretch between Elliston and Shawsville (Section D), the South Fork's floodplain measures about 3,000 feet in places. By contrast, between Fagg and Ironto on the Section B map, the North Fork passes through a narrow, steep-sided valley. In this latter part of the corridor, the floodplain must accommodate rights-of-way for a Norfolk-Southern rail line and Virginia Route 603, leaving very little flat land for development purposes.

Topography seems to play a key role in determining the floodplain's character in Montgomery. The North Fork flows through a series of roughly linear, parallel valleys for most of its length, while the upper South Fork above Shawsville is found among the more irregular mountains and valleys typical of the Blue Ridge physiographic province. Consequently, the floodplain in the North Fork seems to show less variability in width over short distances than the upper South Fork. Finally the lower South Fork from Shawsville to Lafayette, as well as the short stretch below the two forks' confluence, runs through a landscape that is more hilly than mountainous, and the floodplain here seems wider than any other portion of the study area in

Montgomery County.

Map 9, Section E, shows the floodplain as defined by FEMA for western Roanoke County. There, most floodplain land is agricultural, vacant or residential, with a few important exceptions. The railroad moves through the floodplain at some points. Between Stypes Branch and the Salem boundary, seven industrial parcels are located partially in the floodplain. Three more industrial parcels are completely in the floodplain.

On Map 9 Section F, Salem's floodplain, as defined by FEMA, is detailed. Just as Salem's land use map shows a mixture of all types of uses in the study area, the floodplain map shows that the floodplain boundary includes all types of uses. This is especially true for industrial parcels, including much of the railroad tracks. The same can be said for the floodplain in Roanoke City (Section G & H). Historically, past floods have damaged all types of land uses in Salem and Roanoke, where flatter floodplain land has attracted much development. Conversely, precipitous bluffs from Vinton to the eastern boundary of the study area have precluded intensive use of the floodplain there. The map for Section I shows a predominantly narrow floodplain.

3. Recreation

Recreation is an increasingly important use of the river throughout the corridor. For example, in Montgomery County, a bicycle route parallels the river through Ellett Valley along Routes 785 and 723 (see Map 10, Section A). Four private recreation areas are found along the river in Montgomery County. Section Map B shows the Blacksburg Country Club, the Nature Conservancy's Ironto Shale Barrens and Falls Ridge Preserve. The Nature Conservancy property is considered to be a valuable and rare resource; therefore access to it is limited by the owners. The other private recreation area in Montgomery County's part of the corridor is Camp Alta Mons (Section C), a United Methodist camp near Shawsville. In Section B, the Interstate 81 Rest Stop has parks/playground facilities for visitors.

In western Roanoke County, Green Hill Park is located south of the river near the Salem City limits. In Salem itself, parks and playgrounds abound within the corridor. Most of these are publicly owned and operated. The same can be said for the river park system within the City of Roanoke. A lengthy bike route runs through part of Salem south of the river. A shorter bike route is located on Wiley Drive in Roanoke City (see Map section G). Moving eastward out of the more urbanized area, recreation is limited by the bluffs along the river in Roanoke, Bedford and Franklin Counties. Perhaps the dominant recreational activity here is canoeing. (The river is considered to be canoeable eastward of the junction of the North and South forks in Montgomery County). There is a public boat launch in Bedford County near the end of the study area at Hardy Ford Bridge. Fishing, especially in the stocked portions of the river, is a favorite recreational pursuit throughout the corridor area.

4. Major Agricultural Practices

Major agricultural practices vary throughout the study area. Along the North Fork of the river in Montgomery County, there are very few intensive farming activities. With the exception of one small dairy operation (approximately 50 cows - no waste retention facility) and some limited cropland, most of the agricultural land is primarily grassland farming for cattle grazing or for hay. With grassland farming, chemicals are usually not used, although some chemical fertilizers are used for hay fields. Chemicals are often used on the crops grown along the river. There are approximately 70 scattered acres that are being farmed for crops along the North Fork (with corn as the principal crop, sometimes rotated with alfalfa). Due to the rocky terrain, most farming takes place along the bottomland near the river (where the flat terrain results in less erosion).

Although conditions along the South Fork are very similar to those along the North Fork, the former has very few farming operations. There are approximately 80 acres in active cropland, primarily corn. A small sod operation is located near the river in the Elliston area. A large dairy operation, with 80 to 100 cows, is located along the South Fork. Its animal waste facility was financed through a Special Conservation Project with Montgomery County. These funds also were used to plant and improve some grasses along the South Fork in 1981 - 1983.

In western Roanoke County, near Glenvar, vegetables and small fruits are grown. Nearby are several nurseries and greenhouses, which are considered to be very water-dependent activities. Less water-dependent agricultural activities, such as hay and pastureland, also exist along the river in the western part of the Roanoke Valley. Other minor agricultural lands are scattered along the river corridor, a surprising example being the approximately 30 acres of active cropland near the Roanoke Industrial Center in southeast Roanoke City.

There are very few, if any, intensive farming activities along the Roanoke River in Bedford County from the County line to the Hardy Road Bridge. Most of the land is woodland, with only about 110 acres cleared and devoted to any agricultural activity. Agricultural practices are primarily pastureland and/or land for hay. The most common grasses are orchard grass or fescue. With this grassland farming, generally no chemicals are used, although some chemical fertilizers are used for the hay fields. Little or no pesticides or herbicides are used for this type of farming. Most farming practices take place along the bottomland near the river. Since this land is flat, relatively little erosion occurs. There are no major dairy or beef cattle operations in this area.

The cultivated areas of agricultural land in Franklin County appear to be in use for hayland/grass land, are generally stabilized, and do not appear to be eroding significantly during or after land disturbance. Where land disturbance does take place, it appears there is ample forested or grass covered buffer areas to prevent the entry of significant levels of sediments into the river. Slopes in the area inhibit the use of active farming over much of the corridor in Franklin County, thus much of it is in forest.

5. Public Water & Sewer

Map 11 shows the availability of public water and sewer to parcels of land within the study area. Public water and sewer is defined as any system with seven or more hook-ups (not necessarily owned by a local government). Some undeveloped parcels are noted as having water and sewer although such services may not be operational yet on-site. In these cases, water and sewer lines are adjacent to the site and access to these services is readily available when needed.

In Montgomery County, Section Map A indicates that public water and sewer are not available in that portion of the study area. Section B is similar, with sewer available only for the development around the Blacksburg Country Club and at the Interstate 81 rest stop. In Section C of Montgomery County, a few services are shown as available on the northern portion of the map. On Section Map D, more water and sewer services are found to exist at scattered points throughout this section of the study area.

In western Roanoke County, shown on Section Map E, most lots have neither public water nor sewer. On some parcels, at the eastern edge of the map, near Salem, water and/or sewer are available. With one exception, parcels south of the river do not have public water and sewer. More water services are found north of the river, such as in the area near Exit 39 to Interstate 81.

In Salem, parcels within the study area have access to public water and sewer. In Roanoke City, all developable parcels are served by or have access to water and sewer. Water and sewer are available at Vinton's residential areas near the river, as well as on several parcels near 3rd Street in Vinton. The majority of the remainder of the study area eastward has neither water nor sewer services.

D. Ordinance/Plan Review

1. Zoning Ordinance Uses and Special Requirements

Zoning classifications will differ somewhat from one locality to another. Part a of this section is designed to show the usual uses found in typical districts in a locality. Part b shows unusual uses found in districts in the study area localities. Under Part b, a use is noted only if it is found in the locality's zoning ordinance for that district but is not included in the Part a "Usual Uses" list for that district. In both Parts a and b, only general headings, such as residential, commercial, etc., are given. For example, although a locality might have several different residential districts (such as single-family, duplex, multi-family residential, etc.), these would be combined into a single residential category for the purpose of this matrix. The categories correspond to the categories used in the zoning and land use maps in this study. Part c discusses the zoning maps for the study area. Part d pertains to special requirements found in each locality's ordinance. Part e is a summary of other procedural land use controls.

a. Usual Zoning Uses

The following are considered to be uses typically found in these districts (please see each locality's zoning ordinance and map for more information on official uses and categories if needed).

Residential - single family dwellings, duplexes, multi-family dwellings, group homes, townhouses, accessory buildings, playgrounds, parks, community centers, churches, schools, libraries, public utilities, home occupations, mobile homes, day care facilities, outdoor recreation, mobile home parks.

Commercial - financial institutions, hospitals, retail shops, personal services, bus terminals, professional offices, medical offices, museums, nursing homes, motels/hotels, funeral homes, parking lots, churches, cemeteries, libraries, schools, parks, playgrounds, public utilities, second-story apartments, restaurants, motor vehicle sales/service/repair, theatres, assembly halls, mobile home sales lots, dry cleaners, car washes, laundromats, educational/instructional activities, post offices, fire/police/rescue services, bed and breakfast establishments, day care facilities, recreation, bakeries, drugstores, grocery stores, convenience markets, barber shops, beauty parlors, bingo parlors.

Industrial - truck terminal/sales/service/repair, wholesale trade/storage, slaughterhouses, manufacturing processes, accessory uses, public utilities, distribution plants,

laboratories, contractor's equipment storage, laundry/dry cleaning plants, processing/assembly plants, carpentry shops, sawmills, bottling/packaging plants, upholstery plants, vehicle assembly/painting/rebuilding, welding, plumbing/electrical/building supplies, coal/wood/lumber yards, landfills, airports, public transit garages, boiler shops, railway facilities, junkyards, boat building, concrete/asphalt/brick/stone plants, sheet metal shops, feed mills, machinery sales/service.

Agriculture/Forestry - plant nurseries, stables, single-family dwellings, day care facilities, churches, schools, libraries, public utilities, parks, playgrounds, home occupations, agriculture operations (including crops and raising of livestock), accessory buildings, kennels, outdoor recreation, veterinarians, community centers, mobile homes, campgrounds, private docks/piers, forestal operations, agricultural warehouses, conservation areas, livestock markets, sawmills, wood storage/processing, mining, mobile home parks, golf courses.

Public/Semi-Public - (Vinton is the only locality in the study area with a Public/Semi-Public district. Therefore all of Vinton's uses are placed in the "Usual" category and none in the Part b "Unusual" category.) - schools, municipal/county buildings, parks, playgrounds, recreational facilities, cemeteries, swimming pools, water storage, detention ponds, dry dams, public utilities, bike paths, pedestrian trails, accessory buildings, parking.

b. Unusual Zoning Uses

The following matrix shows "unusual uses" - this is defined as uses allowed in a district other than the "usual uses" noted in Section a above. They are defined as such solely as a quick summary for this study. The authors do not intend to imply that "unusual uses" are necessarily inappropriate. The table lists uses permitted by right, unless followed by SE (use by special exception) or SUP (special use permit).

	<u>RESIDENTIAL</u>	<u>COMMERCIAL</u>	<u>INDUSTRIAL</u>	<u>AG/FOREST</u>
Vinton	funeral homes; rooming & boarding; tourist homes; hospitals (SE).	single-family dwellings; two-family dwellings; medical/dental laboratories; wholesale merchandising brokers; building supply;	retail outlet stores (SE).	

RESIDENTIAL

COMMERCIAL

INDUSTRIAL

AG/FOREST

truck sales/
service; kennels
(SE); greenhouses
(SE); mini-ware-
houses (SE).

Franklin
County Marina (SUP);
Fire/Police/
Rescue service
(SUP).

Apartments
combined with
business;
Nursing
Homes/elder
care; Shop-
ping center.

Some retail
(antique
shop, farm,
logging,
equipment
sales/ser-
vice/repair,
convenience
store (SUP);
Sales/ser-
vice/repair
of auto-
mobiles,
trucks, rec.
vehicles
(SUP);
Airport;
R a c e w a y
(SUP);
Motel/hotel/
tourist/re-
s o r t
facility
(SUP); Flea
M a r k e t
(SUP); Junk-
yard/Auto-
m o b i l e
Graveyard
(SUP).

Mont.
County Nursing homes
and hospitals
(SE); Pro-
fessional
offices (SE);
Mortuaries
(SE).

Kennels;
Craft In-
dustries;
Mini-ware-
houses (SE).

Outlet stores;
Mining (SE);
daycare
centers.

Two-family
dwellings;
Restaurants
(SE); Gen-
eral stores
(SE); Race
tracks (SE);
Auto repair
(SE); Land-
fills (SE).

	<u>RESIDENTIAL</u>	<u>COMMERCIAL</u>	<u>INDUSTRIAL</u>	<u>AG/FOREST</u>
Roanoke County	Agriculture (except feed lots & swine); Private kennels; Rooming & Boarding; Hospital and Hospital Special Care (SE).	Two-family and multi-family dwellings; Public Amusements (SE); Animal Hospitals and Kennels (SE); Flea Markets (SE); Public Dance Halls (SE).	Mining; used tire storage (SE).	Two-family dwelling; Professional Home Office; General Country Store; Antique Shop; Wayside Stands; Human Care Facilities, Nursing Homes and Hospitals (SE); Junkyards (SE); Used Tire Storage (SE).
Roanoke City	Day care facilities; Cemeteries (SE); Stables (SE); Libraries, museums (SE); Art galleries; Utility Substations (SE).	Upper story dwellings; Fraternal organizations (SE); Colleges/universities; Hospitals; Military reserves; Emergency service training facilities; Coliseums, stadiums; Automobile cleaning facilities.	Airports; Military reserve; Emergency service training facilities; Scrap yard; Parks; Railroad related transportation facilities; Day care centers (SE).	Zoos; Bed/Breakfast estab. (SE).

RESIDENTIAL

COMMERCIAL

INDUSTRIAL

AG/FOREST

Salem Duplexes(*);
Professional
Offices with
less than
5 employees.

*Requires Zoning and Use Permit (Salem only)

NOTE: Bedford County's Land Use Guidance System is a flexible, innovative zoning system that does not include separate zones. Therefore, it is not discussed above.

c. Zoning Maps (Map 12)

Map 12 shows zoning for parcels in the study area. For the purpose of this study, zoning districts in each locality were combined as necessary to form six general categories--agriculture/forest, public/semi-public, residential, commercial, industrial, and vacant/unclassified. (Within the study area, only the Town of Vinton uses the public/semi-public category.) Parts a and b above give both usual and unusual uses for all the categories. Readers desiring more detail should consult the official zoning maps for each locality. For example, where a map herein shows the zoning as residential, only the official zoning map kept by the locality would detail whether it is a single-family or a multi-family residential zone.

Map 12, Section A in Montgomery County, shows all agriculture/forest zoning. Section B is similar; however, there is some residential development near the Blacksburg Country Club on the western portion of the map. Interstate 81 Right-of-Way, on the eastern edge of Section B is noted herein as vacant/unclassified land. On Section Map C, a small amount of residential zoning in Alleghany Springs is the only exception to the overall agriculture/forest pattern. Section D of Montgomery County follows the predominantly agriculture/forest zoning pattern, with the exception of several industrial parcels along the river, some small pieces of commercial zoning in Lafayette and a large piece of residentially-zoned land at the southern tip.

Section E, in western Roanoke County, shows extensive industrial zoning along the river. Agricultural zoning is also found throughout this section of Roanoke County. Some commercial parcels are located along Route 11 and 460, and a few pockets of residential zoning are found near the river in the central portion of this map. More residential zoning is located on the eastern edge of the map, near the City of Salem.

In Salem, much industrial zoning is located along the northern edge of the river. There are smaller pieces of industrial zoning south of the river, an area which is primarily zoned residential otherwise (with some agricultural parcels). Commercial sections are located at both the western and eastern ends of this map.

Roanoke City's zoning map for the corridor shows large blocks of industrial zoning both north and south of the river. Residential zoning is common in the city's portion of the study area, and several areas of commercial zoning are found therein also. Roanoke Memorial Hospital and Towers Shopping Center are two examples of commercially zoned parcels near the river.

Aside from two public parcels in Vinton, the Town's land is zoned industrial or residential within the corridor. In Roanoke County, one industrial parcel and numerous residential parcels are

found west of the Blue Ridge Parkway and south of the river. In the remainder of Roanoke County and Franklin County, agriculture/forest zoning dominates the map (with some exceptions near Hardy Ford Bridge). In Bedford County, zoning is shown as identical to existing land use. Bedford County utilizes the Land Use Guidance System, which is a flexible form of zoning without district boundaries.

d. Special Zoning Requirements

Although a zoning ordinance contains numerous requirements pertaining to the use of land, the following is a list of "special" zoning requirements included in local ordinances.

	Frnk1. County	Mont. County	Rke. Co.	Rke. City	Salem	Vinton
Conditional Zoning	X	X	X	X	X	X
Special Exceptions	X	X	X	X		X
Floodplain District		X	X	X	X	X
Historic District				X		
Ag/Forestal District		X		X		
Lake Overlay District	X					
Planned Unit Development	X		X	X	X	
Emergency Communications Overlay Zone			X			
Airport Impact Zone			X	X		
Mobile Home Park/Subdivision Overlay Zone			X	X		
Cluster Overlay		X				
Zoning & Use Permit					X	
Minimum Lot Size in Agriculture or Forestry Zone	20,000 sq. ft.	1/2 acre	15,000 sq. ft.	40,000 sq. ft.	8 acres	N/A

e. Other Land Use Ordinances

In regard to other procedural land use controls, it is noted that the study area localities also utilize other ordinances/controls as given below.

	Bed. County	Frnkln. County	Mont. County	Rke. Co.	Rke. City	Salem	Vinton
Subdivision Ordinance	X*	X	X	X	X	X	X
Site Plan Review	X*	X	X	X	X	X	X
Erosion and Sediment Control Ordinance	X	X	X	X	X	X	X
Land Use Guidance System	X						
Sign Ordinance (independent of Zoning Ordinance)	X*					X	
Mobile Home Park Ordinance	X*	X					
Floodplain Ordinance (independent of Zoning Ordinance)	X*	X					
P.U.D. Ordinance (in addition to requirements in Zoning Ordinance)	X*	X					

*Included under Land Use Guidance System

2. Comprehensive Plan Guidelines Relating to the Roanoke River

The following guidelines are excerpts taken from the comprehensive plans of jurisdictions participating in the Roanoke River Corridor Study. They relate to the management of the Roanoke River and its surrounding environment. Each jurisdiction's comprehensive plan also provides for the management of housing, economy, community services, etc.

a. Bedford County Comprehensive Plan, Adopted May 24, 1988

Goals and Objectives

1. Protect and preserve the environmental quality and natural resources of the County.
2. Prevent the degradation of and enhance the water quality of rivers and streams.
3. Prevent destructive developments in environmentally sensitive areas such as floodplains, critical watersheds and steep slopes.
4. Encourage the protection of unique wildlife and vegetation in the County, especially endangered species.
5. Control development in areas of subsurface drainage problems.
6. Preserve areas of special historic, natural and environmental significance.
7. Guide development to areas that are topographically suitable and that are not subject to adverse soil conditions.
8. Provide or expand water and sewer facilities to areas of high population density or to areas where well and septic tank use poses a health or environmental hazard to assure adequate and unpolluted surface and groundwater supplies for present and future generations.

b. Franklin County Comprehensive Plan, Adopted December 16, 1985

Planning Objectives

1. Maintain sufficient tree cover, including brush lands,

forest land and plantations, on all areas where steep slopes exist to prevent severe erosion and to provide watershed protection.

2. Identify and preserve areas of outstanding historic, cultural and scenic value.
 3. Protect floodplain areas and all types of wetland areas as permanent conservation areas.
 4. Fully and as comprehensively as possible evaluate all future actions in order to minimize adverse environmental impacts upon the air, water, land, and residents of Franklin County themselves.
 5. Include in ordinances provisions for conservation areas, buffer zones, or filter strips along principle streams, rivers, lake shorelines, and tributaries to inhibit the effects of non-point pollutants from agricultural, residential, commercial, industrial, and transportation land use activities.
 6. Provide water and sewer treatment and solid waste management facilities to keep pace with residential, commercial, and industrial growth within Franklin County.
- c. Montgomery County Comprehensive Plan, Adopted on Jan. 24, 1983

Goals, Objectives & Policies

1. Protect and enhance the natural, historic, and scenic environment of the County.
2. Development shall minimize the harmful effects of erosion and sedimentation upon adjoining property and water courses in accordance with the Soil Erosion and Sedimentation Control Ordinance. In addition, when increased development results in off-site runoff, the County shall work with developers to reduce runoff and to provide necessary off-site drainageway improvements to support development.
3. Development of flood-prone lands and lands underlain with sinkholes shall be discouraged in accordance with the National Flood Insurance Program and the Virginia Uniform Statewide Building Code.
4. The County shall encourage the preservation and use of historic sites and buildings identified throughout the

County.

5. Public water and sewer systems that are cost effective and necessary to protect the health and safety of County residents shall be provided by the County.
 6. Prevent the pollution of air, surface water and groundwater resources.
 7. The County shall require that all landowners in designated agricultural and forestal districts apply for either a conservation plan (Soil Conservation Service) or a forestry management plan (Virginia Division of Forestry) as a condition for the establishment of the agricultural and forestal district.
 8. Timber harvesting within Conservation Areas should utilize Best Management Practices (BMPs) developed by the Virginia Division of Forestry with industry and public support.
 9. The use of erosion prevention practices and procedures will be encouraged in order to maintain agricultural productivity.
 10. Activities which significantly contribute to water pollution will be discouraged.
- d. Roanoke County Comprehensive Plan, Adopted June 25, 1985

Policy Guidelines

1. Open space is an appropriate use of environmentally sensitive areas, such as floodplain, drainage swales, steep slopes, unstable soils, among others, and shall be encouraged in these areas.
2. Land management standards (based upon Best Management Practices of the State Water Control Board) shall be developed for land uses permitted within public water supply watersheds to prevent non-point source pollution.
3. The County shall prepare a list of primary groundwater recharge areas in need of protection based on factors which may include height of water table, soil types, type of nearby development, and distance from potential or existing public water supply, among others.

4. The County shall study the effect of development on critical slopes--adequate drainage control measures will be implemented to prevent erosion and flooding of adjacent lands and degradation of streams.
5. The County shall determine where floodplains and natural drainage corridors exist within the County.
6. Surface waters shall be buffered from surrounding land uses by practices such as zoning regulations that require earth berms or filter strips of natural vegetation for all new development surrounding rivers, streams and lakes.
7. A survey of historical and archaeological sites shall be conducted in order to develop a preservation plan to protect these sites from encroaching development.
8. The County shall develop certain criteria for defining unique natural resource areas and prepare a listing of where these areas are located in the County.

e. Roanoke City (Roanoke Vision), Adopted May 12, 1986

Planning and Development Actions

1. Implement appropriate flood control measures and minimize development in the flood plain.
2. Develop open space conservation areas to protect natural resources and sensitive land.
3. Enforce erosion and sediment control regulations for new construction.
4. Identify and address non-point source problem areas such as litter, open refuse and impervious areas.
5. Develop regional water supply plan.

f. Salem, Virginia Land Use Plan, August 1974

Goals and Objectives

1. The Plan should facilitate the improvement of the physical environment of the City with the intent of controlling development to make the city functionally efficient and aesthetically pleasing.
2. The Plan should address the necessity to protect

critical environmental areas. This would include the resolution of problems associated with flood plains and severe steep slopes.

g. Vinton Comprehensive Plan, Adopted December 13, 1988

Policy Recommendations

1. Encourage participation with Roanoke County and Bedford county in regional water supply efforts.
2. Investigate a joint stormwater management plan between the administrative staffs of Vinton and Roanoke County.
3. Recommend that the Town Council and staff work with state agencies to create and implement Model Groundwater Protection regulations to protect the Vinton service area. To provide future protection against new growth in environmentally sensitive areas, request that the General Assembly provide the Town of Vinton with legal authority to exercise development review on projects proposed within a two-mile radius of Vinton Corporate limits.
4. Recommend that Route P-1 as noted in the National Park Service's 1987 Reconnaissance Survey of the Roanoke River Parkway Corridor be chosen instead of Route P-0 if the Roanoke River Parkway is built.

h. Future Land Uses for the seven localities are not listed above as they are indicated on Map 13, showing future land uses as adopted by the localities in their comprehensive plans. Two striking features on the map are the variety of uses approved for the corridor and the variety of coding systems used by the localities.

Both factors point toward a need for more coordinated planning along the corridor. In Salem and Vinton, where little undeveloped land remains, the future land use maps generally follow the classic categories found on the existing land use maps. Both show a wide variety of land uses, from residential to industrial, along the corridor. In Roanoke City, where undeveloped land is also rare, the future land use map shows areas of potential change and flood control. In Montgomery County, conservation, agriculture and rural categories dominate the future land use map. In Franklin County, the corridor's future land use is low-density residential or agriculture/forest/rural residential.

In Roanoke County, an innovative future land use system is used. Categories include parks/open space, rural preserve, rural

village, village center, etc. Roanoke County's Future Land Use Map designates surface water and flood hazard areas. Obviously, this category runs throughout the study area. All of Bedford County's portion of the study area is designated as a growth area, with no further district breakdown. In Bedford County, a growth area is an area of major residential, commercial, industrial and public/semi-public facilities growth.

3. Review of Agricultural/Forestal Districts

The Virginia Agricultural and Forestal Districts Act, originally enacted during the 1970s, provides for the voluntary creation of special districts in a given locality whose purpose, in part, is to "protect agricultural and forestal lands as valued natural and ecological resources", and to "encourage development and improvement of...[these] lands for the production of food and other agricultural and forestal products" (Sec. 15.1-1507, Code of Virginia (1950) As Amended). To date less than a dozen Virginia localities have availed themselves of the powers granted by this Act, though there is continuing interest in its provisions. Within the corridor study area, only Montgomery County has such agricultural/forestal districts (AFDs). Montgomery is in the top two or three counties in the State in number and size of districts created and in acreage included therein.

The Act contains several specific provisions designed to fulfill its purposes. For example, use-value taxation is authorized for landowners in the AFDs, whether or not the locality has separately instituted such tax relief. Some powers over land use regulation by the local government are constrained within the AFD -- e.g., a locality cannot use public funds within a district for non-farm purposes. Regulation of use is tied to an individual plan filed with the county by each participating landowner in the district, which inventories resources on the land and specifies the future use to be made of these resources. Further detail is contained in the Virginia Cooperative Extension Service publication "Virginia's Agricultural and Forestal Districts Act: A Summary", and in the "Additional Information on Agricultural and Forestal Districts in Montgomery County".

The Roanoke River Corridor Study area contains parts of AFDs as shown on Map 14 (applicable to Montgomery County only). By far the largest extent of AFD land in the study area is located along the upper North Fork, in the McDonald's Mill and Bennett's Mill areas (Section A). Not coincidentally, as we have seen, this is also the portion of the study area containing the greatest acreage in active agricultural production. Most of the AFD properties in this area are pasture land near the river, with more forested parcels found on the uplands farther away. Two other AFDs of note are located more downstream: one on the North Fork between Ironto itself and the I-81 interchange for Ironto, and the other near Alleghany Springs along the South Fork. As in the McDonald's Mill area, these parcels are characterized more by agricultural use than forestal use, though again both types are present. The relatively lesser degree of dominance by active farms in these downstream reaches probably accounts for the smaller size and fewer participants in the latter AFDs. (In Montgomery County as a whole, larger AFDs tend to be associated with the most productive farmland).

4. Legal Constraints to River Corridor Planning in Virginia

There are several federal and state laws or principles that regulate land use for the purpose of protecting water quality and the environment. The following legal constraints were taken into consideration as goals, objectives and policies were developed for the Roanoke River Corridor Study:

a. **Riparian rights** govern the use of surface water and are restricted to owners of land that adjoins a stream or standing water. The traditional Riparian Doctrine is a common law concept which holds that each landowner has the right to make reasonable use of water on his land, provided that water is returned to its natural stream before it leaves the property. The property owner also has the right to receive the full flow of the stream undiminished in quantity and quality.

b. The **taking clause** is a clause of the Fifth Amendment to the U.S. Constitution which states that private property shall not be taken for public use without just compensation. The increasing threat to the environmental quality of our land is causing localities to enforce stricter land use regulations, and "takings" are often used as a tool in regulating land use. In Virginia, the State grants power to localities to condemn (or take) property for public use. According to 25.46.2:1 Condemnation of Land for Public Park Purposes in The Code of Virginia, the State has the authority to exercise the power of eminent domain to condemn land or lands within this State for use as a public park or for public park services. The proceedings for the condemnation of land for this purpose shall be in accordance with Title 25, Chapter 1.1. The Code also allows for the determination of just compensation for condemnation in Code Section 25-46.19. According to Michie's Jurisprudence, "[t]he power of eminent domain may be delegated to counties for the purposes of acquiring property necessary for county buildings or other public uses." Also, "[a] city may condemn property for a public park" (Michie's Jurisprudence of Virginia and West Virginia. Volume 7A; The Michie Company. Charlottesville, Virginia, 1985, p. 13).

c. **Dillon's Rule** simply dictates that the power of local governments to enact ordinances that control land use decisions is derived from the State's specific delegation of police power to those local governments. This delegation may be either by charter grants or by the enactment of general "enabling statutes". In Virginia, the enabling legislation is found in The Code of Virginia.

d. The Code of Virginia gives localities the right to regulate land use and protect the environment through a variety of planning documents. These are:

1. The Comprehensive Plan

According to the Code, "the Comprehensive Plan...shall show the [local] commission's long-range recommendations for the general development of the territory covered by the Plan, including...the designation of areas...for conservation, recreation, ...[and] flood plain and drainage." The Plan may include, among other things, the "...designation of areas for the implementation of reasonable groundwater protection measures." (15.1-446.1)

2. The Zoning Ordinance

According to the Code, "[z]oning ordinances and districts shall be drawn and applied with reasonable consideration for the existing use and character of property, ...the suitability of property for various uses, ...the conservation of natural resources, the preservation of flood plains, ...the conservation of properties and their values and the encouragement of the most appropriate use of land throughout the county or municipality." (15.1-490).

e. Other statutes within the Code that allow for the protection of the waterways of Virginia include:

1. Code of Virginia, 62.1-11

This statute grants power to the State to regulate the protection and development of waters declared as natural resources within the State. Part "d" of statute 11 states "[t]he public welfare and interest of the people of the Commonwealth require the proper development, wise use, conservation and protection of water resources together with protection of land resources, as affected thereby."

2. Code of Virginia, 62.1-44.2 - State Water Control Law

This law requires the protection of existing high quality state waters and the restoration of all other state waters to high quality. It also requires the protection of clean waters from pollution; the prevention of any increase in pollution; the reduction in existing pollution; and the promotion of water resource conservation, management and distribution. It also requires that water consumption reductions be encouraged to provide for the health, safety, and welfare of the present and future citizens of the Commonwealth.

f. The State Constitution (Article XI - Conservation) provides a mandate and opportunities for Virginia and its political subdivisions to conserve and protect environmental/natural resources.

IV. SUMMARY OF EXISTING CONDITIONS INVENTORY

A. Aesthetic Factors

1. Viewsheds/Access Points

The river corridor contains excellent views, ranging from pasturelands, woodlands, gentle slopes, steep slopes, to bluffs. In the western and eastern edges of the corridor, rural views predominate, although access is often limited. As the river moves eastward through Salem and Roanoke, access to the river is easier. The views in this portion of the corridor demonstrate how more intensive land uses and the river interact. Primarily within the urban area, public parks utilize the river as a focal point.

2. Cultural Resources

Within the more rural sections of the corridor, Montgomery County has the largest number of cultural resources that have been recorded to-date. These include historic districts, historic bridges, and registered landmarks. Within the urban area, most of the historic sites are found within Roanoke City. These include both registered and unregistered landmarks as well as a historic district.

B. Environmental Factors

1. Critical Habitats/"Important Habitats"

a. Rare, Endangered and Threatened Species

Within the study area, rare, endangered and threatened species are found in ten mapped locations. Eight of these are found in Montgomery County, including two significant Nature Conservancy properties. In Roanoke County, two sites characterized by special status plant species are found in the far western end of the County between Glenvar and Lafayette. Seven species of rare fish, including two of which are rare throughout their global range, have been reported from several points along the North and South Forks of the Roanoke River.

b. "Representative Areas and Edges"

Representative areas within the corridor include the Falls Ridge Preserve and the Ironstone Shale Barrens in Montgomery County. Both sites are owned by the Nature Conservancy's Virginia Chapter. They represent unique environments whose intrinsic merits are of such value that the Nature Conservancy has deemed their preservation important to its mission.

c. Non-Tidal Wetlands

Wetlands (areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions) are present at scattered locations within the study area. These small wetlands, seen as various low-lying points along the river or its tributaries, exist even in the more urbanized parts of the corridor at some locations.

d. Migratory Bird Congregation Areas

The Roanoke River has very few places in which migratory species' preferred environments (stretches of relatively calm, slow-moving water with few rapid ripples) are present. However, there are some places along the river corridor where one can find migratory species in small numbers. The most significant areas along the river for migratory birds is at the Roanoke Regional Sewage Treatment Plant. A semi-permanent colony of yellow-crowned night herons can be found near the Veterans Administration Hospital in Salem. Specific data on other migratory birds has been collected by local groups.

2. Geologic Features

a. Karst and Caverns

Karst formations contain numerous solutional features which allow easy and rapid penetration of surface water into the groundwater reserves below, causing a potential for contamination. In Montgomery County, a large karst area in the northern part of the County covers over half of the North Fork study area. Several caverns are located in this area also.

b. Geology

The study area traverses or touches upon two physiographic provinces between its headwaters and the Hardy Ford Bridge - the Valley and Ridge and the Blue Ridge. The former is characterized by long, relatively straight, valleys separated by steep mountain ridges trending northeast to southwest. The latter consists of irregular mountains, upland plateaus and valleys. Numerous faults are found within the corridor area. Perhaps the most noteworthy of these is the Blue Ridge fault which follows the boundary between the Blue Ridge and Valley and Ridge Provinces.

c. Mineral Resources

Along the North Fork of the river, between Ellett and Ironto, the Falls Hollow Travertine Deposit is located. This deposit is presently preserved by the Nature Conservancy. It was

formerly used to produce lime in 1939 and 1940 and is the only site in Virginia where quicklime has been produced by the burning of travertine-marl. Other mineral resources are located at various spots within the study area. They include roadstone, gravel, masonry sand, limestone, sandstone, and siltstone quarries. State reports indicate that three prospects (sites with potential for future mining) are found near the river in Montgomery County.

3. Water, Wastewater and Groundwater Problems

Virginia Water Control Board data are available for water characteristics within the corridor area. These statistics are summarized herein. They include information on general water quality, ambient water quality, nutrient trends, the pollution response emergency program, the toxic management program, and biological monitoring.

4. Steep Slope

The uppermost and lowermost ends of the corridor contain the highest proportions of steep land, whereas the central part (essentially the urbanized areas of Roanoke, Salem and Vinton) are the flattest. In the less urbanized sections of the corridor, it is not uncommon to find that only floodplain land lacks steepness.

5. Erosion/Easily Eroded Soils

Easily eroded soils correlate strongly with steep slopes (steepness of these slopes allows erosion to operate with gravity to weather them rapidly). Within the corridor, most of the easily-erodible land is at the western and eastern ends of the study area. Particularly in Bedford and Franklin Counties there is a scarcity of sites which do not fall into the severe category. More favorable conditions for development are found within the Roanoke Valley, where soils seem to be relatively resistant to erosion.

C. Land Use Factors

1. Existing Land Use

The study area maps revealed a variety of existing land uses, with more intensive development closest to the center of the study area (Roanoke City and Salem). Parcels within the outlying portions of the corridor area are more frequently undeveloped or devoted to agriculture or forestry activities. Exceptions might include small communities such as Ironto, Elliston, Lafayette, etc. in Montgomery County. Land use in Roanoke County might be characterized as transitional, being somewhat more intensive than the outlying counties.

2. Use of Flood-Prone Land

Flat terrain is considered to be a prerequisite for many types of development. Unfortunately, such terrain is frequently located in the floodplain. Corridor maps indicated that a wide variety of land uses are located within the floodplain in the more urbanized portion of the study area. Industry, including railroads, is a common user of the floodplain land in the more urban parts of the study area. Such sites benefit from flat lands and access to water. It is assumed that many of these uses were in place prior to current local floodplain regulations. Precipitous bluffs in the outer portions of the study area have precluded intensive development of the corridor at many points.

3. Recreation

Recreation was found to be an increasingly important use of the river throughout the corridor. Bike routes are located within the Roanoke County and Montgomery County sections of the corridor as well as in Salem and Roanoke City. Two private recreational sites are owned by the Nature Conservancy in Montgomery County (Falls Ridge Preserve and the Ironto Shale Barrens). These are considered to be valuable and rare resources and access to them is limited by the owners. Other public and private recreation areas are noted on the maps. The more urbanized portion of the study area has made good use of flat land with access to the river for recreational facilities.

4. Major Agricultural Practices

Various agricultural activities take place along the river in the corridor's rural portions (and in some parts of the urban area also). More agricultural activities occur on the North Fork than on the South Fork in Montgomery County. Along the North Fork, grassland farming is more common than are crops or dairies. In the western portion of the Roanoke Valley, vegetables, small fruits, and hay are grown. Nurseries and greenhouses are found there also. Because the corridor is so steep east of Roanoke, agricultural activities are less common there, although pastureland and land for hay are present.

5. Public Water and Sewer

Public water and sewer services are available at scattered sites within Montgomery County with services increasingly available in western Roanoke County. In Roanoke City and Salem, virtually all parcels have access to public water and sewer. In Vinton, residential areas near the river, as well as some parcels near Third Street, are served by water and sewer. The remainder of the study area eastward is limited in its water/sewer services.

D. Ordinance/Plan Review

1. Zoning Ordinance Uses and Special Requirements

A matrix of zoning uses for the study area localities shows that governing bodies differ somewhat in their opinion as to the type of uses that are appropriate for specific zones. Having generalized for the purpose of this study, the matrix of zoning uses is included to help the reader see what types of uses might be allowed in zones shown on the zoning map. For example, when the reader reviews the zoning map and notes a residential zone, he might assume that this zone would allow "usual" uses such as single family homes. The matrix indicates that in one specific locality an "unusual" use would include funeral homes. The zoning map which accompanies this section indicates that more intensive zoning categories are found in more urbanized sections of the corridor. For example, Roanoke City and Salem include all types of zones (residential, commercial, industrial, etc.) within the study area. In outlying counties, agriculture/forestry zoning is commonly found, with various exceptions scattered throughout. Bedford County utilizes a flexible form of zoning without district boundaries.

Another matrix shows the types of requirements and districts (pertaining to the use of land) which are also included in local zoning ordinances. At the end of this matrix is a comparison of minimum lot size in agriculture or forestry zones. These range from 15,000 sq. ft. in Roanoke County to 8 acres in Salem. A final matrix in this section outlines other procedural land use controls for each locality.

2. Comprehensive Plan Guidelines Relating to the Roanoke River

Excerpts from the comprehensive plans for jurisdictions within the study area show that the management of the river has been recognized as an important factor in the development of goals and policies for these plans. However, the Future Land Use Maps, as officially adopted by each locality, show that approaches vary significantly. Two striking features of the Future Land Use Maps are the variety of uses approved for the corridor and the variety of coding systems used by the localities. In Salem, Roanoke City and Vinton, where little undeveloped land remains, the Future Land Use Maps generally follow the Existing Land Use Maps. Both show a wide variety of land uses along the corridor. More agricultural and low-intensity residential uses are found on the Montgomery County and Franklin County Future Land Use Maps. In Roanoke County, an innovative future land use system includes such categories as rural preserve and village center. Roanoke County's Future Land Use Map also designates water and flood hazard areas, which is a predominant category within the study area. In Bedford County,

the study area is designated as a growth area with no further district breakdowns.

3. Review of Agricultural/Forestral Districts

Within the study area, only Montgomery County contains agricultural and forestal districts (AFDs) as defined by the Virginia Agricultural and Forestal Districts Act. Montgomery is in the top two or three counties in the State of Virginia in number and size of districts created and in acreage included therein. The largest extent of AFD land use is located along the Upper North Fork in the McDonald's Mill and Bennett's Mill areas. In Montgomery County as a whole, larger AFDs tend to be associated with the most productive farmland.

4. Legal Constraints to River Corridor Planning in Virginia

Several federal and state laws or principles regulate land use for the purpose of protecting water quality and the environment. These include riparian rights which govern the use of surface water and are restricted to owners of land that adjoins a stream or standing water. The taking clause states that private property should not be taken for public use with just compensation. Dillon's Rule dictates that the power of local governments to enact ordinances that control land use decisions is derived from the State's specific delegation of police power to these local governments. Several Code of Virginia sections give localities the right to regulate land use and protect the environment through a variety of planning documents, including the comprehensive plan and zoning ordinance. Article XI (Conservation) of the State Constitution provides a mandate and opportunities for Virginia and its political subdivisions to conserve and protect environmental/natural resources.

V. RECOMMENDATIONS

Rationale for Action

While there has been significant movement toward larger roles for the state government in the regulation of land use and water quality during the past several years, it is still within the jurisdiction of local government to provide the decision-making and enforcement of land use policies. Cooperative, joint action by local governments is not likely to change the trend toward state regulation in the short term. Cooperative action will provide a mechanism for ensuring that local governments will remain key participants in land use decision-making in the future. This form of intergovernmental cooperation provides the greatest assurance that although change is inevitable and must be planned for and regulated, the delicate balancing of individual property owners' rights and responsibilities, and the public's rights and responsibilities, will be most equitably struck.

Action Agenda

The following Roanoke River Corridor Study Policy Recommendations represent the results of consensus between the participants in the study. The consensus has led to the development of an Action Agenda that will guide change within the corridor to achieve improved conditions in the use of land along the river and the quality of the water within the region. The Policy Recommendations recognize that not all of the desired actions are the responsibility of local government, but also include actions best undertaken by the private sector as well. These Policy Recommendations address a number of actions that can be taken during the short term that do not require extensive resources to accomplish, while also identifying other long term actions that should be taken (that will require more extensive commitment of resources). The primary focus of the recommendations is on those short term, low cost actions that will lead to significant improvements in the environmental condition of the Roanoke River. These recommendations also focus on the balancing of rights and responsibilities. The following section presents the recommendations of the Roanoke River Corridor Study.

POLICY RECOMMENDATIONS

I. PUBLIC SECTOR POLICY RECOMMENDATIONS

A. Short-Term Recommendations - it is recommended that:

1. Each locality within the Roanoke River Corridor Study Area amend their Comprehensive Plans by adopting the following statements:

GOAL: To establish the Roanoke River Corridor Area, as identified in the Roanoke River Corridor Study, as an area of special environmental concern worthy of coordinated conservation efforts by all governmental jurisdictions lying within the upper Roanoke River basin.

POLICY 1: To participate in the creation of the Roanoke River Conservation District Commission by appointing the Directors of Planning Departments from each jurisdiction within the study area, and seeking the appointment of the Planning District Executive Directors for the purpose of developing a Comprehensive Roanoke River Conservation Overlay Zone that would encompass the entire corridor study area.

POLICY 2: Coordinate all proposed Comprehensive Plan or Zoning Ordinance changes which would affect the Roanoke River Conservation Overlay Zone with the Roanoke River Conservation District Commission for comment prior to their enactment.

POLICY 3: Endorse the need for better coordination and cooperation through a single non-profit conservation organization to help achieve the goals and objectives of the plan for the entire Roanoke River Basin.

2. Recommend that the provisions of the Roanoke River Conservation Overlay Zone include the following elements:
 - a. Limitations on the development and use of lands lying within the Corridor Overlay Zone;
 - b. Require compliance with Best Management Practices for all uses and development undertaken within the Conservation Overlay Zone in accordance with State Water Control Board and Soil and Water Conservation District handbook guidelines;
 - c. Require establishment and/or retention of minimum vegetative buffer areas along the banks of the Roanoke River within the Corridor Area to stabilize the shoreline and increase filtration of nutrients and pollutants prior to their reaching the water;
 - d. Require soil and erosion control measures in accordance with local Soil and Erosion Control Ordinances for all land disturbance activities that occur within the Overlay Zone;
 - e. Establish performance criteria for land development planned for areas lying within the Overlay Zone; and
 - f. Ensure enforcement by the zoning official within each jurisdiction of the provisions of the Overlay Zone with technical assistance from appropriate state and federal agencies and the local Soil and Water Conservation District.
3. Recommend that the Roanoke River Conservation District Commission meet on a monthly or more frequent basis until the Overlay Zone Ordinance is presented to each jurisdiction for review and adoption.
4. Establish as a time frame for preparation of the Roanoke River Conservation Overlay Zone Ordinance, a period of six months from the date of acceptance of the Roanoke River Corridor Study by each jurisdiction.

B. Long-Term Recommendations

1. Request the Parks and Recreation Departments within each jurisdiction covered by the Roanoke River Corridor Study to participate in the development of the Overlay District Ordinance with particular attention to the

management of the resulting Roanoke River Greenway that would entail the following elements:

- a. Utilize the locations of areas identified as encompassing sites of conservation importance as identified in the Roanoke River Corridor Study and resulting from the implementation of the Overlay Zoning District, ranking and selecting those sites determined to be most important for preservation;
 - b. Include a comprehensive recreation program that indicates public access points, future park sites, linear trail systems, etc.;
 - c. Provide guidance and recommendations with respect to land and water conservation alternatives for the protection of those areas identified as worthy of protection;
 - d. Promote a conservation easement program that would comply with the Overlay District Zone's conservation objectives and that would be coordinated in conjunction with the Virginia Outdoors Foundation, Division of Natural Heritage (Department of Conservation and Recreation) and the Department of Historic Resources. The easement program would be coordinated through the Roanoke River Conservation District Commission in conjunction with cooperating conservation organizations to acquire easements on land identified as being worthy of conservation;
 - e. Establish an educational program for the Upper Roanoke River Basin that would focus on environmental awareness and stewardship issues. An example of which could be the "Adopt A Stream" Program which is part of the Isaac Walton League's SAVE A STREAM project.
2. Develop and Adopt an Erosion and Sediment Control Plan for the river corridor in accordance with the guidelines of the Virginia Soil and Water Conservation Board and in conjunction with participating Soil and Water Conservation Districts and seek its implementation in each jurisdiction within the study area.
 3. Develop a Comprehensive Stormwater Management Plan for the Roanoke River Watershed in cooperation with Planning District Commissions, local governments and appropriate state agencies.

4. Initiate a Comprehensive Roanoke River Tributary Study, based on the Fifth Planning District Commission/Virginia Water Control Board's Tinker Creek Model, that would provide guidance to localities for land use policies and decisions encompassing these tributaries.
5. Actively encourage the study of Minimum Instream Flow criteria and standards for major Virginia Waterways by the appropriate state agencies.
6. Encourage the establishment of a mechanism for providing long-term leadership and guidance to the Roanoke River Conservation District Commission on matters relative to the Roanoke River Corridor Overlay District Zone.

II. PRIVATE SECTOR POLICY RECOMMENDATIONS

- A. Encourage increased coordination and cooperation among private non-profit conservation organizations in order to improve their involvement in preserving areas (sites) identified as being worthy of preservation as a result of the Overlay Zoning District.
- B. Increase involvement in environmental education programs for the Roanoke River Basin that focus on environmental awareness (e.g., the Isaac Walton League's "Adopt A Stream" Program which is part of their SAVE A STREAM national project).
- C. Cooperate with Parks and Recreation officials and appropriate state agencies in developing and implementing a Comprehensive Conservation Easement Program for the Roanoke River Corridor (and Basin).
- D. Establish a program to monitor activities that occur within the river corridor (and basin) area that may have a deleterious impact upon the water quality of the River and Lake.
- E. Act as liaison with local government officials, regional advisory committees, state and federal agencies and other conservation organizations regarding issues, policies, programs and proposed legislation relative to environmental protection of the river corridor and basin area.

APPENDIX I

SUMMARY OF RECENT PLANS RELATING TO THE ROANOKE RIVER

Numerous other studies on the Roanoke River have been completed in recent years. The following studies have been relevant in the preparation of this report.

Plan: Geohydrology of the Upper Roanoke River Basin, VA

Prepared by: Virginia State Water Control Board
Bureau of Water Control Management

Date: August 1976

Purpose: Dr. James O. Waller conducted an investigation of the effects of the geology of the water resources of the Upper Roanoke River Basin for his Ph.D. research. The results of the investigation apply to water-resources planning, development, and management in the Upper Roanoke River Basin, as well as to water-resources evaluation in other parts of the Valley and Ridge and Blue Ridge Physiographic Provinces.

The three major objectives of this investigation were:

1. To identify the geohydrologic units and their surface water, groundwater, and water-quality characteristics;
2. To establish guidelines for sound planning, development and management of the water resources within the Roanoke River Basin;
3. To identify the type and scope of basic information needed for long-range planning of the water resources in the Appalachian Valley and Ridge Province and the adjacent west slope of the Blue Ridge.

Some of the issues that Dr. Waller addressed in his study include flooding, stormwater management, water quality degradation, water supply, storage reservoirs, hydroelectric power generation and recreational use. This report is a condensed version of Dr. Waller's dissertation which

includes more complete supporting documentation in the form of data and maps.

Plan: Upper Roanoke River Subarea Water Quality Assessment and Plan Elements

Prepared by: Virginia Water Control Board

Date: January 1989

Purpose: The purpose of this water quality assessment is to identify existing or future water quality problems in the Upper Roanoke River Subarea and offer solutions and/or recommendations to correct identified pollution abatement problems. This assessment includes the 1986 Virginia Water Quality Assessment or 305(b) Report which identifies problem areas by segments along the river as defined in VWCB Information Bulletin 565. Each segment is analyzed, and recommendations or solutions for point source or non-point source abatement are offered. Assessments are made concerning total maximum daily loads (TMDL), wasteload allocation, dredged or fill programs, non-point source control (Best Management Practices), residual wastes control, land disposal, and water quality standards. The report is divided into two parts: Chapter I - Water Quality Assessment - Upper Roanoke River Subarea; and Chapter II - Coordination with Other Planning. Facilities Plan Summaries are included for the following localities: Altavista, Boones Mill, Elliston/Lafayette, Roanoke City, Roanoke County (Roanoke Valley), Rocky Mount, and Shawsville.

Plan: Roanoke Basin Water Supply Plan

Prepared by: Virginia Water Control Board

Date: None listed

Purpose: The purpose of this plan is to identify water supply problems and their alternatives/solutions, and to evaluate the adequacy of the water resources within the Roanoke River Basin to meet off-stream needs through the year 2030. This plan measures and projects water demands according to the location of the water use, the purpose of the water use, and whether the water is supplied by a

community water system or self-supplied. The plan is organized by dividing the Basin into three smaller subareas according to a hydrologically-based cataloging system developed by the U.S. Geological Survey. These three areas are the Upper Roanoke, Smith-Dan, and Lower Roanoke Subareas. The division of the Basin in this manner facilitates the analysis of potential conflicts between upstream and downstream water use. Potential water problems and solutions are outlined in the plan for each locality in the Basin area.

Plan: FINAL Interim Feasibility Report & Environmental Impact Statement for Flood Damage Reduction

Prepared by: Army Corps of Engineers

Date: January 1984

Purpose: The purpose of this study is to investigate flooding and other water resource problems in the headwaters area of the Roanoke River Upper Basin and to determine if there are feasible solutions to these problems. The report is divided into six chapters: Introduction, Problem Identification, Plan Formulation, The Selected Plan, Plan Implementation, and Recommendations.

Plan: Roanoke River Flood Reduction Plan

Prepared by: Army Corps of Engineers

Date: May 1989

Purpose: This General Design Manual (GDM) discusses water related problems mainly concerned with flooding that occurs along the Upper Basin, Headwaters Area, of the Roanoke River within the City of Roanoke. The plan in this report is based upon the Roanoke River Upper Basin Final Interim Feasibility Report and Environmental Impact Statement for Flood Damage Reduction, January 1984. The GDM is intended to prepare the overall functional aspects of the proposed project and will serve to satisfy the intent of a feature design memorandum since this is a single purpose project and will be the basis for preparing final construction documents. The report gives a

general site description and a syllabus for the project. Some of the aspects of this plan include snag and debris removal, training walls, landscaping plan, floodproofing, and a flood warning system. The GDM has two volumes: Volume I -Main Text and Drawings; and Volume II-Appendices.

Plan: Environmental Assessment and Finding of No Significant Impact - Roanoke River Basin, Virginia Headwaters Area Flood Damage Reduction

Prepared by: Army Corps of Engineers

Date: June 1989

Purpose: This report was prepared in order to assess the environmental impacts, including impacts on significant fish and wildlife resources, of significant plan (Roanoke River Flood Reduction Plan, Army Corps of Engineers) modifications and to provide updated information on the status of the Roanoke logperch. This species has been suggested for listing by the United States Fish and Wildlife Service as an endangered species since the Final Environmental Impact Statement (1984) was filed with EPA. The environmental impacts of the components listed above in the Roanoke River Flood Reduction Plan summary are also discussed. Comments regarding the project and the Corp's findings are included in the report as well.

Plan: Water Quality Management Study for the Roanoke SMSA

Prepared by: Virginia Water Control Board

Date: December 1983

Purpose: The purpose of this plan is to update the water quality management strategy that has been and will be conducted in the Roanoke SMSA to manage all types of water quality problems. Two informational studies are contained in this plan. The first study deals with the potential number of rooftops or basement laterals that are connected to the sewage collection system. These laterals carry a significant amount of runoff to the Roanoke Sewage Plant. Areas with potential problems are identified on the basis of housing,

age, average slope, census data, and opinions of local officials. The second study identifies non-point source pollution within the Roanoke SMSA study area. Fifteen of 44 watersheds or stream segments were monitored for water quality. Priority watersheds were identified and a list of conclusions and recommendations concerning water quality and non-point source pollution was compiled.

Plan: Roanoke River Greenway Master Plan (Draft)

Prepared by: Jones & Jones for the River Foundation

Date: March 1988

Purpose: The Roanoke River Greenway Master Plan follows the National Park Service's reconnaissance study, which was conducted to determine the feasibility of building a parkway to connect the western end of the Roanoke Valley to the existing Blue Ridge Parkway via the Roanoke Gorge, and then on to the Booker T. Washington National Monument. As part of the Explore Project, the Roanoke River Greenway is proposed to be a 40-mile linear conservation area that will link the natural and urban areas along the Roanoke River and the Blue Ridge Parkway. The plan has three parts: (1) the Roanoke River Greenway and River Road, (2) the Roanoke River Parkway, and (3) recommended highway improvements between Hardy Ford and Booker T. Washington National Monument. Some of the recommended conservation elements in the plan are conservation of scenic river bluffs, river and tributary cleanup, and flood reduction. Several of the recommended recreation elements included in the plan are Roanoke River Wayside improvements, an extension of Wasena Park, and a scenic overlook and nature trail.

Plan: Explore Park Master Plan

Prepared by: Jones & Jones for The River Foundation

Date: December 1987

Purpose: The purpose of the Explore Park is to offer quality historical, environmental and recreational activities which will help to diversify and

strengthen the economy of western Virginia. Emphasizing the history and scenic beauty in this area, the Explore Park will chronicle the westward expansion of pioneers from the Virginia Blue Ridge to the northwest coast of the United States. The plan outlines each phase of the park, from the "American Indian Park" to the "Far West, including Northwest, Southwest, and Alaska". The planning process and development strategy involved in developing the Explore Park Master Plan are also outlined.

Plan: Feasibility Study for a Roanoke Valley Comprehensive Stormwater Management Program

Prepared by: Camp Dresser and McKee for the Fifth Planning District Commission

Date: May 1985

Purpose: This report summarizes a feasibility study of a comprehensive stormwater management program for the Roanoke Valley. The information and recommendations included in this report are intended to serve as a guide by which to develop such a program. The topics that are reviewed in the report include a description of the study area, benefits of a comprehensive stormwater management program, description of drainage problems and future stormwater management concerns, review of existing local stormwater management programs, and databases for stormwater management planning. This study was prepared for the Fifth Planning District Commission on behalf of Roanoke County, the Cities of Roanoke and Salem, and the Town of Vinton.

Plan: Reconnaissance Survey of the Roanoke River Parkway Corridor

Prepared by: National Park Service for The River Foundation

Date: 1987

Purpose: This report is the result of The River Foundation's contract with the National Park Service to conduct a reconnaissance survey along a 40-mile section of the Roanoke River. The purpose of this study was to determine the amount of

roadway that could be built to conform with Blue Ridge Parkway standards within the corridor, thus creating a river parkway. The report has two volumes: Volume I - Draft Survey Report, which details the selection of the parkway corridor between Dixie Caverns and Booker T. Washington National Monument; and Volume II - Technical Appendixes, which includes a detailed description of site constraints and resource opportunities that directed the selection of the corridor. The proposed River Parkway is designed to connect Roanoke City with the proposed "Explore" project as well as to protect the natural resources along the 40-mile river corridor.

Plan: Roanoke River Corridor Study (Draft)

Prepared by: Land Planning Studio in the Landscape Architecture Program at Virginia Polytechnic Institute and State University

Date: April 26, 1989

Purpose: The purpose of this study is to provide useful information concerning the Roanoke River Basin and to help foster cooperation among citizens, planners, government representatives, developers, and river users. This study will also help policy makers to better manage and protect the delicate resources of the river as they simultaneously strive to balance competing interests. The students conducting the study divided the Roanoke River into segments according to 7.5 minute U.S.G.S. quadrangle map boundaries. For each segment, they analyzed land use, degradation, natural resources, recreational and cultural resources, visual resources, and potentials. The final draft of this plan is expected to be completed in the Fall of 1989.

Plan: The Site Signature Method of Land Suitability Planning and the Roanoke River Reclamation Project

Prepared by: David P. Hill, VPI&SU

Date: June 4, 1984

Purpose: This report outlines a new methodology, developed by Mr. Hill, by which a suitable method of land

use planning can be determined for the Roanoke River Reclamation project. In his plan, Mr. Hill discusses the study area and its environmental characteristics; the biological, cultural, aesthetic, and physical concerns surrounding the river; and appropriate land use schemes based on his findings and methodology. A Recreation Master Plan demonstrating the use of the site-signature method of land use planning is also included in the report.

Plan: The Roanoke Valley Water Supply Plan

Prepared by: Virginia Water Control Board

Date: October 1984

Purpose: The purpose of this report is to identify the water supply planning efforts in the Roanoke Valley and to develop long-term alternatives for the projected demands to the year 2030. Several objectives of the report include:

1. Develop a regional water supply source to meet the projected water demand of 2030 by using information contained in the Army Corps of Engineers "Upper Roanoke Valley Water Supply Study", (Moore Gardner and Associates, 1980);
2. To meet the projected water supply needs by redesigning alternative source plans of the existing Moore Gardner and Associates report;
3. To develop a ranking methodology for comparing the alternatives for environmental, social, and economic impact;
4. To present these findings to the Virginia Water Control Board and local governments for review; and
5. To incorporate these findings or a modification of these after review into the Roanoke River Basin Water Supply Plan.

The report is divided into eight chapters: Chapter I - Introduction; Chapter II - Existing Facilities; Chapter III - Water Supply Demand; Chapter IV - Problem Definition; Chapter V - Short

Term Recommendations and Alternatives; Chapter VI - Long Term Alternatives; Chapter VII - Long Term Recommendations; and Chapter VIII - Alternative Selection.

Plan: Upper Roanoke Valley Water Supply Study

Prepared by: Moore Gardner and Associates

Date: January 1980

Purpose: This report presents 8 alternatives to satisfy the water demand through the year 2000 in the City of Roanoke, the City of Salem, the Town of Vinton, and Roanoke County. The alternatives are based on maximum utilization of existing supplies and generally include numerous system interconnections to balance valley-wide supply and demand.

Plan: Roanoke County Groundwater - Present Conditions and Prospects

Prepared by: Virginia Water Control Board

Date: July 1976

Purpose: The purpose of this report is to identify the current groundwater conditions and to assess the future of groundwater potential and quality in Roanoke County. The report is divided into seven chapters that discuss the physical setting of the study area, the hydrogeology of the area, groundwater quality, groundwater problems, groundwater potential and development, and findings, conclusions and recommendations.

Plan: Spring Hollow Study

Prepared by: Virginia Tech - College of Architecture and Urban Studies

Date: August 15, 1988

Purpose: This report outlines the legal and regulatory context of the controversy surrounding the proposed Spring Hollow Reservoir. Two of the primary areas investigated in this study are the

current legal framework governing allocation of Virginia's river waters, and recent developments concerning possible minimum instream flow policies.

Plan: Draft - Roanoke River Corridor Plan
City of Roanoke, Virginia

Prepared by: Lardner/Klein Landscape Architects
Mattern & Craig Engineers & Surveyors
Jones & Jones Architects and Landscape Architects

Date: July 1989

Purpose: The purpose of this plan is to provide direction for Roanoke City's action regarding the Roanoke River during the next ten years. The plan sets the stage for the creation of a linear green corridor along the 10-mile portion of the River within the Roanoke City boundaries.

The Roanoke River Corridor Plan is divided into two parts. Part I reviews the General Design Memorandum (GDM) for flood reduction along the Roanoke River as prepared by the Army Corps of Engineers. Also included in this section is the identification of important environmental, aesthetic, and recreational concerns related to the flood reduction project. Part II of the plan outlines the development of a detailed River Corridor plan for the 10-mile segment of the Roanoke River within the Roanoke City Limits. This portion of the plan combines the proposed flood reduction elements with the current and future environmental, aesthetic, cultural and recreational values of the river corridor. Recommendations for both long- and short-term opportunities concerning the quality of the environment, and cultural and recreational activities are included in the plan.

APPENDIX II

ROANOKE RIVER PROBLEMS AND ALTERNATIVES

The following thirteen pages entitled "Roanoke River Problems and Alternatives" was developed by the joint efforts of the policy advisory, technical advisory and citizens advisory committees of the Roanoke River Corridor Study. This text represents the input from numerous public meetings and written recommendations from interested individuals, local and state officials and agencies, and citizen and non-profit conservation organizations. Development of the final recommended goals, policies and strategies for the study were derived from these thirteen pages of text.

ROANOKE RIVER PROBLEMS AND ALTERNATIVES

PROBLEM AREA	PROBLEMS/OPPORTUNITIES		POSSIBLE ALTERNATIVES	RECOMMENDED STRATEGIES
B. ACCESS				
			<p>B.1.2 Coordinate a series of parks to provide access in conjunction with with an Open Space/Recreation Plan the River and with local comprehensive plans.</p>	
	<p>B.2 Bikeway/hiking along the River</p>		<p>B.2.1 Develop linkage routes for current & future parks along the River to allow bicycle and other access linkage between public facilities</p> <p>B.2.2 Work with the Railroad to provide access along the river in conjunction with an Openspace/ Recreation Plan for the River</p>	
	<p>B.3 Legal liability</p>		<p>B.3.1 Encourage participating local governments to enter into formal agreements with landowners to provide legal access for the public conjunction with an Open Space/ Recreation Plan; and pursuant to State Statute 29-130.2, removing landowners with legal liability for such public uses.</p> <p>B.3.2 Extend the concept of the hunting "Damage Stamp" to compensate property land owners for damages by users of the River.</p>	

PROBLEM AREA	PROBLEMS/OPPORTUNITIES	POSSIBLE ALTERNATIVES	RECOMMENDED STRATEGIES
C. ENVIRONMENTAL QUALITY			
	<p>C.1. Surface Water Quality</p>	<p>C.1.1 Encourage localities to undertake the necessary geo/hydrological studies to properly identify active karst topographic areas susceptible to groundwater pollution.</p> <p>C.1.2 Encourage localities to enact within their Zoning & Subdivision Ordinances limitations on development of active karst topography areas where public sewer accommodations are not provided.</p> <p>C.1.3 Amend State Ag/Forestal Districts to require compliance with Management practices.</p> <p>C.1.4 Encourage localities to amend their Zoning & Subdivision Ordinance to require retention of a minimum buffer strip between development activities/erosion prone land uses and the River using BMP Standards.</p> <p>C.1.5 Encourage development plans provide permanent protection of land adjacent to the River.</p> <p>C.1.6 Encourage State Review of the Roanoke River for Scenic River Designation on those outside of existing urban areas (i.e) in the North Fork of the River and near Smith Mt. Lake.</p> <p>C.1.7 Investigate the potential for enacting a Roanoke River Conservation Overlay Zone that would provide added requirements for development within the River Corridor. River Corridor</p>	

PROBLEM AREA	PROBLEMS/OPPORTUNITIES	POSSIBLE ALTERNATIVES	RECOMMENDED STRATEGIES
C. ENVIRONMENTAL QUALITY			
	C.4 Critical Habitats	<p>C.4.1 Work with appropriate State, Federal & Private agencies/organizations to identify areas of critical habitat importance within the Roanoke River Corridor Area.</p> <p>A.4.2 Incorporate identified critical habitat areas into a Comprehensive Roanoke River Open Space Plan with special precaution to avoid mention of specific species identification.</p> <p>C.4.3 Encourage owners of properties encompassing critical habitats to seek protection of those areas by use of conservation easements or donation of land to qualified conservation agencies/organizations.</p> <p>C.4.4 Encourage conservation organizations/agencies to actively seek preservation of identified critical habitats.</p> <p>C.4.5 Encourage development plans encompassing critical habitat areas to set aside those areas as openspace or seek some other method for preserving them.</p> <p>C.4.6 Encourage localities to amend their zoning & subdivisions ordinances to allow for cluster/PUD development designs for areas encompassing sites of conservation importance.</p>	

PROBLEM AREA	PROBLEMS/OPPORTUNITIES	POSSIBLE ALTERNATIVES	RECOMMENDED STRATEGIES
D. CULTURAL RESOURCES		<p>D.2.4 Encourage localities to amend their Comprehensive Plan to incorporate a Roanoke River Openspace Plan component that identifies rural landscapes, vistas and areas of Conservation importance and encourages their preservation</p> <p>D.2.5 Encourage development of Innovative Zoning methods that foster conservation oriented development designs & amend local zoning and subdivision ordinances accordingly.</p> <p>D.2.6 Encourage localities to require developers to seek review of development designs, to identify areas of conservation importance on their development plans, and to show how the plans mitigate any negative impact on those identified conservation areas.</p> <p>D.2.8 Encourage the formation of a single nonprofit Conservation Organization to operate throughout the entire Roanoke River Watershed Area that would work on Conservation initiatives within the watershed. Work with the National Land Trust Alliance and the VA Chapter of the Nature Conservancy in the formation of the new non-profit, conservation organization.</p> <p>D.2.9 Encourage State (VDOT) Scenic Byway designation for qualified roadways in the vicinity of the Roanoke River.</p>	

PROBLEM AREA	PROBLEMS/OPPORTUNITIES	POSSIBLE ALTERNATIVES	RECOMMENDED STRATEGIES
D. CULTURAL RESOURCES			
	<p>D.3 Protection of Agriculture & Forestry Uses</p>	<p>D.3.1 Encourage localities to enact enabling ordinances for the establishment of Ag/Forestal Districts, and to form additional Districts, where qualified, within the Corridor Study Area.</p> <p>D.3.2 Prepare a Roanoke River Openspace Plan that identifies prime & important farmland soils & fosters means for preserving areas currently in active agricultural use.</p> <p>D.3.3 Encourage the use of conservation/scenic easements to preserve rural landscapes, vistas and important forest and agricultural areas.</p> <p>D.3.4 Encourage owners of large parcels to pursue conservation oriented plans when designing subdivision of their property.</p> <p>D.3.5 Encourage localities to amend their Comprehensive Plan to incorporate a Roanoke River Open Space Plan component that identifies rural landscapes, vistas and areas of Conservation importance and encourages their preservation.</p> <p>D.3.6 Encourage development of innovative zoning methods that foster conservation oriented development designs & amend local zoning and subdivision ordinances accordingly.</p> <p>D.3.7. Encourage localities to require developers to seek review of development designs to identify areas of conservation importance their development plans, and to show how the plans mitigate any negative impact on those identified conservation areas.</p>	

