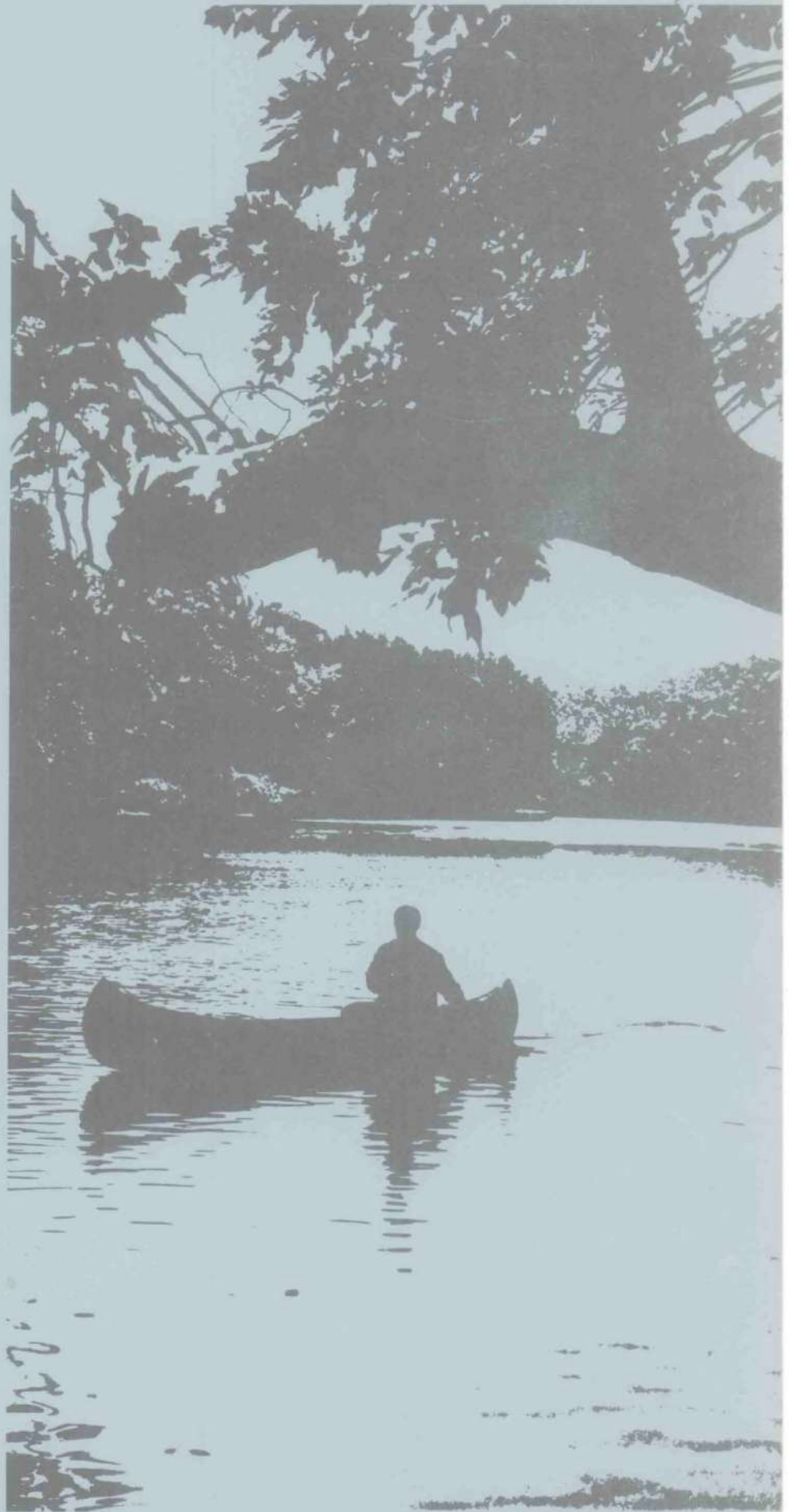


The Gasconade River

A Wild and Scenic
River Study



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DEPARTMENT OF THE INTERIOR

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Bureau of Outdoor Recreation
James G. Watt, Director

THIS REPORT WAS PREPARED PURSUANT TO PUBLIC LAW 90-542. PUBLICATION OF THE FINDINGS AND RECOMMENDATIONS HEREIN SHOULD NOT BE CONSTRUED AS REPRESENTING EITHER THE APPROVAL OR DISAPPROVAL OF THE SECRETARY OF THE INTERIOR. THE PURPOSE OF THIS REPORT IS TO PROVIDE CONSIDERATION BY THE BUREAU OF OUTDOOR RECREATION, THE SECRETARY OF THE INTERIOR, AND OTHER FEDERAL AGENCIES.

GASCONADE RIVER

MISSOURI

WILD AND SCENIC RIVER STUDY

JUNE 1975



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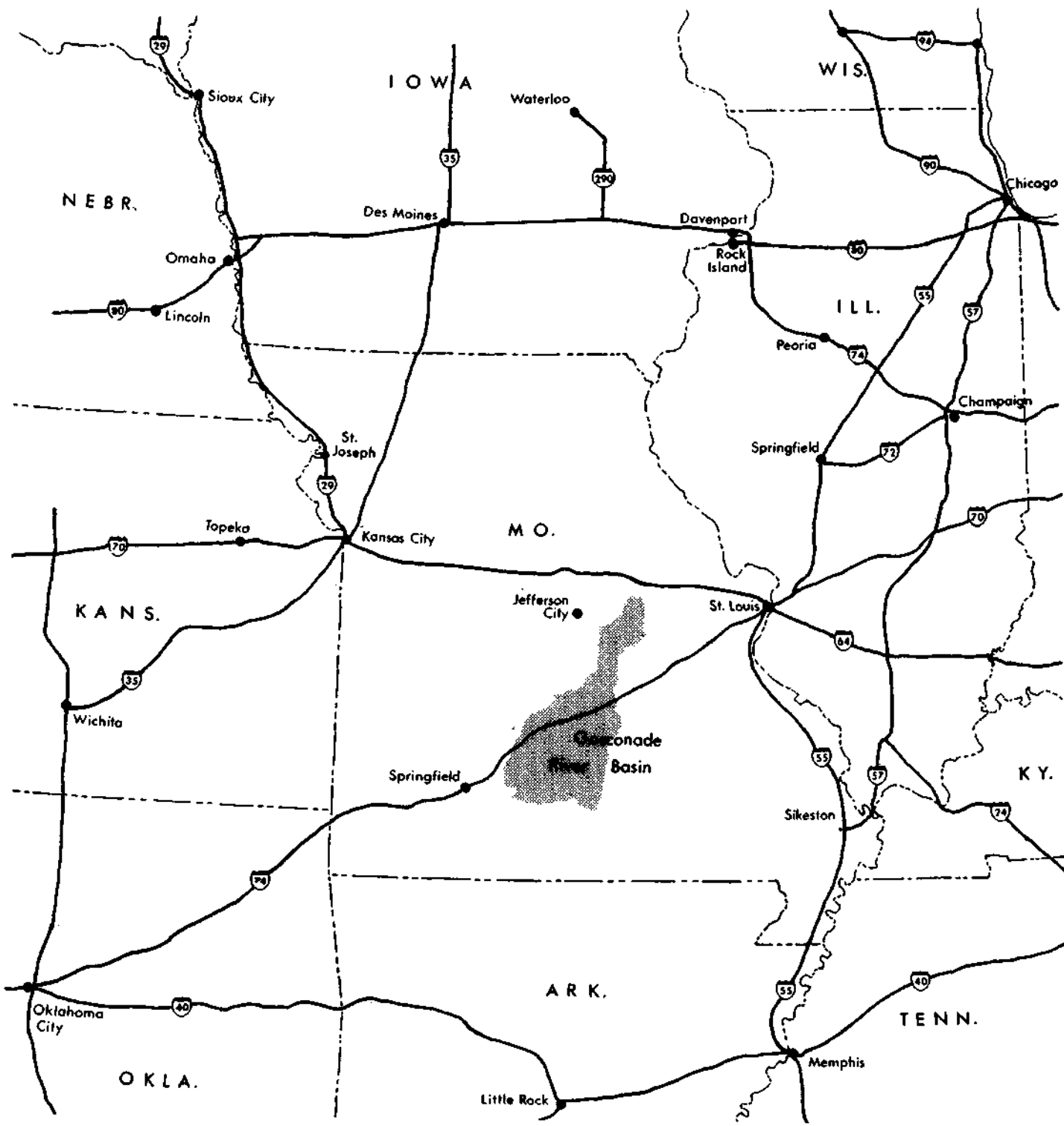
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I. INTRODUCTION



VICINITY MAP
GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

I. INTRODUCTION

On October 2, 1968, the Congress of the United States enacted the Wild and Scenic Rivers Act, Public Law 90-542. In this Act the Congress declared it:

. . . to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.

The Act established the National Wild and Scenic Rivers System, designated eight rivers as initial components of the stream, and prescribed methods and standards by which additional rivers could be added to the system from time to time. Twenty-seven rivers were also designated by the Act for study as potential additions to the National System. One of these is the Gasconade River and its major tributaries. The tributaries selected for study were the Big Piney and Osage Fork Rivers and Little Piney and Roubidoux Creeks.

The Act calls for a determination of the suitability of the Gasconade River for inclusion in the National System and, if it is to be included, recommendations and guidelines pertaining to the administration and management of the river and its environment.

This report contains basic data pertaining to the study area, study findings, conclusions, recommendations, and a discussion of alternative actions. In addition, the report includes a conceptual river plan which provides guidelines for the preservation, utilization, and management of the Gasconade and Big Piney Rivers. Environmental and socio-economic impacts expected as a result of the actions proposed were also evaluated and presented and summarized for this report. In accordance with the requirements of Section 102(2)(C) of the National Environmental Policy Act of 1969, a separate draft environmental impact statement will be filed with the Council on Environmental Quality and submitted for review.

Background

The Gasconade River has been subject to several previous studies and legislative actions. The Flood Control Act of 1938 authorized two reservoirs on the Gasconade River for flood control and other purposes. One of these reservoirs was to be located near Richland, Missouri, while the second would have been near the confluence of Little Piney Creek with the Gasconade River. Construction of the projects was never initiated and significant economic changes within the basin eventually caused the projects to be placed in an inactive status.

Resolutions adopted July 5, 1946, and June 13, 1956, by the Committee on Public Works, House of Representatives, directed the U. S. Corps of Engineers to conduct further surveys of flood control and allied purposes to determine if any projects in the Gasconade basin would be desirable. A Corps of Engineers investigation and feasibility study of the two previously authorized reservoirs was completed in 1973. It was concluded that both projects are economically infeasible. Subsequently, the Corps of Engineers has recommended that no structural improvements be undertaken and that the two reservoir projects be de-authorized.

In 1965, a State Wild Rivers Advisory Committee was appointed by the Governor to study and make recommendations for the preservation of the State's rivers. As a result of efforts by the advisory committee and other study groups later established, several House and Senate bills were introduced between 1967 and 1971 to establish a State scenic rivers system. Due to opposition by private landowner organizations, none of the bills were ever reported out of committee for a vote by the State legislature. Although all factions recognized the need for regulations in many areas during the last legislative effort to establish a State system, some objections by landowners were not resolved. Landowner organizations remained opposed to fee acquisition of "buffer zones" along the rivers, but agreed to the use of scenic easements. They were also opposed to the use of eminent domain in a river preservation program and could not agree on which agency of the State should administer the program.

The most controversial issue during this period involved an attempt to place the scenic rivers issue directly before the people through an initiative petition. The petition drive was an extremely emotional issue, and the threat of violence became a reality when the car of the petition drive chairman was dynamited. Eventually, the petition supporters withdrew their proposal after receiving assurances from landowner organizations that an acceptable compromise could be accomplished. Following withdrawal of the petition, the landowner organizations decided instead to oppose any and all scenic rivers legislation. While most landowners, recreationists, and conservationists agree that protection of Missouri's natural rivers and streams is important, the question as to how to accomplish such protection remains unresolved. At the present time, Missouri does not have a State scenic rivers system.

In 1968, during the height of controversy in Missouri, the National Wild and Scenic Rivers System was established by Public Law 90-542. As required by this legislation, the Federal Government became involved in conducting a study of the Gasconade River to determine its eligibility for inclusion in the National Wild and Scenic Rivers System.

Conduct of the Study

The Department of the Interior's responsibility for studying rivers named in the Wild and Scenic Rivers Act was delegated by the Secretary of the Interior to the Bureau of Outdoor Recreation. A field study team composed of Federal and State agencies was formed in 1971. Federal agencies represented on the study team included the Bureau of Outdoor Recreation, U. S. Forest Service, National Park Service, Environmental Protection Agency, U. S. Fish and Wildlife Service, and the U. S. Army Corps of Engineers. State agencies with representatives on the study team included the State Park Board, Department of Conservation, Clean Water Commission, Water Resources Board, State Geological Survey, and the Inter-Agency Council for Outdoor Recreation.

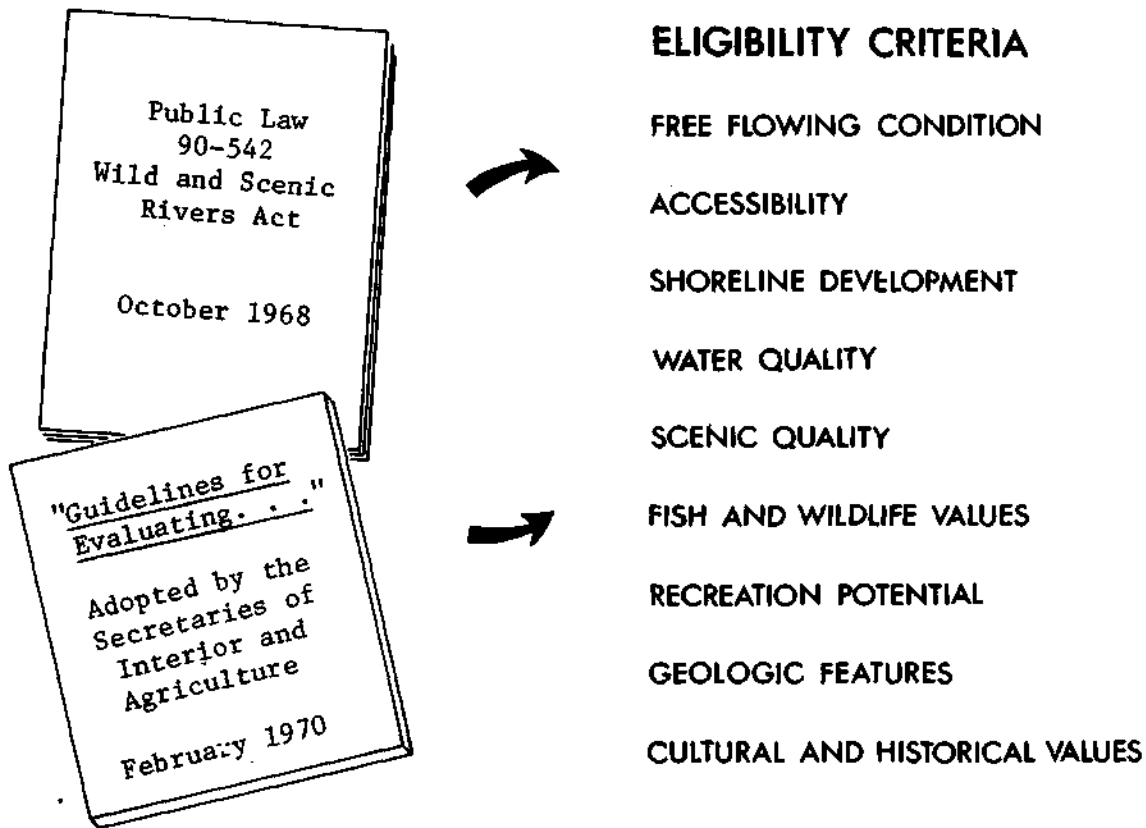
One of the most important elements of the study was public involvement in the planning and decision-making process. To insure public input, meetings with concerned individuals were held throughout the study. Three meetings were held in November 1971 to initiate the study, explain the purpose of the study, and describe the various provisions of the Wild and Scenic Rivers Act. Following the public meetings, the study team conducted field trips along the river and its surrounding area gathering the necessary background material for the preparation of an evaluation report. These trips involved frequent stream-side meetings with concerned landowners.

In September 1973 study team findings were announced at five public meetings, and the public was given an opportunity to comment on various river preservation alternatives and concepts proposed. Three of these meetings were held within the basin, and the remaining meetings were held in St. Louis and Kansas City. Comments and suggestions offered at these meetings were very carefully evaluated and served an important role in the subsequent development of a recommended course of action.

Eligibility Determination and Classification Procedure

The first basic task outlined for the Gasconade River study in the Wild and Scenic Rivers Act was to determine whether or not the river reaches met the eligibility criteria for either wild, scenic, or recreational river areas as set forth in the Wild and Scenic Rivers Act and the "Guidelines for Evaluating Wild, Scenic, and Recreational River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System as Adopted by the Secretaries of the Interior and Agriculture." In other words . . .

COULD THEY QUALIFY FOR THE NATIONAL SYSTEM?



In addition to these general requirements, every wild, scenic, or recreational river in its free-flowing condition or upon restoration to this condition shall be considered eligible for inclusion in the National Wild and Scenic Rivers System and, if included, shall be classified, designated, and administered as one of the following:

1. Wild river areas--Those areas or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
2. Scenic river areas--Those rivers or sections of rivers that are free of impoundments with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible.

3. Recreational river areas--Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

In arriving at a finding of eligibility and stream classification, the study team had to exercise its judgment, not only for each of the eligibility criteria as they applied to a particular segment of a river but on the river system as a whole, and to evaluate the combined effect of all criteria. It should be understood that the criteria are not absolutes. There is no way the criteria can be written so as to automatically indicate which rivers are eligible and what class they must be. Accordingly, the entire stream system and its immediate land area were considered as a unit, with primary emphasis upon the quality of the experience and overall impressions the public would receive while using the streams.

During the field investigations, the study team concluded that the Little Piney and Roubidoux Creeks and the Osage Fork River did not have the qualities necessary to justify further consideration of their potential for inclusion in the National System. The basis for this finding is described below.

Little Piney Creek--Little Piney Creek is known for its good water quality, stocked trout fishery, pleasant views of scenic rock bluffs, flowing springs, and attractive shoreline vegetation. However, there is not a sufficient volume of water in normal years during the recreation season to permit the full enjoyment of water-related recreation activities generally associated with comparable rivers in the Gasconade River system. The lower seven miles are floatable but contain various transportation corridors and other shoreline developments which severely impair the stream's scenic values.

Osage Fork River--Scenery along the Osage Fork is not spectacular, and few areas exist which could be considered of outstanding scenic quality. While the river offers potential for some recreation opportunities, its primary attraction is its pastoral qualities. However, these qualities are also typical of many similar south-central Missouri streams.

Roubidoux Creek--The stream possesses neither outstanding scenic qualities nor good recreation potential. Floating and other water-related recreation activities are severely limited due to low water flows during the normal recreation season. From the community of Roubidoux to where the creek becomes a "losing stream" and goes underground in Fort Leonard Wood, floating and fishing activities are restricted to short, floatable pools between the many extremely shallow areas.

The exceptional scenic and recreational values exhibited by the main stem of the Gasconade River and its major tributary, the Big Piney

River, qualified both river areas for further consideration. The contents of this report, therefore, apply to the Gasconade and Big Piney River areas specifically.

Acknowledgements

During the course of the study, the study team worked closely with many individuals and organizations in the Gasconade River basin. The compilation of information and statistical data would not have been possible without the cooperation of governmental agencies, quasi-public organizations, and private groups and individuals. Sincere appreciation is expressed to all who provided assistance.

II. FINDINGS AND CONCLUSIONS

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FINDINGS

Important findings of the study team include the following:

Portions of the Gasconade River system contain some of the more rugged topography and scenic areas in the State of Missouri.

Stream segments which qualify for inclusion in the National System are in a free-flowing condition, are of sufficient length to provide a meaningful experience, and display a scenic character of exceptionally high quality.

Approximately 17,000,000 people live within 250 miles of the Gasconade River, but only 180,000 people live within the eight counties that have all or a portion of their boundaries within the basin.

The study area is best characterized as rural, farm, and forest country.

Major highways provide good access to the study area. Secondary roads afford adequate access to the streams. Interstate 44, a major transcontinental highway, crosses both the Big Piney and Gasconade Rivers.

Generally, the present water quality of the Gasconade and Big Piney Rivers varies from good to excellent and is of sufficient quality to meet the "Aesthetics-General Criteria" as defined by the National Technical Advisory Committee on Water Quality Criteria, April 1, 1968. No major sources of air pollution exist along the river corridors.

The Gasconade and its tributaries flow through one of the most cavernous regions in the Nation; 131 named caves, some several miles in length, have been located along the streams. Thirty-nine of the many springs along the river system have been named.

Many sheer bluffs along the rivers, some rising more than 200 feet above the water, are a spectacular and well-known basin feature.

Vegetation along the river is diverse and, in most instances, provides ample screening from nearby developments. Approximately 148 species of trees, wildflowers, and other plants have been identified by the Missouri Department of Conservation.

The Gasconade basin's size, length, and diverse topography provides suitable habitat for a wide variety of fish and wildlife species. Deer, turkey, cottontail rabbit, and bob-white quail are the more important game species. One hundred and nine species of fish and 61 species of mammals have been recorded in the basin. Approximately 290 species of birds use the area during the year, including the American Osprey and southern bald eagle. Reptiles and amphibians are plentiful.

Float fishing, which originated in the Missouri Ozarks at the turn of the century, attracts fishermen from a number of surrounding States. Water quality and flow characteristics make parts of the Gasconade and Big Piney Rivers ideal for family canoe outings.

The unique recreational and scenic qualities of the river areas assure the river user of an exhilarating, high quality recreation experience.

Although portions of the Gasconade and Big Piney Rivers and their surrounding environment have remained essentially natural and scenic in character, the study team also found several factors which presently or potentially endanger those qualities. These include the following:

In the last decade, an estimated one million acres of Ozark forest land have been cleared for cattle grazing and other purposes. This practice will probably continue and would severely impair the scenic and recreational values if timbered areas are cleared within view of the river.

Only four full-time commercial sand and gravel extraction operations are now active on the rivers. Industrial operations of this type which are located closer than one-fourth of a mile to the recommended river areas would be incompatible with recreation use and the maintenance of river quality.

Construction of houses within the study area has been increasing, especially near major communities, travel routes, and along easily accessible river reaches. Unattractive permanent homes and seasonal cottage development exist on some parts of the Gasconade, particularly near Jerome. Development of recreation homesites is expected to increase along the more isolated river areas.

Two major highways, 46 bridges and fords, four railroad lines, one car ferry, four major pipelines, and a number of power and telephone lines now cross both rivers.

At times, water quality on certain river areas is impaired by stream enrichment resulting from existing developments and land use activities. The excessive algae and aquatic

vegetation growth which results limits recreation activities and diminishes scenic values.

Recreation use on the Gasconade and Big Piney Rivers is increasing as the existing recreation developments in adjacent, better known basins become more heavily used. If not carefully controlled, future recreation demands on both rivers could result in overuse and a subsequent deterioration of scenic and recreational values.

CONCLUSIONS

Classification

It is concluded that a total of 222 miles of the Gasconade and Big Piney Rivers possess outstandingly remarkable scenic and aesthetic recreational, fish and wildlife, and geologic values, and that the rivers and their immediate environments should be protected for the benefit and enjoyment of future generations.

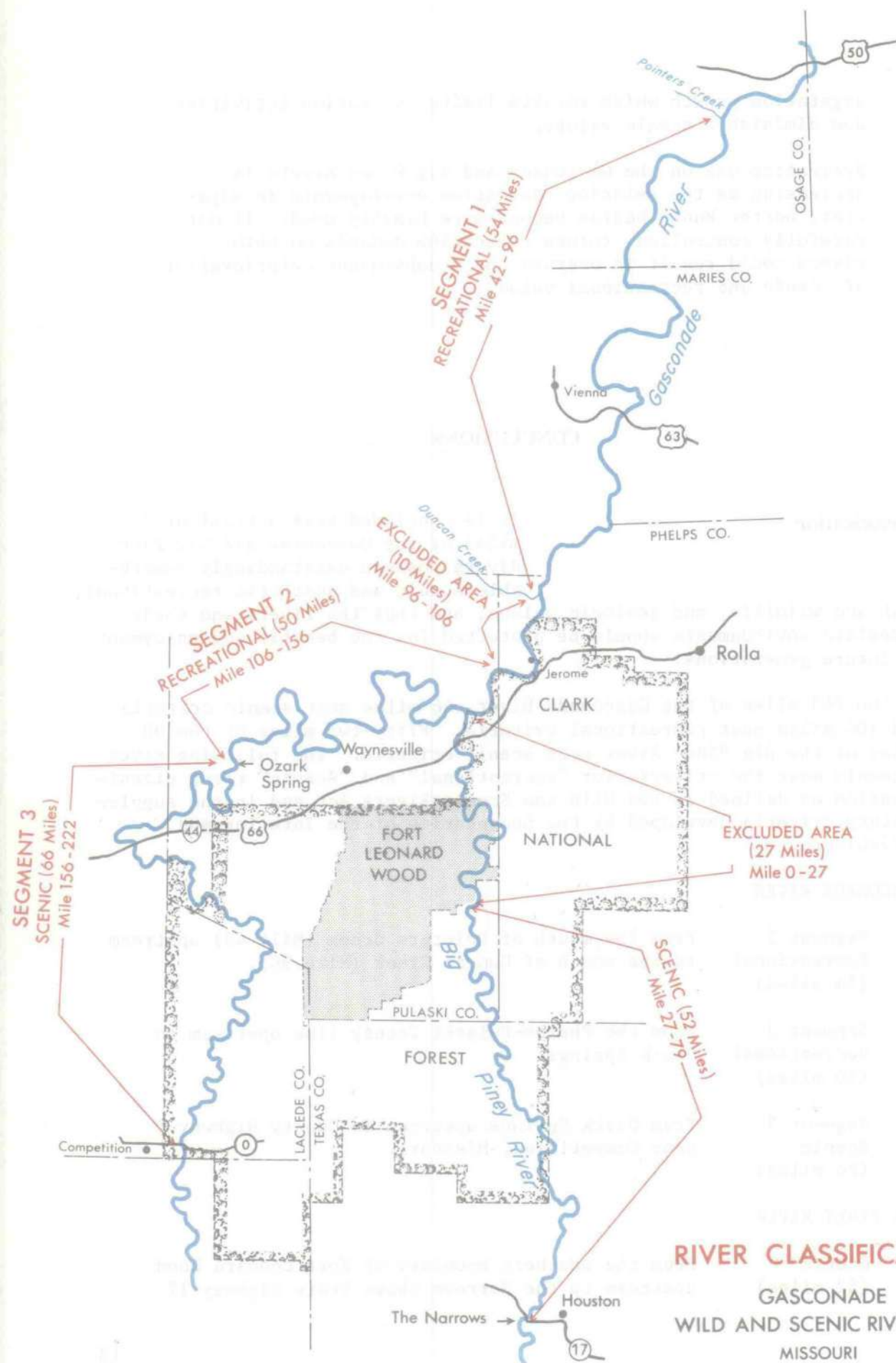
Of the 265 miles of the Gasconade River, 66 miles meet scenic criteria and 104 miles meet recreational criteria. Fifty-two miles of the 90 miles of the Big Piney River meet scenic criteria. The following river segments meet the criteria for "recreational" and "scenic" river classification as defined in the Wild and Scenic Rivers Act and in the supplementary criteria developed by the Secretaries of the Interior and Agriculture.

GASCONADE RIVER

Segment 1 Recreational (54 miles)	From the mouth of Pointers Creek (Mile 42) upstream to the mouth of Duncan Creek (Mile 96).
Segment 2 Recreational (50 miles)	From the Phelps-Pulaski County line upstream to Ozark Springs.
Segment 3 Scenic (66 miles)	From Ozark Springs upstream to County Highway 0 near Competition, Missouri.

BIG PINEY RIVER

Scenic (52 miles)	From the southern boundary of Fort Leonard Wood upstream to the Narrows above State Highway 17.
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The following segments of the Gasconade and Big Piney Rivers and their immediate environments do not meet the criteria required for inclusion in the National Wild and Scenic Rivers System.

Gasconade River

River Mouth to Pointers Creek--Shoreline development in this stretch severely influences the river scene and significantly lowers the quality of the recreation experience. Cottages, roads, bridges, and other developments are in almost constant view by the river user. The adjacent lands consist mainly of wide, flat valleys with a few bluffs set back from the river. Scenery along this segment is not spectacular and no areas exist which would be considered outstanding in scenic quality.

Duncan Creek to Phelps-Pulaski County Line--The large scenic bluffs and other natural features displayed along this 10-mile portion between segments meeting recreational criteria are offset by an excessive amount of shoreline development. Cabins occur in clusters throughout with at least 50 closely spaced, year-round dwellings and summer cottages located along a two-mile stretch near the Village of Jerome. Also located within the area and adding to the congestion are Interstate Highway 44, a railroad bridge, and several other road and powerline crossings which frequently span or parallel the river. Man has so completely modified the river corridor here that the scenic values and related recreation experiences are almost completely compromised.

County Highway 0 Bridge to Headwaters--This portion lacks the large bluffs and other outstanding natural features which exist downstream. Instead of a well-screened and scenic river corridor, there are more frequent views of open pastured uplands and other agricultural activities. Opportunities for water-related recreation activities are extremely limited on this segment due to low water flows during the normal recreation season. Here floating requires an excessive amount of dragging over shallow areas and limited fishery habitat restricts sport fishing activities. Most recreation activities are limited by the small size of the river and by the low water flows. The recreation and scenic qualities exhibited on this portion are locally or regionally important but do not display the qualities characteristic of rivers of national significance.

Big Piney River

River Mouth to Southern Boundary of Fort Leonard Wood--Evidence of man's activities become quite obvious when the river enters Fort Leonard Wood. Two dams within the Fort have replaced the natural upstream river flow with deep, slack pools. Also evident are building structures, large gravel operations, and bank deterioration resulting from heavy use on recreation areas and from military training operations. Below the Fort shoreline dwellings and the community of Devil's Elbow flank the stream; cable and powerline crossings are numerous. Several roads parallel and cross the river in this area including Interstate Highway

44, old Highway U.S. 66, and a railroad. Waters in this portion are enriched by effluent from domestic and industrial waste resources and from agricultural runoff. The abundant growth of aquatic vegetation during the summer season frequently interferes with recreational use of the river. The many developments and intrusions found along this stretch have significantly modified the river corridor and, in the process, have either removed or reduced many of the exceptional scenic and aesthetic values previously present.

The Narrows Near Highway 17 to Headwaters--This area has most of the same characteristics of the headwaters of the Gasconade. The small size of the stream and low water flows during the normal recreation season severely limit water-oriented recreation activities. Unique natural features and scenic qualities viewed in the downstream area are supplanted here by views of open pasture and a small fringe of shoreline timber.

Public Involvement

As a basic premise held throughout the study, public involvement in the planning process was considered to be essential. Opinions and ideas expressed by people, both within and outside the Gasconade River basin, had to be taken into account to assure that no relevant factors were overlooked. While it is important to protect and preserve the Nation's outstanding scenic and recreational resources, it is not without people in mind that such protection can be warranted. Therefore, the ideas, concerns, private interests, and philosophies of people, especially those with direct concern, are necessary ingredients to making responsible recommendations with which any study should culminate.

In addition to meeting with various groups and individuals during conduct of the study, five public information meetings were held to solicit the views of concerned and interested people regarding study findings and various alternatives for river resource protection. The first three 1973 public information meetings were held at Licking, Waynesville, and Vienna, Missouri, all within the Gasconade River basin. Nearly all persons attending these meetings were opposed to inclusion of the rivers in the National Wild and Scenic Rivers System or of imposing any form of government control over the river resources. The principal issues raised by people owning land along the rivers and other concerned basin residents were:

1. Disruption of agricultural practices and, subsequently, their livelihood as a result of removing crop or pasture lands from production.
2. Adequacy of compensation for lands to be acquired.
3. Removal of land from county tax rolls resulting in increased property taxes.

4. Encroachment on private rights.
5. Deterioration of river resources and scenic values due to excessive public recreation use.
6. Adequacy of law enforcement capabilities to control such things as littering, vandalism, and trespass.
7. Loss of planning or decision-making authority by local government and landowner associations.

Two additional public information meetings were held in Kansas City and St. Louis, Missouri, immediately following the aforementioned meetings. In contrast to the other meetings, most of those in attendance represented conservation and environmental interests. Considerable support for inclusion of the river areas in the National System was expressed, although many of the same concerns listed above were also raised.

The most important and positive aspect of the five meetings was that there were significant areas of agreement among all groups. Many different views were expressed, BUT IT WAS A CONSENSUS OF THOSE PRESENT AT ALL FIVE MEETINGS THAT:

1. The natural environments of both rivers should be preserved.
2. Every reasonable effort must be made to limit the impact of any river preservation program on local residents.
3. The number of river users must be controlled to prevent degradation through overuse.
4. Rules and regulations regarding user conduct, littering, and trespass must be strictly enforced.

An analysis of these areas of agreement in regard to the concerns expressed by landowners reveals that a river protection program based upon a consensus of views should resolve most landowner concerns.

It was the expressed belief of basin residents that through local initiative and control the river areas studied can be effectively protected and made available for public use and enjoyment. Thus, it was concluded that the basin residents should be given every opportunity to demonstrate their capability to "manage" river resources in a manner fully consistent with the intent and purpose of the Wild and Scenic Rivers Act. Accordingly, the protection and enhancement of natural and recreational values along the more developed portions of the Gasconade River found to qualify as "recreational" (104 miles) should become the responsibility of the local people in conjunction with local, State, and Federal programs. It was also concluded that the intervening 10-mile river stretch between recreational segments also required local management to prevent further unwise development which would adversely affect the downstream recreational river segment.

Based on the reasons discussed within this report, responsibility for the protection of the more remote and scenic reaches of the Gasconade and Big Piney Rivers should rest with the Federal Government. The following recommendations and guidelines take into account the concerns, needs, and well being of people both within the basin, the State of Missouri, and throughout the Nation.

III. RECOMMENDATIONS

III. RECOMMENDATIONS

In order to preserve the Gasconade and Big Piney Rivers in their free-flowing state, to protect and enhance the outstanding natural and scenic values of the river environment, and to assure these values are available for present and future generations, it is recommended that legislation be enacted which:

1. Amends Section 3(a) of P. L. 90-542 to include 66 miles of the Gasconade River and 52 miles of the Big Piney River, which meet the required criteria and are described in this report as Federal components of the National Wild and Scenic Rivers System, and designates them "scenic" river areas as defined in Section 2(b)(2) of the Wild and Scenic Rivers Act.
2. Directs the Secretary of Agriculture (Forest Service) to administer the "scenic" river areas and establish scenic river boundaries in accord with the guidelines contained in the Secretary of the Interior's report.
3. Requires completion of a management plan within two years from date of enactment.
4. Recognizes that 104 miles of the Gasconade River between Ozark Springs and Pointers Creek, excluding a 10-mile stretch between Duncan Creek and the Phelps-Pulaski County line, meet the criteria for classification as "recreational" under P. L. 90-542 but calls for management of that area, including the 10-mile stretch, to be accomplished through local initiative in conjunction with existing State programs. This "recreational" segment is not recommended for inclusion in the National Wild and Scenic Rivers System at this time.
5. Authorizes establishment of a 12-member Gasconade River Advisory Board composed of Federal, State, local, and private interests; directs the Secretary of the Interior to appoint the chairman and other members from recommendations made by the Secretary of Agriculture, the Governor, and by the County court in each of the counties involved; and defines the board's function as follows:

Advise the administering agency on scenic river management.

Assist in the development of local management plans and their implementation.

Report annually to the Secretary of the Interior on effectiveness of local efforts.

6. Directs that the general criteria used by the river advisory board to evaluate the current and long-term effectiveness of Federal and local management include the following:

Land use and river management plans which meet the basic purposes and management objectives for "scenic" and "recreational" river areas as set forth in the Act and in the "Guidelines for Evaluating Wild, Scenic, and Recreational River Areas . . ." adopted by the Secretaries of the Interior and Agriculture.

Uniform zoning regulations which control developments in a manner which does not impair the quality of the river corridor environment.

Provisions for appropriate public access and recreational use of the river.

Adequate control of public conduct through coordinated local and State law enforcement measures.

7. Requires the Secretary of the Interior to report to the Congress on effectiveness of local efforts within four years from date of Act or sooner if, in his opinion, actions have or may occur which would adversely affect the values of the Gasconade River between Ozark Springs and Pointers Creek.
8. Expresses the intent of the Congress to place under Federal control the river reach (104 miles) described in (4) if local efforts to meet the objectives of P. L. 90-542 are not successful.

It is further recommended that:

1. The development and management of the proposed National Scenic River areas give primary emphasis to maintaining and enhancing the aesthetic, scenic, fish and wildlife, and geologic features. All recreation facility development should be consistent with the protection of those values of the rivers' environment which enable them to qualify for inclusion in the National System.
2. Fee acquisition of lands within the scenic river corridors be kept to a minimum and that scenic easements be used whenever practical in order to minimize impacts on the local people and economy.
3. Appropriate agricultural practices along the river areas be recognized as an important cultural feature.
4. The administering agency determine the visitor capacity of each scenic river and establish a method of visitor control before visitor capacity is reached and implement such controls when necessary.

5. Any construction of new bridge crossings, renovation of existing structures, powerline or pipeline crossings, and water resource projects and any other visual disturbance of the river corridor be reviewed and approved in advance by the managing agency to ensure that construction is consistent with the purposes of the Wild and Scenic Rivers Act. The managing agency should ensure that all planned or proposed powerline crossings, where possible, are re-routed around the segments proposed for inclusion in the National Wild and Scenic Rivers System.
6. The natural areas identified in the Recommended Conceptual River Plan be included within the scenic river boundaries with minimum access and interpretive facilities developed to provide for public visitation and use. A detailed inventory of all archaeological, historical, and other special interest areas along the river corridors should be made and a program developed for their protection and interpretation.
7. Appropriate State and Federal agencies take the necessary actions to ensure good water quality throughout the Gasconade River basin through enforcement of water quality standards and the encouragement of compatible soil and water conservation practices. A program for monitoring chemical, biological, and physical water quality characteristics should be established throughout the basin. All waste collection and treatment facilities throughout the basin should be upgraded. Septic tank-tile sewage disposal systems should not be allowed where soil conditions make possible subsurface pollution of the Gasconade River system.
8. Local units of government along the river areas adopt land use policies and zoning standards which are consistent with the purposes of the Wild and Scenic Rivers Act. Zoning objectives should be to prohibit new commercial, industrial, or residential uses which are inconsistent with the purposes of the Act and to protect the shorelands by means of acreage, frontage, and setback requirements. In addition, governmental units throughout the watershed should give consideration to adopting general zoning and subdivision regulations which would promote orderly growth and ensure that future developments do not degrade the overall quality of the basin environment. Consideration should be given flood plain and stream-bank zoning by local units of government and the State to ensure compatible development in those areas of the Gasconade basin not recommended for inclusion in the National System.

IV.
RECOMMENDED CONCEPTUAL RIVER PLAN

IV. RECOMMENDED CONCEPTUAL RIVER PLAN

The following conceptual river plan calls for two separate forms of management for protecting the portions of the Gasconade and Big Piney Rivers which qualify for inclusion in the National Wild and Scenic Rivers System.

1. The plan sets forth guidelines for managing and protecting the "scenic" river segments as components of the National Wild and Scenic Rivers System.
2. The plan suggests guidelines for managing and protecting the "recreational" river segments through local initiative.

INCLUSION OF PORTIONS OF THE GASCONADE AND BIG PINEY RIVERS IN THE NATIONAL WILD AND SCENIC RIVERS SYSTEM

The proposed guidelines for establishing boundaries and recreational developments on the "scenic" portions of the Gasconade and Big Piney Rivers are presented as conceptual recommendations and should not be considered as being the complete or final plan for a scenic river program. Concepts presented in this plan should be modified or refined in the final master plan of the administering agency whenever necessary to ensure that the needs of people in the local, State, and adjacent State areas are met. The master plans for management of the river areas should be prepared in cooperation with concerned State, local, and private interests. Depending on the master plan developed by the administering agency, existing State areas within the "scenic" portions of the two rivers would probably continue to be managed by the State.

Area and Cost

The area suggested for inclusion in the National Wild and Scenic Rivers System extends along 66 miles of the Gasconade River and 52 miles of the

Big Piney River. Instead of proposing a specific riverway boundary, guidelines are proposed which would be used by the administering agency to establish the actual boundaries. Thus, current data regarding the total area to be encompassed within the boundary and the fee and less-than-fee interests to be acquired are estimates of the acquisition needs expected to result from use of the proposed guidelines. The assumptions made in order to provide a basis for estimating the acreage requirements are described in the acquisition policy and recreation development sections of this plan.

It is estimated that the administering agency would purchase at least 1,000 acres of land in fee title to carry out the intent of the Act. However, it must be realized that additional acreages may be required based on management plans which will be developed by the administering agency following a detailed study of the river areas. The remaining acquisition needs will be on a less-than-fee basis through the use of scenic easements. Easement costs are estimated to be 50 percent of fee title costs. The total cost of both fee title and easements will be approximately \$7,160,000. Estimated acreage and cost requirements are shown in Table 1.

TABLE 1

ESTIMATED MINIMUM ACQUISITION NEEDS
(Cost in Thousands of Dollars)

River	Fee Title		Easements		Total	
	Acres	Cost	Acres	Cost	Acres	Cost
Gasconade	550	\$440	9,350	\$3,740	9,900	\$4,180
Big Piney	450	360	6,550	2,620	7,000	2,980
Subtotals	1,000	\$800	15,900	\$6,360	16,900	\$7,160

The objective of the acquisition program is to keep fee title acquisition of adjacent river lands to the minimum necessary for meeting the management objectives of the river plan. In most cases, it is anticipated that fee acquisition would proceed only after negotiations for easements have failed. However, if the value of easements approaches full fee title costs, the land should be acquired in fee.

Recreation developments recommended in this river plan, which include public access sites, float camps, and access roads, would cost an estimated \$1,424,000. The estimated cost for operation and maintenance of the recommended facilities would be approximately \$411,000 annually. In order to establish a management corridor including scenic easements, a land line survey estimated to cost \$500,000 would be required.

TABLE 2

TOTAL ESTIMATED COSTS
(1974 Dollars)

Initial Capital Costs	
Acquisition	\$7,160,000
Land line survey	500,000
Natural areas survey	415,000
Fence removal and site restoration	20,000
Facility development	1,424,000
Visitors information services management plan	50,000
TOTAL CAPITAL COSTS	<u>\$9,569,000</u>
Annual Costs	
Operation and maintenance	\$ 411,000
Water Quality monitoring	<u>5,000</u>
TOTAL ANNUAL COSTS	<u>\$ 416,000</u>

Boundaries

Boundaries for the proposed Gasconade and Big Piney National Scenic Rivers would be delineated by the administering agency. The actual boundaries

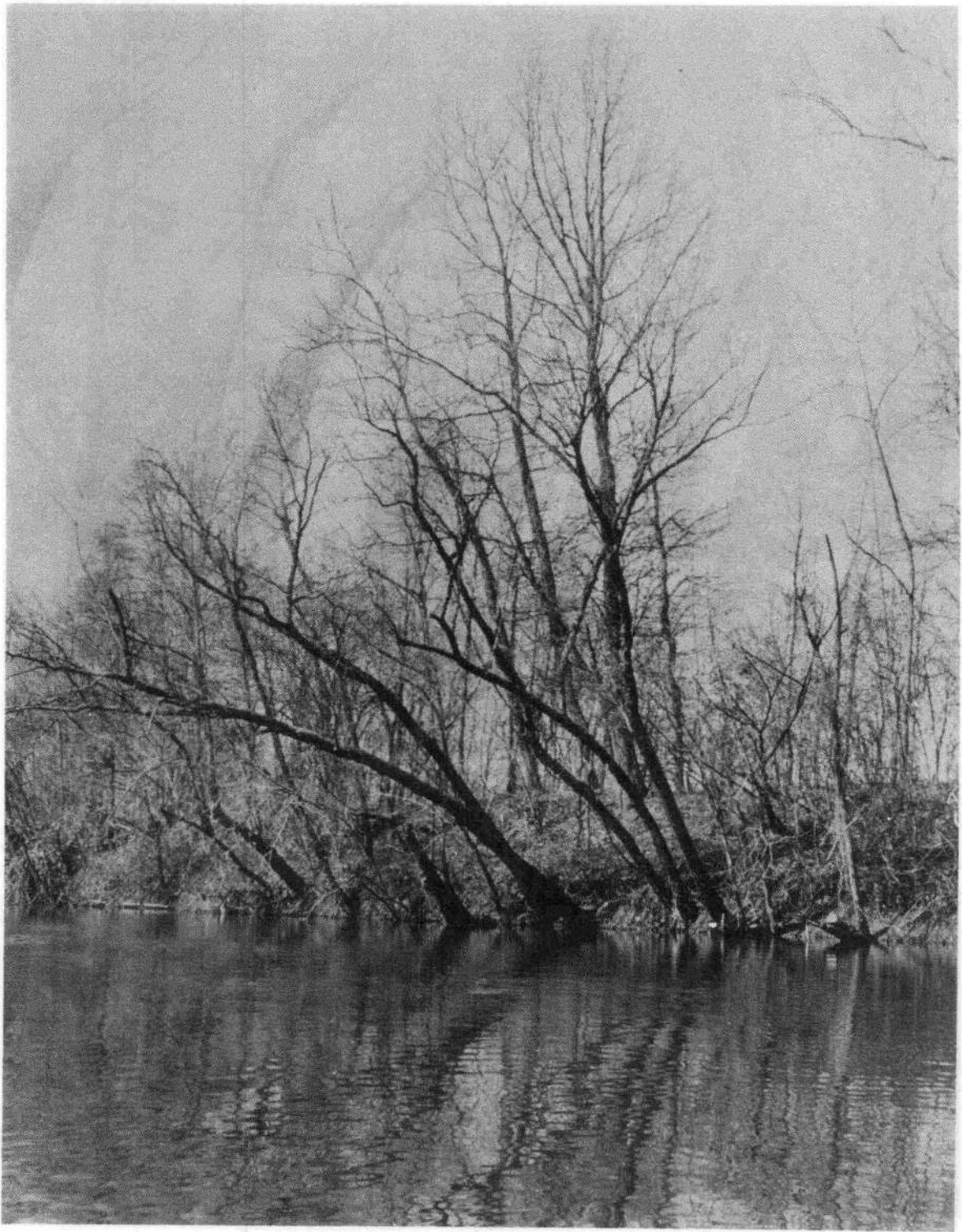
for both rivers would be developed using the general guidelines presented in this river plan and three basic criteria: (1) the "visual corridor concept," (2) the inclusion of outstanding natural or archaeological areas and required public use and access areas, and (3) the minimization of new survey and severance costs. The guidelines should also provide a means by which individual property owners can determine to a reasonable extent how their property might be affected.

The primary factor which determines the width of river corridor necessary is the line-of-sight or "visual corridor concept" which requires that adequate land be provided to keep the river corridor scenic and pleasant appearing in the eyes of the river user (boater or fisherman). Basically, the visual corridor is the zone of adjacent land which has a visual impact on the river user and, therefore, should be protected from adverse use and development if the natural and scenic integrity of the river is to be retained. In many instances, this can be accomplished through the purchase of scenic easements along a relatively narrow corridor which may vary in width depending on (1) the height and angle of slope of adjacent riverbanks and (2) the amount of available plant and tree cover. The relative availability of either of these two factors will increase or decrease the corridor width necessary to protect it.

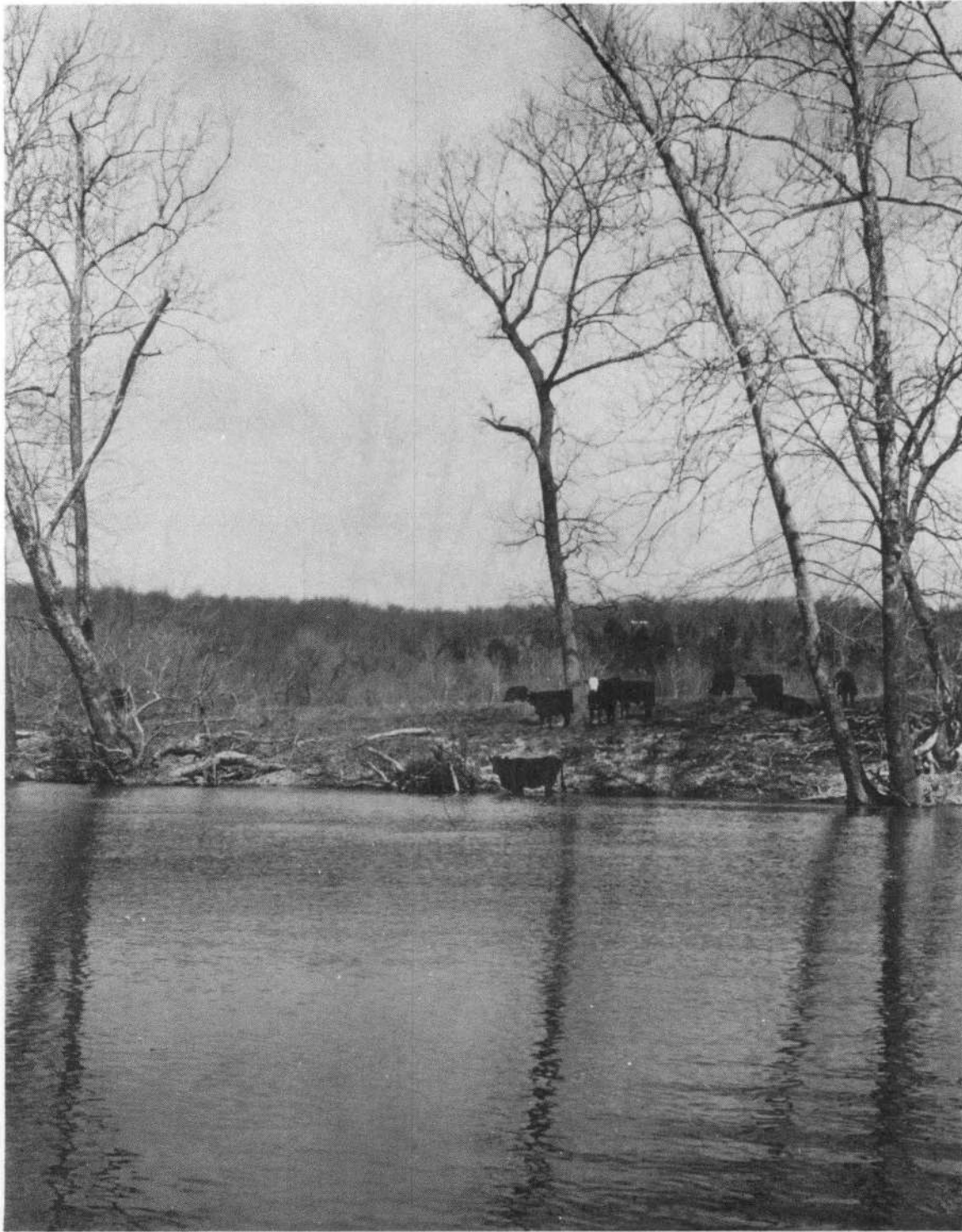
The following illustrations describe three typical kinds of river corridor screening provided by vegetation and terrain found along the Gasconade and Big Piney Rivers which should be considered in determining the width of scenic easement required and, in most instances, the boundary location.



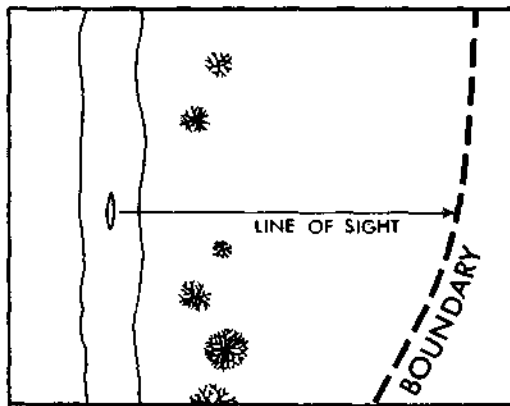
DENSE VEGETATIVE SCREEN - NARROW EASEMENT REQUIRED



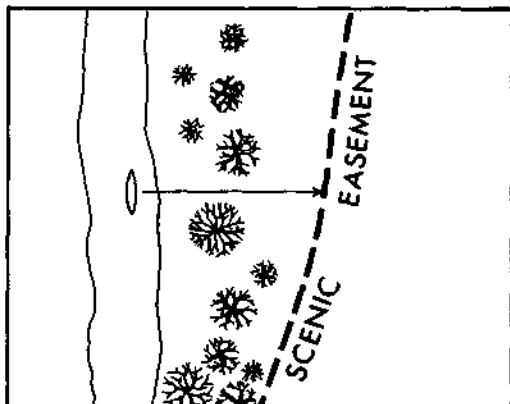
PARTIAL VEGETATIVE SCREEN - WIDER EASEMENT REQUIRED



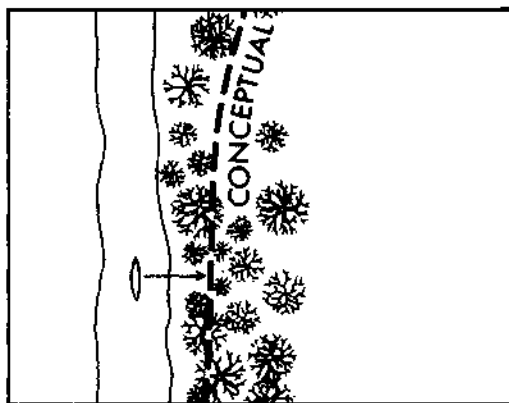
SPARSE VEGETATIVE SCREEN OR OPEN VIEW
MAXIMUM SCENIC EASEMENT WIDTH POSSIBLY REQUIRED



BOATER'S VIEW
NOT LIMITED
BY VEGETATION



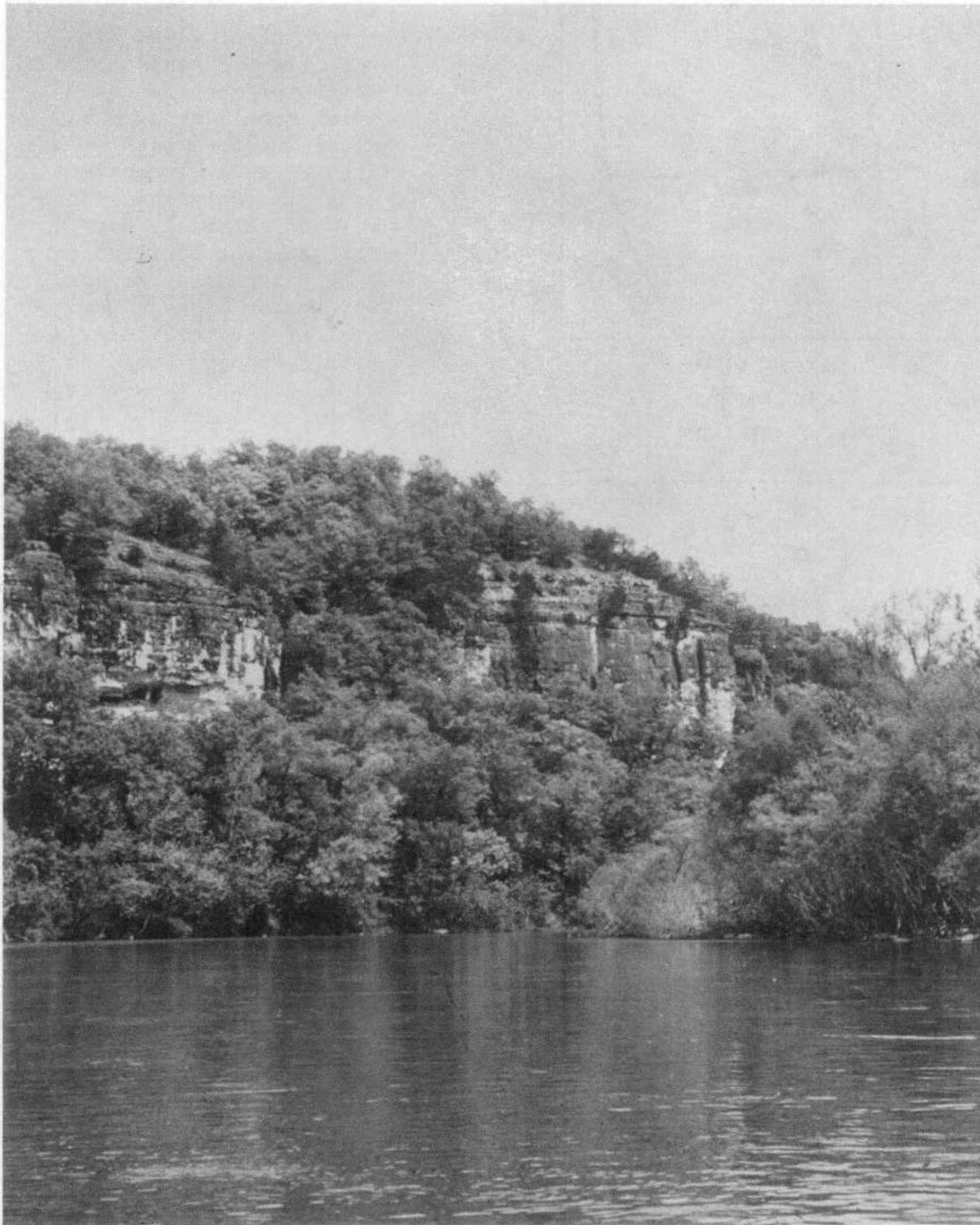
BOATER'S VIEW
PARTIALLY LIMITED
BY VEGETATION



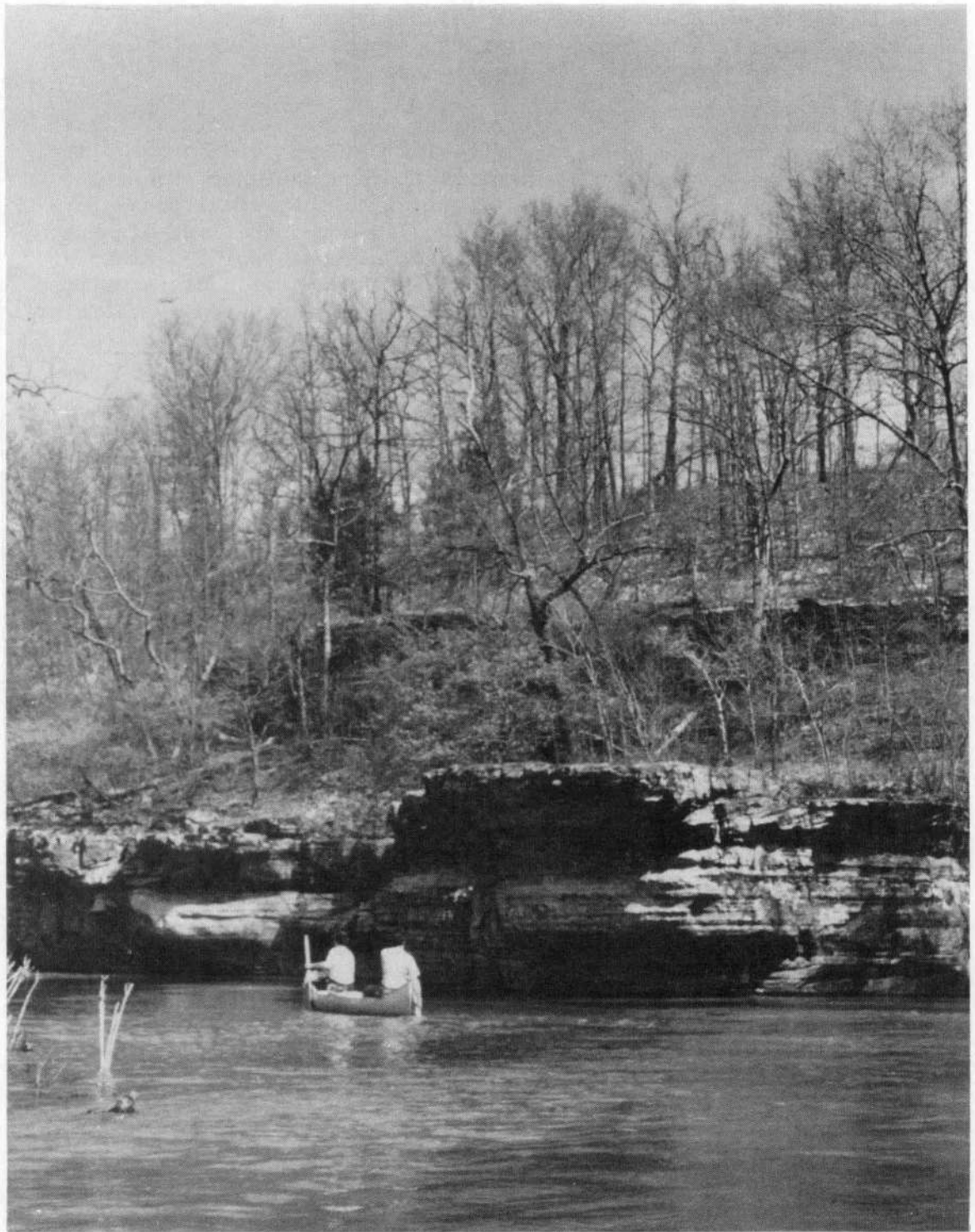
BOATER'S VIEW
LIMITED BY
DENSE VEGETATION

The varying degree of screening provided by shoreline vegetation is one of the primary factors which should be used to determine the width of a scenic easement required to maintain the visual integrity of the river corridor. This concept is illustrated in the accompanying drawing which provides an overhead view of the three previous river scenes. When the line-of-sight view from the river is limited by dense vegetation, a minimal scenic easement width would be required. The line-of-sight view from the river partially limited by dense vegetation would require a somewhat wider scenic easement. And, finally, when the view from the river is not limited, a scenic easement substantially wider--perhaps the 1/4-mile maximum--would be required. Because a significant amount of the recreation use along the rivers occurs during the spring and fall months, the corridor width should be determined during these periods of minimal tree foliage.

The many massive bluffs located along the rivers are a unique scenic resource and are also extremely effective in screening the river corridor. The height and configuration of the bluffs vary considerably throughout the river areas. Examples of two types of bluff areas are shown in the following illustrations:



ONE OF THE LARGER TYPES OF BLUFF AREAS FOUND ALONG THE RIVERS



ONE OF THE SMALLER TYPES OF BLUFF AREAS FOUND ALONG THE RIVERS

Where bluffs front the rivers as in the illustrations, the boundary should be set back a sufficient distance behind the ridge line of the bluffs to ensure protection of slopes within view of the streams.

Although both large and small bluff areas provide exceptional river corridor screening, the line-of-sight view of large bluffs normally results in a smaller scenic easement width than would be required for areas with small bluffs. The one exception to the normal line-of-sight definition which must be considered involves the line-of-sight view of a river boater on a straight river segment facing a bluff area at a bend in the river. In this instance, the boater's distance from the bluffs provides him with a greater line-of-sight view of the bluff top and also increases the width of the scenic easement which would be required.

In order to minimize land costs, it is suggested that, whenever possible, the boundary coincide with existing property ownership in addition to the visual corridor. This should moderate attendant land costs such as new survey fees and the payment of severance costs where existing productive land uses and ownerships would be substantially altered due to acquisition.

Acquisition Policy and Land Use Controls

Property rights acquired within the boundary should be adequate to provide strong protection of the natural scene and to accommodate the desired level

of recreational use. However, it is the intent of the Wild and Scenic Rivers Act that National Wild and Scenic Rivers be administered in such a way as to protect and enhance scenic and recreational values without limiting other uses that are compatible and do not substantially interfere with public use and enjoyment of these values. This can be accomplished by using easements which are designed to permit existing or expected land uses compatible with the intent of the Act and to prevent those uses which degrade the river's special environment.

A key feature of the administering agency's acquisition program should be an extensive use of scenic easements in lieu of fee title acquisition. The amount of fee title acquisition should be reduced to the absolute minimum required in order to minimize the impacts to local interests.

Fee Title Acquisition

Lands needed to provide access and services to the public and to protect the river and its environment, including unique natural areas, which may be jeopardized by less-than-fee control should be acquired in fee title.

Scenic Easements

Necessary protection and control of land use for a major portion of the land area along the riverway should be accomplished through the purchase of scenic easements. Essentially, a scenic easement involves acquisition of the right to control certain uses of the land for the purpose of protecting the natural qualities of the river. Easement acquisition may be accomplished through an agreement or series of agreements (for appropriate compensation) whereby a landowner binds himself, his heirs, successors or assigns to:

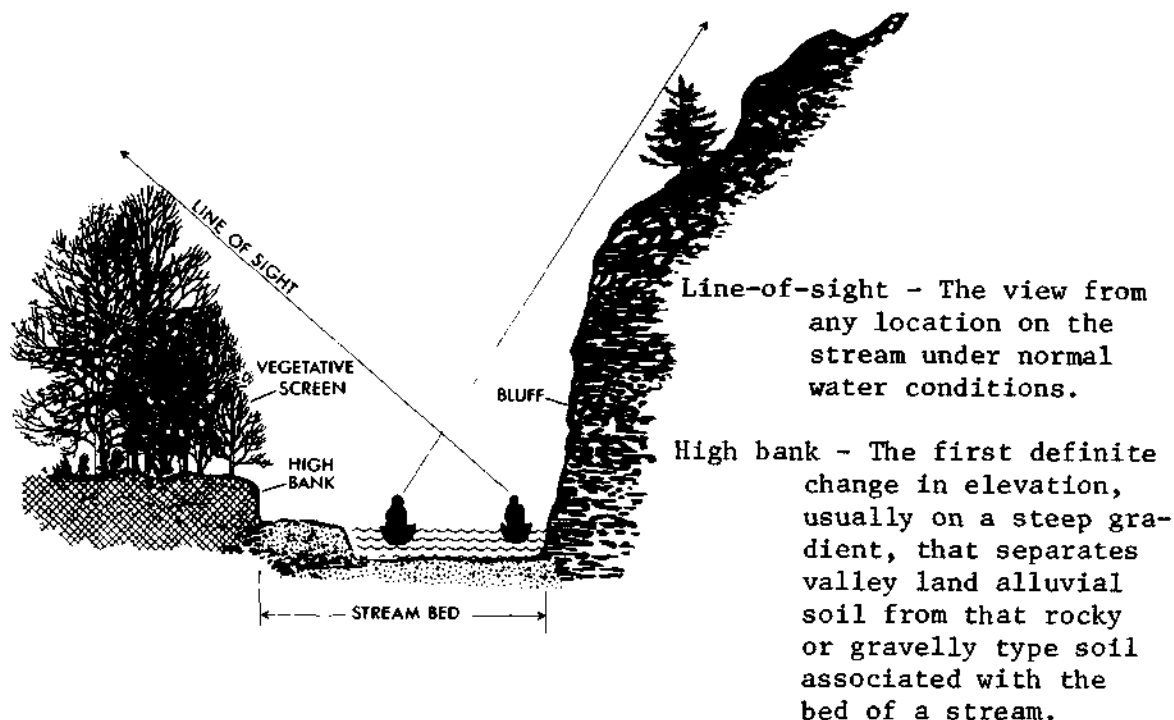
- (1) Refrain from using or developing the land in ways which would detract from the scenic and natural character of the land.
- (2) Guarantee public access over his private lands from high bank to high bank (i.e., between the high banks), including islands. Such a guarantee would not infringe upon the landowner's right to continue existing compatible land uses.

In no instance would scenic easement acquisition restrict, without the landowner's consent, any regular use exercised prior to the acquisition. The use of an easement in lieu of fee purchase would permit land to remain in private ownership and, therefore, remain on the tax rolls. Easement rights which would be negotiated with landowners along the Gasconade and Big Piney Rivers could include:

- (1) Limitations on the heights of future structures, on the exterior appearance of buildings, and on the intensity of development.
- (2) Restrictions on the allowable extent of the cutting of trees and native vegetation.
- (3) Prohibitions of commercial sand and gravel extraction operations.
- (4) Prohibitions of billboards and advertising signs.
- (5) Prohibitions of piles of trash or other unsightly materials.
- (6) Restriction of the land to specific uses and developments, such as single family residential, agricultural, timber growing, particular recreation uses, etc.
- (7) Restrictions of livestock grazing and watering in the river but only after such grazing and/or watering have been determined to be environmentally detrimental or inconsistent with the public use of the river by the administering agency.

It is desirable that all scenic easements be established on the basis of mutual agreement between concerned landowners and the administering agency. The easement document should stipulate that the administering agency is responsible for law enforcement and litter control in the river corridor; will maintain the river channel free of obstruction; and, where appropriate and necessary, rehabilitate and stabilize river-banks.

The extent of a scenic easement would be based on the line-of-sight view from the river in conjunction with appropriate set back distances. It has been determined that for the Gasconade and Big Piney River the maximum or outside limit of any scenic easement should not exceed one-quarter of a mile (1,320 feet) from either high bank when measured at right angles to the stream at the closest point. It is estimated that the average width of all scenic easements required throughout both river corridors would be 660 feet. The following sketch illustrates some terms used to describe the scenic easement.



Stream bed - That land, normally consisting of rocky or gravelly soil types, that lies within the banks.

Vegetative screen - A growth of various types of plants and trees that is of sufficient density to limit vision or interfere with detailed identification of objects during periods of defoliation.

Bluff - A relatively steep feature of topography formed by rock outcroppings, vegetated slopes, or a combination of both that instills a definite impression of height and magnitude.

Development

The purpose of providing public use facilities should be to enhance the visitor's enjoyment of the river area and to ensure that the visitor

does not destroy the very environment he seeks to enjoy. For this reason, the conceptual development plan suggested for both rivers is intended to retain the river environment in as natural a state as possible while providing suitable recreation facilities needed for appropriate use and enjoyment (see map on page 40). Developments should be oriented primarily for activities which require river access such as floating, fishing, and swimming. Facility development for recreation activities not directly associated with the river should be kept to a minimum.

Access Points

Although some public access areas are presently available along the Gasconade and Big Piney Rivers, a limited number of additional access areas will be needed to provide for the public use and enjoyment of the scenic and recreational resources. Such sites must be carefully located and developed so as not to adversely impact the environment through overuse. Most access sites should require little more than sanitary and trash facilities, drinking water, and small parking areas which can be used for fishing and floating access. A limited number of access areas should also provide boat launching and picnicking facilities.

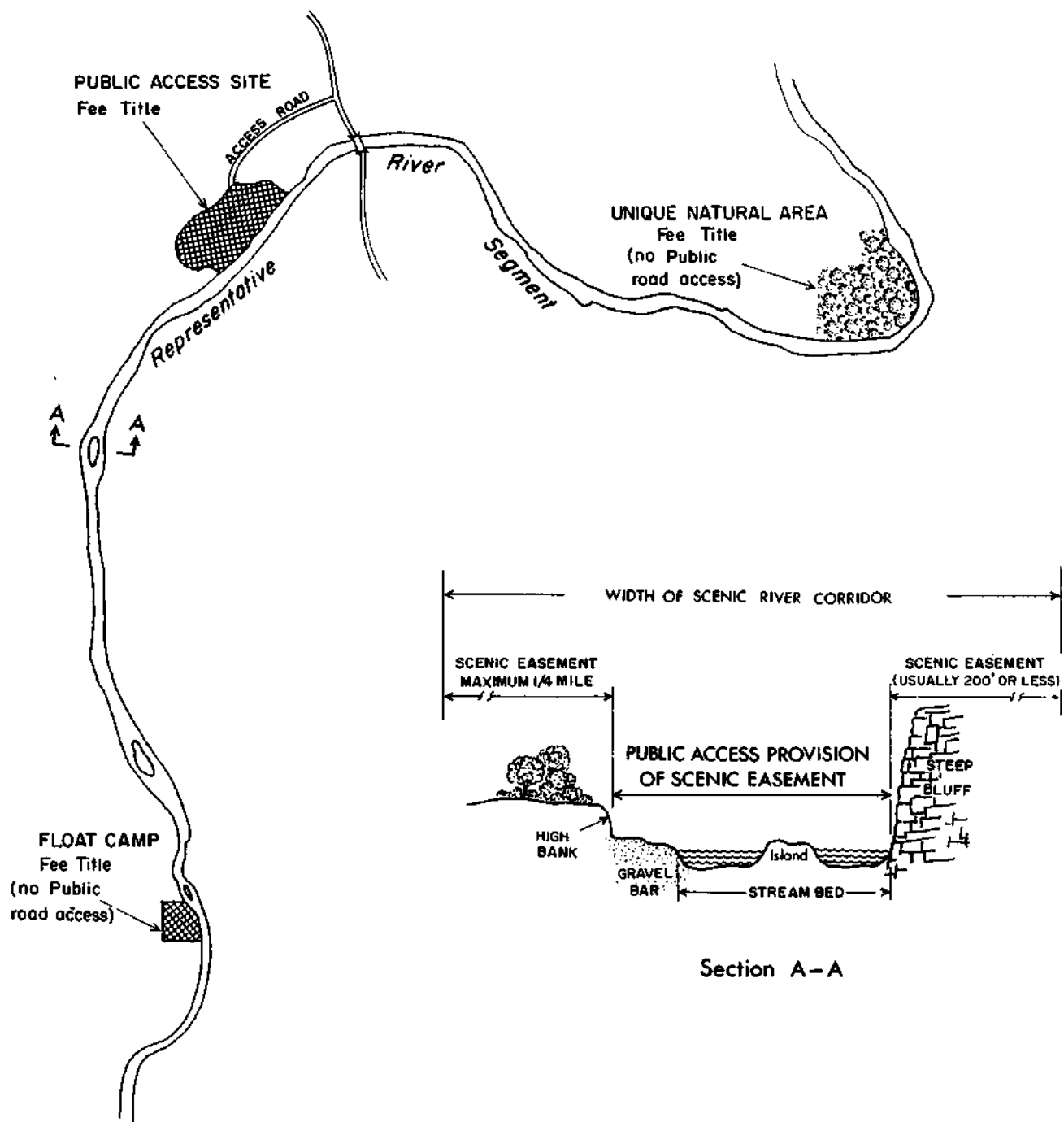
It is estimated that approximately six to eight additional access sites will be needed. Four or five of the access sites would be located along the Gasconade River, and two or three on the Big Piney. The exact number of access sites would need to be determined during the master planning process. They would be spaced, however, in such a manner as to afford opportunities for leisurely one-day float trips and other day use activities as well as overnight float trips.

Float Camps

Small campgrounds accessible only by water (or service roads for administrative use only) should be provided for river users participating in overnight float trips. The facilities should be rustic in design and would include sanitary facilities, tent pads, and fire places. Campers should be required to carry their litter and trash out with them. Approximately 17 to 20 float camps should be established along the rivers--10 to 12 on the Gasconade and seven or eight along the Big Piney River. The actual number and location of float camps would be determined by the administering agency as part of the master planning process.

Unique Natural Areas

Certain areas which display unique geological or ecological values (see map on page 41) exist along both rivers. Such features should be thoroughly examined by the managing agency to determine their suitability



GENERAL RIVER PLAN AND CORRIDOR ESTABLISHMENT CONCEPTS

GASCONADE
WILD AND SCENIC RIVER STUDY

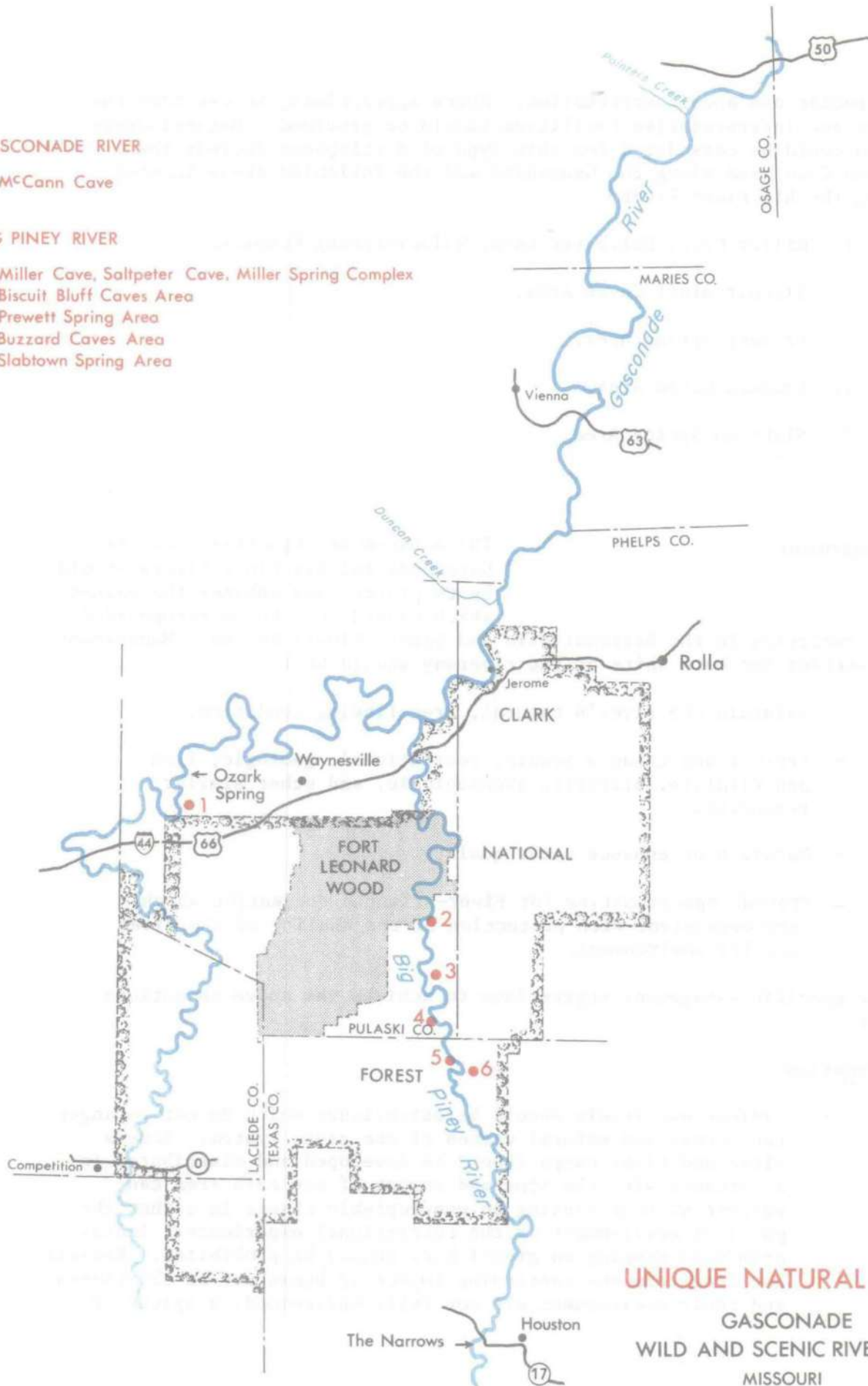
MISSOURI

GASCONADE RIVER

1. McCann Cave

BIG PINEY RIVER

2. Miller Cave, Saltpeter Cave, Miller Spring Complex
3. Biscuit Bluff Caves Area
4. Prewett Spring Area
5. Buzzard Caves Area
6. Slabtown Spring Area



UNIQUE NATURAL AREAS

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

for public use and interpretation. Where appropriate, access from the river and interpretation facilities should be provided. Natural areas which could be considered for this type of development include the McCann Cave area along the Gasconade and the following areas located along the Big Piney River:

1. Miller Cave, Saltpeter Cave, Miller-Spring Complex.
2. Biscuit Bluff Caves Area.
3. Prewett Spring Area.
4. Buzzard Caves Area.
5. Slabtown Spring Area.

Management

The management objectives for the Gasconade and Big Piney Rivers should be to protect and enhance the values which caused them to be recommended for inclusion in the National Wild and Scenic Rivers System. Management objectives for both units of the riverway should be to:

- Maintain the river's natural, free-flowing condition.
- Protect and enhance scenic, recreational, geologic, fish and wildlife, historic, archaeological, and other similar resources.
- Maintain or enhance water quality.
- Provide opportunities for river-oriented recreation which are consistent with protection of the quality of the river and its environment.

Some specific management suggestions to achieve the above objectives are:

Recreation

- Visitor-use levels should be established which do not endanger the scenic and natural values of the river system. Access sites and float camps should be developed and distributed in accordance with the type and amount of use each area can support without causing an unacceptable change in either the physical environment or the recreational experience. Indiscriminate camping on gravel bars should be prohibited. Because the long-term and continuing impact of human use on the rivers and their environment are not fully understood, a system of

periodic evaluation and monitoring should be established to develop criteria for the protection and management necessary to ensure a meaningful scenic river experience for the river user.

- The administering agency should establish a method of visitor control which would be initiated before visitor capacity is reached and should not hesitate to implement such controls when necessary. Only in this manner can there be some assurance that the optimum visitor enjoyment will be obtained without posing a threat to the natural values vital to the river areas.
- Facility development should not detract from the quality of the river scene. Development should generally be back from the river's bank and screened from view of the river user.
- The use of motorized vehicles and watercraft for recreation purposes should be strictly controlled and in some areas may need to be prohibited.
- A detailed inventory of historic, archaeologic, and other special interest areas should be made, and a program developed for their protection and, where appropriate, their interpretation. Interpretive devices and signs should be relatively unobtrusive or complementary to the natural and historic scene. To protect these resources, portions of the inventories may need to be confidential.

Fish and Wildlife

- Habitat management for fish and wildlife should reflect equal consideration of game and nongame species, and all practices employed should be in conformance with the maintenance of the natural qualities of the riverway.

Land Resource Use

- Native species should be primarily used in areas where seeding or planting is required. Special management protection measures would be needed for areas of unique biological value.
- Protection of the forest resources within and near the river boundaries from fire, insect, and disease damage should receive added consideration. Control or salvage measures necessary for diseased or damaged trees or other vegetation should be carefully weighed against possible adverse impacts on the ecological and scenic values of the river corridor.
- Maintenance of soils and protection of the watershed adjacent to the river are essential. Because much of the recreation activity and development would take place near

the river's edge, special emphasis should be placed on preventing and controlling soil erosion. This is true for both natural and man-caused deterioration. Soil stabilization measures and revegetation should be carefully weighed against possible adverse impacts on the ecological and scenic values of the river corridor.

- The present amount of livestock grazing and watering along both rivers is not considered degrading to the environment and should be treated as a continuing compatible land use. It is recognized, however, that cattle in the river can be detrimental from the standpoint of esthetic and public health considerations. Therefore, any incompatible increase or change in the nature of grazing or watering activities may require restriction of grazing and water rights through easements or fee acquisition if necessary.
- Removal of bankside vegetation should be prevented where it endangers natural or scenic values. However, selective timber harvesting should be allowed, subject to regulation by the administering agency.
- Efforts should be made to encourage local units of government to apply zoning controls to lands adjacent to the riverway and in nearby developed areas to ensure that the immediate environments of the Gasconade and Big Piney Rivers are protected.

Water Resources

- Since aquatic organisms are especially susceptible to water quality degradation, careful attention must be given to the planning and construction of developments along the river and its tributaries. A program for monitoring chemical, biological, and physical water quality characteristics should be established throughout the watershed.
- An intensive State-local cooperative program to control littering and dumping along the rivers should be initiated.
- Regulations requiring float campers to carry out their garbage and litter should be established, widely advertised, and vigorously enforced.
- Alteration of the natural channels in the basin which would significantly affect the free-flow of water should not be permitted unless it is clearly demonstrated that such alterations would have no adverse effect on the scenic and recreational qualities of the river corridor.
- Efforts to reduce siltation through land conservation measures throughout the watershed should be intensified.

- Sand and gravel extraction for adjacent farm use and the maintenance of low water fords should be permitted subject to agreement with the administering agency. However, commercial sand and gravel operations within the immediate river corridor are detrimental to maintaining a natural river environment and would be prohibited.

Utilities

- Any construction of highways and new bridge crossings, renovation of existing structures, or power or pipeline crossings should be reviewed and approved in advance by the managing agency. Where possible, new construction of powerline and pipeline crossings of the river should be avoided. If crossings cannot be avoided, the managing agency and the public utility company should jointly select the location which will result in the least damage to the river environment. Existing power and pipeline crossings should be adequately screened where possible.

Recommended Administration

The 118 miles of the Gasconade and Big Piney Rivers classified as "scenic" and recommended for inclusion in the National Wild and Scenic Rivers System could be most effectively administered by the Forest Service, U. S. Department of Agriculture. Based on public opinion and an analysis of all feasible and practical alternatives, administration by the Forest Service is recommended and considered most appropriate for the following reasons:

- The Forest Service is a well-known, firmly established land-managing agency in the Gasconade River basin. It administers most of the public lands within the basin and manages a significant portion of the 9,103 acres of public land located within a maximum half-mile wide river corridor on both rivers.
- Seventy-seven miles of the 118 miles of "scenic" river are within or form the proclamation boundary of the Clark National Forest (a unit of the National Forests in Missouri). The Clark National Forest headquarters are located in the middle of the basin at Rolla, Missouri, with district ranger stations at Rolla and Houston.
- Within the national forest boundaries, areas along both rivers are currently being managed for recreation and other public purposes by a professional staff of resource and recreation planners and administrators. In addition, the Forest Service's management and development philosophies, which emphasize more

natural, rustic recreation experiences, are compatible with the management objectives of "scenic river areas."

- Forest Service administration would not result in increased property taxes. Twenty-five percent of the annual receipts from national forest lands are paid to the counties in lieu of taxes for land acquired by the Forest Service. This in lieu payment is to be used for schools and roads. At present county tax levels, annual receipts received by the counties would be larger than county tax revenues for the same land. In addition, the Forest Service provides roads, fire protection, recreation, and employment.
- Recent developments have significantly improved the Forest Service law enforcement and visitor control capabilities. Under the provisions of P. L. 92-82 passed in 1971, the Forest Service may annually reimburse counties in which national forest lands are located for the cost of providing law enforcement assistance to national forests. Most of the funds received by the Clark National Forest in 1973 were used to improve communication facilities between the involved county sheriff departments and Forest Service offices. However, these funds may be used for a variety of purposes, including hiring additional enforcement personnel. The appointment of a new Federal magistrate who will hold court in Van Buren, Missouri, will also increase the Forest Service's ability to enforce Federal laws and regulations on forest lands. Previously, the closest Federal magistrate was located in St. Louis.
- The Forest Service has considerable experience in the administration of National Scenic Rivers including the Eleven Point in Missouri. To effectively negotiate and oversee scenic easements, the administering agency must have, as does the Forest Service, a good working relationship and an established line of communication with the local people.
- Where fee or less-than-fee property acquisition is required, private landowners along the rivers would be assured of receiving fair market value for their property from the Forest Service. Under the provisions of P. L. 91-646, a Federal agency cannot acquire private property for an amount less than the agency's approved appraisal of the property's fair market value. This provision of the law applies to property acquisition through amicable negotiations or by eminent domain.

A detailed management plan requiring approval by the Secretary of Agriculture would be prepared by the Forest Service within two years after designation. This plan should include a detailed accounting of development, operation, maintenance, and replacement costs necessary for the proper management of a National Scenic River. The regular appropriations for the Forest Service should be adjusted accordingly.

Proper administration of the river areas can be further assured with the establishment of a Gasconade River Advisory Board composed of Federal, State, local, and private interests. Its primary objective would be to assist the Forest Service in the planning, management, and development of the river areas. The board would also advise the Secretaries of the Interior and Agriculture concerning management of the rivers and provide periodic evaluations of river management efforts. Perhaps the most important aspect of the advisory board would be that of providing a vehicle for all interests to have a voice in developing management policies for the river areas.

It is envisioned that existing State access sites would continue to be managed by the Missouri Department of Conservation in cooperation with the Forest Service. The State would also continue to enforce State game laws and boating regulations throughout the river areas. On Federal lands, the Forest Service has authority to enforce Federal regulations. Enforcement of pollution laws would remain the responsibility of the State Clean Water Commission.

Local units of government would be encouraged to provide adequate zoning regulations to complement Forest Service programs and to cooperate fully with the Forest Service in implementing a scenic river program.

PROTECTION OF THE "RECREATIONAL" SEGMENTS OF THE LOWER GASCONADE RIVER

Below Ozark Springs on the Gasconade River there are two segments of river totaling 104 miles which meet the criteria for inclusion in the National System as a "recreational" river. The two segments are separated by a ten-mile reach where the Town of Jerome is located. Due to extensive development, the ten-mile reach by itself does not qualify. The physical characteristics of these areas are generally described in Chapter II under Classification.

Many of the planning considerations contained in the preceding conceptual river plan for the "scenic" reaches would also apply to managing the lower Gasconade River:

- Extent of the river area to be managed.
- Acquisition, development, operation, maintenance, and replacement costs.
- Acquisition policy and land use controls.
- Proposed recreation development and opportunities to be provided.
- Law enforcement and user controls.
- Management objectives and techniques.

Recommended Administration

The river areas classified as "recreational" are not recommended for inclusion in the National Wild and Scenic Rivers System at this

time. It is believed that basin residents should manage these areas if they can demonstrate their capability to manage in a manner fully consistent with the intent of the Wild and Scenic Rivers Act. This decision was based on the desire to be responsive to the concerns of local people in a manner which would not jeopardize existing river values or compromise the intent of the Act. In order to accomplish these objectives, it was determined that local management capabilities should be demonstrated and evaluated over a four-year period beginning on the date legislation is enacted to include the "scenic" river areas within the National System. This would provide a sufficient amount of time for local authorities to develop and begin implementation of an effective river management program.

In addition to guiding Federal management of the "scenic" river areas, the Gasconade River Advisory Board would be charged with the responsibility of evaluating the progress of local programs in managing the lower Gasconade. The advisory board would also assist in the development of local management plans and their implementation. The board would periodically report to the Secretary of the Interior on the progress of local management efforts.

Criteria would be developed by the advisory board to evaluate the current and future effectiveness of both Federal and local management efforts. The criteria would include provisions to assure the existence, permanency, and effectiveness of zoning regulations, user control and law enforcement measures, land use and river management plans, and accommodations for public access and recreation use. More specifically, criteria developed by the board should require:

- Land use river management plans which meet the basic purposes and management objectives for "recreational" river areas as set forth in the Act and in the "Guidelines for Evaluating Wild, Scenic, and Recreational River Areas . . ." adopted by the Secretaries of the Interior and Agriculture.
- Development and management of the proposed river areas in a manner which gives primary emphasis to maintaining and enhancing the aesthetic, scenic, fish and wildlife, and geologic features.
- Maintenance of good water quality along both rivers through enforcement of water quality standards and the encouragement of compatible soil and water conservation practices.
- Uniform zoning regulations which control developments in a manner which does not impair the quality of the river corridor environment.
- Provisions for appropriate public access and recreational use of the river which are consistent with the protection of those values

of the rivers environment which enabled them to qualify for inclusion in the National System.

- Adequate control of public conduct through coordinated local and State law enforcement measures.

It is extremely important that the criteria developed by the advisory board be designed to quickly detect and accurately measure any degradation of the present scenic and recreational river qualities.

Counties and municipalities have authority under Missouri law to enact zoning and land use measures. Land use controls, however, are not generally popular in Missouri, especially in rural areas. Because of past resistance to such programs, no county in the Gasconade River basin has yet adopted planning and zoning controls.

Efforts to establish land use planning and zoning measures at the county level have recently been initiated within the Gasconade River basin. Local authorities believe they will be capable of managing the river areas through future enactment of such controls. If, however, the river resources are to be effectively protected and appropriate public areas provided, it would be necessary for each county to establish land use controls in accordance with the overall objectives of a land use plan encompassing the entire river area between Ozark Spring and Pointers Creek (114 miles). If the individual county plans are not coordinated and controlled by an overall plan, inconsistent and ineffective river protection and use control would result.

Wise land use planning is highly important in realizing orderly development at all levels of government and particularly at county, township, and municipal levels. Without comprehensive land use planning, development usually occurs in a haphazard fashion, allowing some land uses to develop at areas where they should not occur. The mere ability of a land area to support a particular land use should not be the only criteria considered when an area is zoned. Many other factors, including the provision of areas where little or no development would be desirable, should be considered. Zoning objectives should be to reduce the effects of poorly planned shoreland development, to prevent erosion, to provide lots that are large enough to adequately support sanitary facilities, to maintain property values, to retain the natural characteristics in the area, and to avoid the construction of permanent facilities in the flood plain.

It is extremely important that the identified river qualities be maintained for the benefit and enjoyment of future generations. The ability of local entities to preserve these qualities is untested. Hopefully, their efforts can successfully meet the objectives of the Wild and Scenic Rivers Act. In the event their efforts are not successful, provisions to seek inclusion of the river areas within the National System under Federal or State control at any time during the four-year period should be included in any legislation establishing the Gasconade and Big Piney National Scenic Rivers.

V.
ENVIRONMENTAL AND SOCIOECONOMIC IMPACT
OF THE PROPOSED ACTION

V. ENVIRONMENTAL AND SOCIOECONOMIC IMPACT OF THE PROPOSED ACTION

The following section provides a brief summary of the environmental and socioeconomic impacts which would result from:

1. Inclusion of the "scenic" areas of the Gasconade and Big Piney Rivers in the National Wild and Scenic Rivers System.
2. Local protection of the lower Gasconade River.

A separate environmental impact statement which more completely describes the environmental and economic effects of the proposed action has been prepared. This summary is intended only to give the reader a brief overview of probable impacts.

INCLUSION OF THE "SCENIC" SEGMENTS OF THE GASCONADE AND BIG PINEY RIVERS IN THE NATIONAL SYSTEM

Environmental Impacts

Inclusion and management of the "scenic" areas of the Gasconade and Big Piney Rivers in the National System in accordance with the guide-

lines described in the conceptual river plan would result in a minimal impact on the river environment. Enactment of legislation as envisioned in this report would entail preservation of the rivers in their free-flowing condition and protection of a minimum amount of adjacent land area in its natural state. A limited number of additional public use areas would be provided for public use and enjoyment of the scenic, recreational, fish and wildlife, cultural, and other similar values. Ecological and environmental changes caused by the installation of recreation facilities should be minimal.

Increased visitation and development of recreation facilities in the river area resulting from publicity generated by the establishment of a Federally protected river, if not controlled, would have a significant impact on the river area. It is for this reason that the conceptual river plan calls for recreation facilities to be designed and located so as to lessen the impact on resources and wildlife and to reduce adverse effects resulting from increased visitor use. The plan also provides for establishment of a method to control visitor use to prevent deterioration of the area's natural values due to overuse.

Because scenic easements are emphasized in place of fee title land control, vigilant management will be necessary to prevent incompatible development from degrading the river environment.

In the long run, inclusion of the rivers in the National System would have an overall beneficial effect, primarily because the administering agency would have the authority to limit overuse to avoid degradation of the river values.

Socioeconomic Impacts

If the "scenic" river segments were included in the National System and established under the acquisition and management guidelines previously described, the economic impact would be minimal and primarily confined to the river corridor. Even in the affected areas, disadvantages would be offset by benefits to the local economy without major disruption of existing social and economic institutions.

Approximately 1,000 acres would be acquired in fee title for public access and use sites and for the protection of unique features. Some cropland and livestock areas might be withdrawn from production. While this would result in some impact at the local level, the overall effect on agricultural uses would be very small on a regional level. In addition, the potential acquisition areas would be widely scattered throughout the river areas, thus limiting local impact.

Landowners would be permitted to continue existing compatible land uses within the corridor where scenic easement would be acquired. The present amount of livestock grazing and watering along both rivers would be considered a continuing compatible land use.

Scenic easements used in place of fee purchase to protect the major portion of river lands would permit land to remain in private ownership and thus on the tax rolls. Incompatible land uses and developments would be restricted on approximately 15,900 acres of land on which scenic easements would be acquired. Pasture conversion operations would have to maintain a sufficient width of timber to provide a suitable vegetative screen and preserve the river's aesthetic values.

Table 3 provides data necessary to illustrate how scenic easements would limit conversion of private forest land to pasture along both rivers. It is estimated that scenic easements on both sides of the rivers would average one-eighth mile in width. Although scenic easements, if actually established, could average less than one-eighth mile in width, use of this estimated width does provide a means to analyze the effect of scenic easements on livestock production. The river corridors were analyzed in regard to soil characteristics, degree of slope, and other factors to determine the amount of private forested land which could be converted and successfully managed as pasture. In this example, 2,350 acres of private forest land located along 118 miles of river would be suitable for conversion to pasture but would not be cleared due to scenic easement restrictions.

TABLE 3

FORESTED RIVER LANDS SUITABLE
FOR CONVERSION TO PASTURE

River	Total Acres of Private Forest . . .*		Total Acres of Private Forest and Pasture Lands*
	Not Suitable for Conversion to Pasture	Suitable for Conversion to Pasture	
Gasconade River	3,650	1,150	5,200
Big Piney River	2,130	1,200	3,080
TOTALS	5,780	2,350**	8,280

* Within a river corridor 118 miles in length and extending one-eighth mile out from each riverbank.

** This figure would be reduced by a portion of the acreage to be acquired in fee title for public access and protection of natural areas.

Data source: U. S. Forest Service, National Forests in Missouri

Because selective timber harvesting would be allowed, subject to regulation by the managing agency, river lands withdrawn would not adversely affect the regional timber supply.

Commercial sand and gravel operations would be restricted in river areas included in fee title acquisition, use, or scenic easements. Sand and gravel operations may intensify in river reaches not included in the system or may be relocated to other areas with the additional transportation costs borne by the buyer.

Road relocation and improved river crossings would not be curtailed, but additional expenses may be incurred to make these projects more compatible with the river areas. Alternative locations would be sought to remove or minimize the environmental impacts from proposed pipeline and electric power transmission line crossings. Natural screening and underground installation are used increasingly, and the added costs are largely passed on to consumers.

The appreciation of land values would be accelerated for lands immediately adjacent to the proposed scenic riverway, and it is expected that land values in nearby communities would also rise. Increased land values would lead to higher assessed values and taxes, although a lag of several years is common. Restrictions on residential development would reduce potential tax revenues. At current average tax rates, withdrawal of 1,000 acres through fee title acquisition would result in an annual loss of about \$1,230 in tax revenues. However, Forest Service acquisition of these lands would constitute an unusual situation for county governments.

More than 60 years ago the Congress decreed that 25 percent of the annual receipts from national forest lands were to be paid to the counties within which such lands are located, in lieu of taxes, to be used for schools or roads. The total amount received by each county is allocated according to the proportion of Federal land in the county. In 1974 the Clark National Forest returned \$1.35 per acre to counties. The in lieu payment was substantially higher than the average per-acre tax paid by private owners of forest land in Missouri. Thus, under the present situation, Forest Service acquisition of additional land for purposes of enhancing access to and recreation use of the rivers would not cause revenue to be lost to county governments. Revenue from selected logging and recreation fees from lands acquired by the Forest Service would be added to the forest receipts, possibly increasing the total in lieu payments.

Lands under scenic and use easements would continue to provide tax revenues. In addition, the Forest Service provides roads, fire protection, recreation, and employment.

Homesite development on land adjacent to the rivers would be curtailed as a result of building restrictions and land purchased for public use areas. However, a portion of the home construction activity that would have occurred adjacent to the river would probably be shifted to locations outside the limit of scenic easements.

Camping, hiking, canoeing, fishing, and hunting activities should continue to increase as the riverway becomes better known and as facilities for access, camping, and day use are developed. Businesses, such as canoe liveries, that offer recreation services and local commercial trade will benefit, but additional costs for policing, maintenance of facilities, and regulation of use are anticipated.

In addition to preventing use of the river corridors for increased homesite and cottage development, sand and gravel extraction, and additional pasture lands, other economic benefits would be foregone as a result of designating the Gasconade and Big Piney Rivers components of the National Wild and Scenic Rivers System. Industry in particular would be prohibited from building along the river segments. Inclusion of the river segments could result in the loss of benefits to be derived from future water resource development projects. However, in regard

to current water resource projects, a Corps of Engineers investigation, completed in 1973, analyzed the feasibility and alternatives of two previously authorized reservoirs on the Gasconade River. The Corps study concluded all projects were economically infeasible and recommended no structural improvements be undertaken and the two reservoir projects be deauthorized.

LOCAL PROTECTION OF THE LOWER GASCONADE RIVER

Environmental and Socioeconomic Impacts

The manner in which local units of government would manage the "recreational" areas of the Gasconade is unknown and untested. Although

management guidelines for the lower Gasconade have been suggested in the conceptual river plan, local governments would have the responsibility for managing these river areas. It is for this reason that the environmental and socioeconomic impacts which would occur as a result of local efforts cannot presently be determined. However, evaluation criteria developed by the river advisory board and approved by the Secretary of the Interior would be used by the board to periodically evaluate the environmental and the socioeconomic impact of local management efforts. If any of the board's evaluations ever revealed a deterioration of the river's recreational and scenic resources, it would be its responsibility to immediately advise the Secretary of the Interior. If such a report reached the Secretary of the Interior prior to termination of the four-year trial period, it would be the Secretary's responsibility to report to the Congress if, in his opinion, actions had or might occur which would adversely affect the values of the "recreational" river areas. In essence, the advisory board's periodic evaluation report would analyze many, if not most, of the important items normally evaluated in environmental impact statements.

VI.
ALTERNATIVE ACTIONS CONSIDERED

VI. ALTERNATIVE ACTIONS CONSIDERED

Other Actions to Protect the "Scenic" Segments

Several alternative actions were considered for protecting the "scenic" segments of the Gasconade and Big Piney Rivers. These included three proposals involving the accelerated

use of existing authorities. Although other actions might also be considered, the following proposals were felt to be most worthy of consideration.

Accelerate Existing Federal, State, and Local Land Acquisition Programs-- Additional acquisition funds for the Forest Service and appropriate State and local agencies would substantially increase their capability to acquire more river frontage. Public agency management of these lands would be designed to protect the scenic and recreational qualities of the rivers. If the availability of funding for public agency acquisition programs kept pace with the need to acquire and protect shorelines, then adequate protection of the aesthetic and recreational values now associated with the rivers could be realized.

Adoption of this alternative would not preclude alteration or impoundment of the river at some time in the future. Nor would it provide the same degree of protection afforded rivers within the National System in regard to construction of new bridges, powerlines, and pipeline crossings.

Formulate a Water Conservancy District--Existing Missouri statutes provide for the formation of a water conservancy district which would enable residents within the district to determine the need and methods for maintaining and improving the district's water resources for a variety of public purposes. An important aspect of a water conservancy district is that it provides basin residents some authority and opportunity to decide how the district's water resources should be developed. This opportunity is provided through the district's board of trustees, elected by district residents, which is delegated a wide range of acquisition, construction, management, and taxing authority. Thus, the board's authority could be used to protect scenic and recreational river values.

It should be recognized that water conservancy districts must include the entire basin drainage area rather than just the corridor deemed necessary for river protection. There would be no assurance that a water conservancy district would conform to the intent and requirements of the National Wild and Scenic Rivers System. Water conservancy districts are generally oriented to multiple use, including the construction of dams, impoundments, channelization, and other stream alterations for purposes of flood control, water supply, or recreational use.

Land Use Planning and Zoning--Counties and municipalities have authority under Missouri law to enact zoning and land use measures. If the river resources are to be effectively protected and appropriate public use areas provided, it would be necessary for each county to establish land use controls in accordance with the overall objectives of a land use plan encompassing both "scenic" river areas. If the individual county plans were not coordinated and controlled by an overall plan, inconsistent and ineffective river protection and use control would likely result.

A national land use policy could provide an incentive for local units of government within the basin to enact land use controls which would protect the aesthetic and recreational values of the river areas. If established, a national land use policy would encourage State and local governments to plan and regulate land use in conformance with the capability of the land resource base to best serve the needs of the Nation. Recreation and public use areas and the preservation of flood plains have been recognized as having a high priority as this environmentally directed legislation was being prepared. Local initiative in establishing coordinated county and regional land use plans and controls could assist in maintaining the natural condition of the river areas as they exist today. To adequately protect the river areas, however, local units of government would also have to be capable of performing and coordinating a number of other planning and river management functions.

Allow Present Trends¹ to Continue in the "Scenic" Segments

Under this alternative, current patterns of land use and development within the river corridors would be allowed to continue. Land use and social and economic factors would be

the sole determinant whether the scenic and recreational qualities now exhibited by the rivers would be maintained. Impacts from land use and development can be anticipated by identifying and analyzing social and economic factors and trends in the six counties located in the study area.² One of the most important facets to be analyzed is the recent change in land use from forest lands to pasture and residential uses. The findings resulting from an analysis of these and other factors are discussed on the following page.

¹Portions of this section have been derived from Sirken, Richard A. and Smith, Richard C., "Socio-Economic Setting Proposed Gasconade and Big Piney Wild and Scenic Rivers," University of Missouri, School of Forestry, Fisheries, and Wildlife, Columbia, Missouri. October 1973. Produced for the U.S.D.A., Forest Service, Contract No. 42-00,124.

²All data collected and presented on a countywide basis for six counties unless stated otherwise.

Population and Employment--After a decline in 1960, population rose to a new high of 104,990 in 1970. This growth resulted from job opportunities at Fort Leonard Wood and from establishment of several apparel manufacturing plants. Other factors include settlement in the area by retirees and expansion of government agencies and the University of Missouri at Rolla.

Population is not expected to substantially increase during the next 15 years. Population to 1990, as predicted by the State Demographer, is as follows:

<u>1975</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>
132,995	132,055	134,137	137,572

A significant shift from a predominately rural farm population to a rural nonfarm population is evident, and a large increase has occurred in the growth of urban areas.

TABLE 4

POPULATION DISTRIBUTION TREND
(Percent)

	<u>1940</u>	<u>1950</u>	<u>1960</u>	<u>1970</u>
Urban	8.8	11.6	18.2	23.0
Rural farm	69.5	66.1	51.9	27.0
Rural nonfarm	<u>21.7</u>	<u>22.3</u>	<u>29.9</u>	<u>50.0</u>
	100.0	100.0	100.0	100.0

Source: Bureau of the Census, U. S. Department of Commerce (from Sirken and Smith).

From an employment standpoint, the influence of government agencies is important--24 percent of all employed persons are publicly employed. In the private sector, 7.6 percent of those employed work in agriculture, forestry, and fisheries, with manufacturing accounting for 19.7 percent of the employment. Four industries provide more than one-half of the employment in manufacturing (Table 5).

TABLE 5
PERCENT OF EMPLOYED PERSONS IN
MANUFACTURING INDUSTRIES

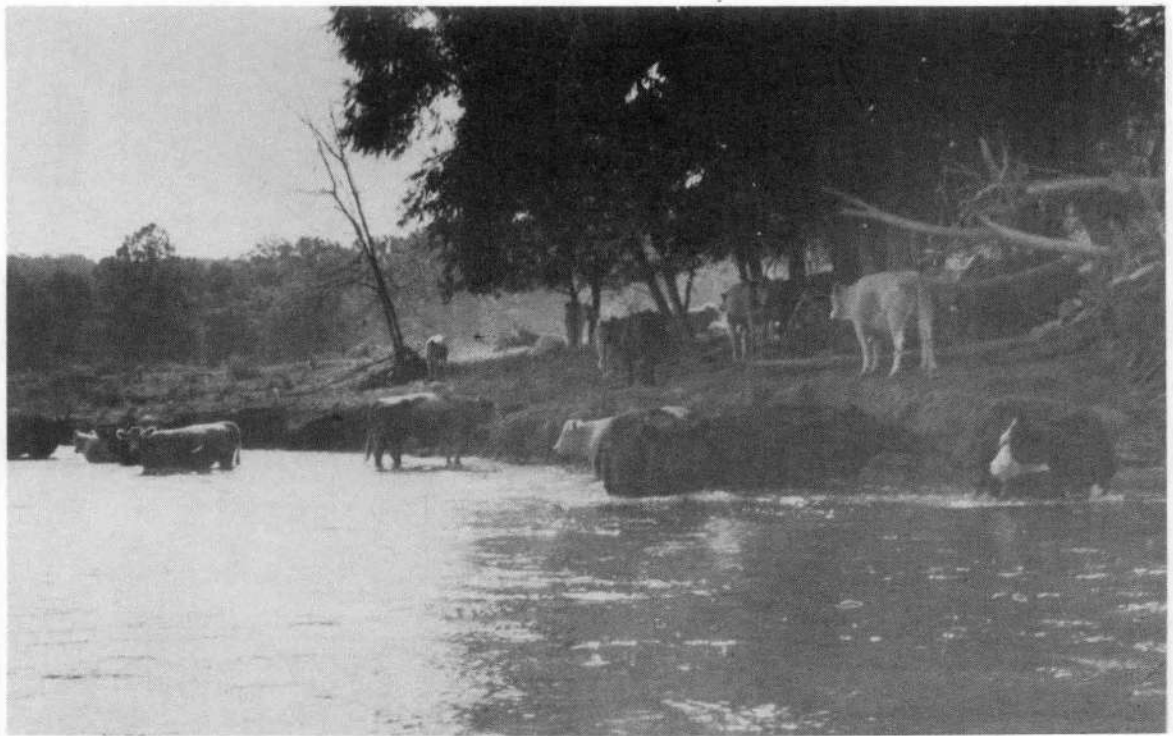
<u>Industry</u>	<u>Percent</u>
Furniture, lumber, and wood products	11.7
Transportation equipment	8.7
Food and kindred products	9.0
Textiles	26.6
Other manufacturing industries	<u>44.0</u>
	100.0

Source: Census of Manufacturers, Bureau of Census, U. S. Department of Commerce (Sirken and Smith).

Population growth is a direct function of industrial activity in the region. Population is expected to increase gradually as new industries provide job opportunities. The influx of retirees will also comprise an increasing share of the population. Development associated with this increase could affect the natural condition of the rivers. The increase in rural nonfarm population and the growth of urban areas would have the most significant impacts on river quality. A substantial portion of the nonfarm population is expected to be retirees and other individuals who desire homesites or cottages located along the rivers. Expansion of urbanized areas to the rivers will result in similar shoreline developments. In both instances, development of this type could adversely affect the aesthetic and recreational qualities of the river areas.

Agriculture

Due to the increasing value and importance of the livestock industry, the agricultural base in the area is becoming more dependent on livestock farming, especially cow-calf production. As a result, there will probably be a continuation of the current trends to convert crop and timber lands along the rivers to pasture and to produce more animals on less lands. In 1955, one cow was pastured on five acres of land, but by 1970 the pasture area per animal declined to 3.7 acres. Trends in livestock production are indicated by the differences in the number of animals raised between 1940 and 1970 (Table 6).



Cattle graze and water along the Gasconade.

Trees on the hill have been defoliated by herbicides preparatory to conversion to pasture.

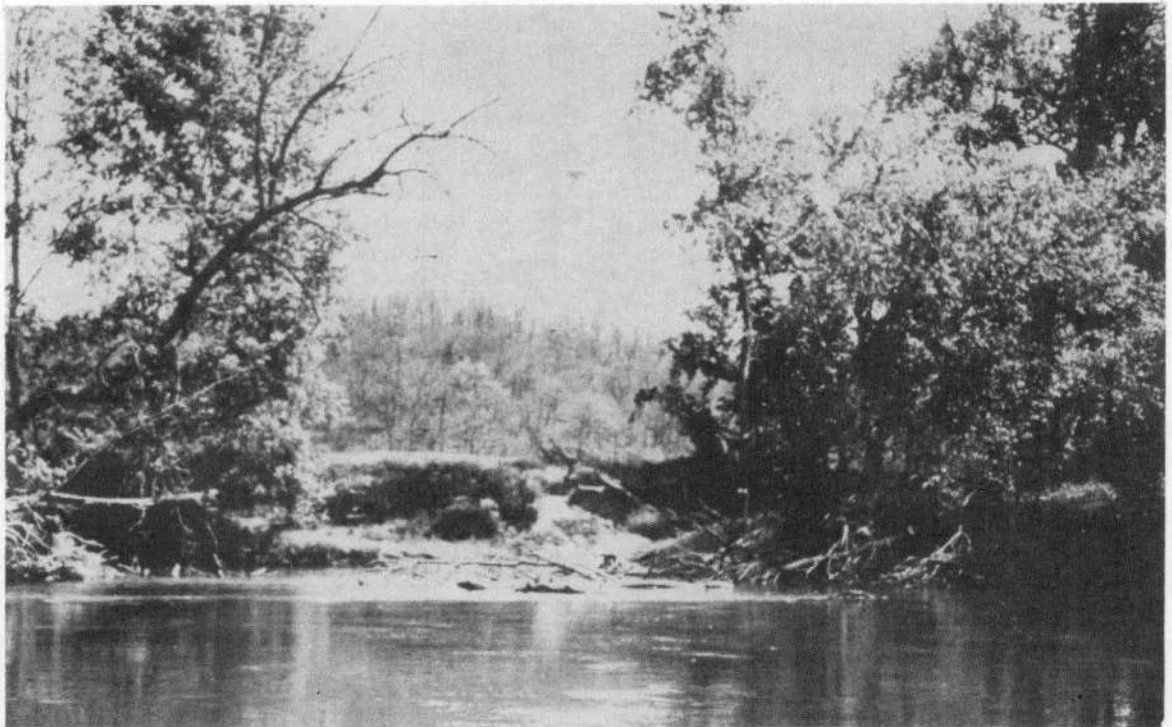


TABLE 6

TRENDS IN LIVESTOCK PRODUCTION

<u>Type of Livestock</u>	<u>1940</u> (Thousands)	<u>1970</u>
Cattle and Calves	123	226
Hogs and Pigs	70	123
Sheep and Lambs	42	4
Chickens	791	149

Source: Census of Agriculture, April 1970, U. S. Department of Commerce (Sirken and Smith)

Future pasture conversion operations which do not retain a sufficient width of timber along the riverbanks would impair the scenic qualities of the river corridor. The current number of cattle which graze and water along the riverbanks does not disrupt the river scene.

Forest Products Industry

During the 13-year interval between State-wide forest inventories, the forest area declined by 18.4 percent as a result of land clearing for pasture and development of rural homesites along hard-surfaced roads. Most of the reduction occurred on private land.

TABLE 7

TRENDS IN COMMERCIAL FOREST LANDS

<u>County</u>	<u>Commercial Forest Land</u> (Thousand acres)	
	<u>1959</u>	<u>1972</u>
Laclede	242.3	195.2
Maries	172.7	137.1
Osage	198.5	170.2
Phelps	247.9	212.7
Pulaski	212.4	175.6
Texas	475.2	373.6
	<u>1,549.0</u>	<u>1,264.4</u>

Source: Forest Survey Reports, North Central Forest Experimental Station, U. S. Forest Service, U. S. Department of Agriculture (Sirken and Smith).

Ownership of forest lands in 1972 was largely associated with farms and other private holdings (Table 8).

TABLE 8

FOREST LANDS OWNERSHIP

<u>Owner Class</u>	<u>Thousand Acres</u>
National Forest	157.9
Other Federal	42.0
State	2.2
Forest Industry	27.5
Other Private	<u>1,034.8</u>
	1,264.4

Source: Forest Survey Reports, North Central Forest Experimental Station, U. S. Forest Service, U. S. Department of Agriculture (Sirken and Smith).

Minerals

Existing mineral activity that might have an impact on the rivers is confined to extraction of alluvial deposits of sand and gravel. The only two commercial gravel extraction operations known to be active are not located within the river areas recommended for inclusion in the System. County highway departments and other local use operations occasionally extract minor amounts of material at accessible points along both rivers.

Most sand and gravel extracted commercially is used within the study area. It is not known whether commercial extraction operations would be established within the recommended river areas to meet future needs. A significant sustained demand for sand and gravel for use outside the area is not expected because deposits are widely distributed through southern Missouri. The potential exists for establishment of commercial sand and gravel operations within the recommended river areas. Commercial operations relocate in new river areas for better sources of material or to shorten their haul distance to customers. The establishment of such operations within one-fourth mile of the recommended river areas would be detrimental to maintaining a natural riverscape and in many instances would significantly alter the river environment. Sand and gravel extraction for farm and house use, or for river channel maintenance in order to protect the bottomlands, normally has little adverse effect on the total riverscape.

Other than sand and gravel, the potential use of other minimal resources is unknown since complete mineral resource evaluation was not made. Current mineral production in the 10-county area through which the river corridor passes also includes clays and stone. Known mineral resources,



The transportation system includes four-lane divided highways and one-lane low-water fords.



other than sand and gravel, near the river in Phelps County include filled-sink pyrite deposits, red iron ore, and clays in a part of the southern fire clay district; in Pulaski County there are deposits of red iron ore; Maries County, fire clay; Osage County, fire clay and brown iron ore; and Gasconade County, fire clay. In addition to the resources mentioned, Phelps County contains metallurgical and chemical grade dolomite in the Gasconade and Jefferson City Formations; and Laclede County contains dolomite of the same grade in the Gasconade, Eminence, and probably the Roubidoux Formations.

The utilization of these mineral resources could require process water from the rivers. However, due to adequate ground water supplies, need for surface water is remote. Clay deposits and filled-sink pyrites tend to be on uplands, not in the immediate vicinity of the river corridor. Iron deposits tend to be too small for economical mining. The dolomites exposed along the rivers are found throughout southern Missouri and are not a scarce resource.

Transportation and Utility Corridors

New or expanded rail facilities in the basin appear to be unnecessary; increased rail traffic can be met with existing facilities. Increased highway traffic apparently can be met by upgrading and relocating existing routes. Relocation of highways, particularly U.S. 63 and its possible expansion to four lanes, could result in visual and audio impacts on the riverway. Improvement of bridges and roads that cross the rivers is projected but would have a less detrimental effect. The greatest environmental impact would stem from road relocation which provides access to river areas presently inaccessible.

It is unknown whether new pipelines or electric power transmission lines would be constructed across the basin. Pipeline construction will depend on demand-supply relationships for the commodities transported, but the major consideration is whether new petroleum refineries and gas fields are developed in the southwestern United States.

Trends in the use of electric energy have been steadily upward. If this continues, construction of new power transmission lines appears inevitable, both to market areas outside the basin and to local customers. Intrusion of such facilities across the river corridors would have an impact on the scenic quality of the river areas.

Land Values

In the 1950's land values in the Gasconade and Big Piney region began to rise. The upward trend accelerated rapidly during the past decade. Although the reasons for acquiring land are many, two have forced prices of both forest land and farmland upward--recreation and speculation. The

adjusted values per acre^{1/} progressed upward to four percent annually from 1940 to 1970. The Economic Research Service, U.S.D.A., recently estimated that from 1971 to 1972 farmland values escalated at a 10 percent annual rate. Forest land increased from about three dollars per acre in 1940 to five dollars in 1955. Prices then began rising rapidly, resulting in a current value for forest land without improvements of \$75 or more per acre. The upward acceleration in land values is clearly shown by the trend based on prices paid per acre by the Missouri Department of Conservation for access sites on the Gasconade and Big Piney Rivers (Table 9).

TABLE 9
TREND IN LAND PRICES ALONG
GASCONADE AND BIG PINEY RIVERS

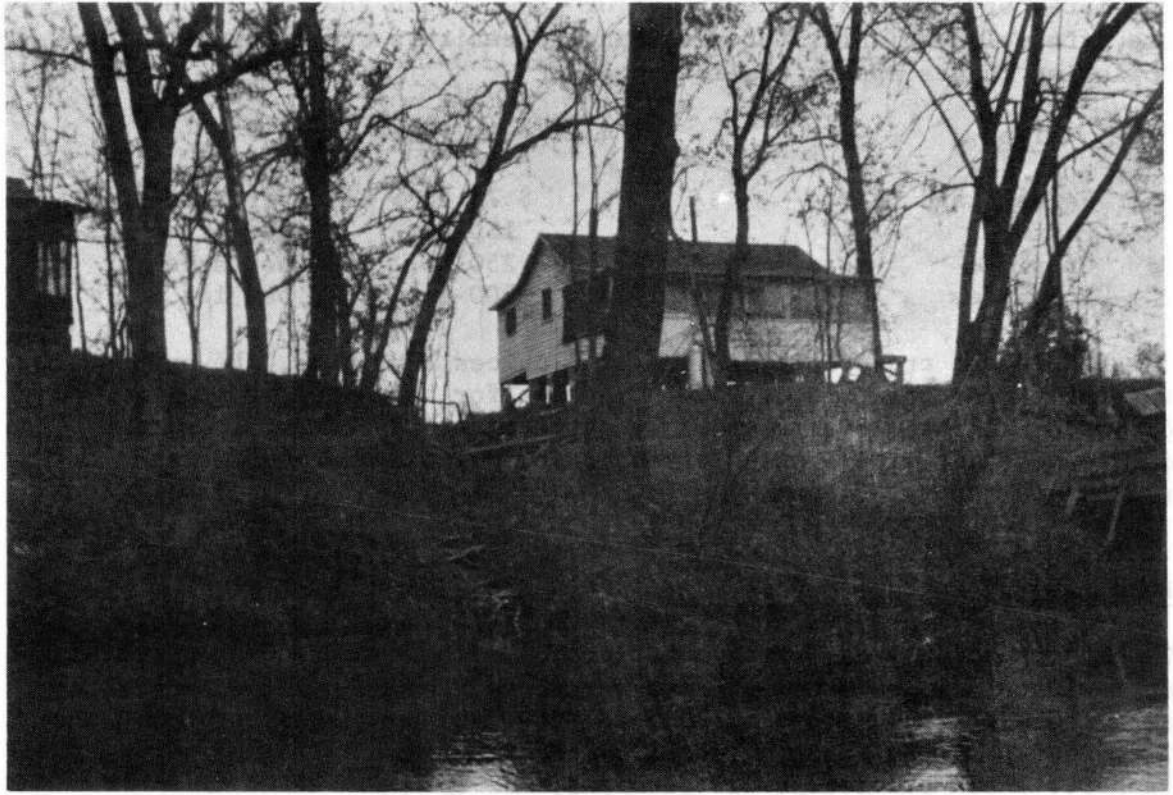
<u>Date of Purchase</u>	<u>Price Per Acre</u>	<u>Value Spring 1973</u>	<u>Adjusted* Trend Price Per Acre</u>
July 1958	\$150.00	\$315.00	\$291.00
October 1958	434.78	868.00	307.00
February 1961	139.28	266.00	320.00
April 1961	454.54	862.00	323.00
September 1964	500.00	800.00	382.00
October 1964	353.42	547.00	395.00
June 1965	500.00	750.00	408.00
July 1966	451.83	632.00	438.00
February 1968	500.00	600.00	510.00
March 1968	400.00	480.00	510.00

* The adjusted trend price per acre is used to indicate an average price per acre that would have been paid if all 10 tracts of land were purchased on the date shown. This procedure removes the effects of differences in individual tract values. The adjusted trend is derived by taking the average value per acre in 1973 (\$612.00) and dividing by 1 plus the percent of increase in value from the date of purchase in 1973.

Source: Sirken and Smith

Land values since 1968 have continued to increase. In 1972, the Missouri Department of Conservation purchased land along the Big Piney River for \$746 per acre.

¹The real appreciation in market value of farmland was estimated from the Census of Agriculture Series, published at five-year intervals. Average values per acre were expressed in constant 1967 dollars to remove the effect of changes in purchasing power of money.



*Cottages are found
along both rivers
but needn't detract
from scenic values.*

Estimates of the 1973 market value of land within the Gasconade basin are extremely variable, but according to realtors and landowners the following ranges appear realistic:

<u>Type</u>	<u>Price Range</u>
Forest Land	\$ 75 to \$ 110 per acre
Pasture	150 to 200 per acre
Cropland	250 to 300 per acre
Homesites	500 to 5,000 per lot

If the present trend of spiraling land prices continues, the opportunity to profit from the sale of river frontage for homesites and recreation purposes will become more and more attractive. Resultant shoreline development activities which often occur could severely affect the riverway's natural values.

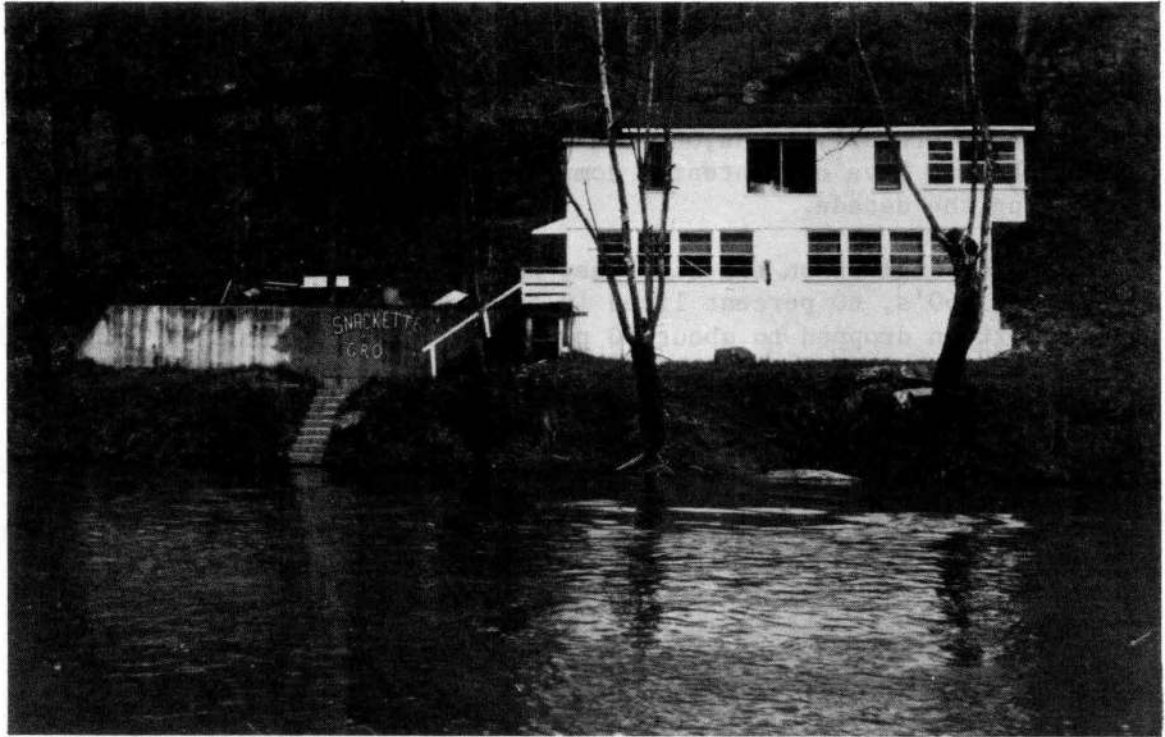
Homesite and Cottage Development

Within the study area, rural construction of houses has been increasing. Approximately 1,349 housing units were constructed in 1969 compared to an average of 753 units from 1965 to 1968, and an average of 575 units from 1960 to 1964. Most of the 1969 construction, 1,175 units, was on property which previously was farmland.

It is estimated that 2,025 acres of land are located above the flood plain, within one-fourth mile of the rivers, and within one-fourth mile of an existing road. Although this area includes the most desirable homesites, the rapid rise in construction costs and interest rates will deter a portion of the development which would otherwise occur on this land. In addition, many purchasers of land who intend to build later decide to sell the undeveloped property. The development which could occur could be of two types. The first consists of relatively high-cost homes built by persons in higher income brackets. Recently built units of this type are located near the rivers. The second type includes cluster arrangements of low-to-medium cost housing, including mobile homes, located near utilities and sewerage facilities. According to landowners along the rivers, about six percent intend to subdivide land and sell lots within five years. As the number of homes increases, their impact on the river is multiplied because of increased timber removal, additional road access, and electric power needs near the rivers.

Recreation

Prior to the 1940's, recreation afforded by both rivers was primarily fishing and camping. A few cabins had been located nearby and local people used the rivers for day-use activities. Floating in jon boats attracted people from far away, but their number was small. Only during the past 20 years or so has canoe floating and the development of second homes expanded substantially.



Riverside business serves the increasing numbers of recreationists.



*More and more
land is being
posted.*

Fishing pressure on the Big Piney, from Dog's Bluff to Ross Bridge, averaged about 60 hours per acre of water from 1963 to 1968, but during the following four years it increased 30 percent. Floating followed a similar trend. From about 21,000 man-hours per year during 1963-1968, it increased steadily to 32,000 man-hours in 1972. Commercial floats (rented boats) have consistently comprised 30 percent of the floating use during the decade.

Residence of anglers on the Big Piney has also undergone a change. In the early 1960's, 60 percent lived in adjoining counties, but by 1972 the proportion dropped to about 50 percent. St. Louis anglers increased from 25 to 30 percent, and other in-State anglers living outside the basin accounted for 15 to 25 percent of the use.

Although recreation use is increasing along both rivers, it has not been extensive due to existing recreation development on recreational waters in adjacent, better known basins. As overcrowding of recreational waters in adjacent basins occurs, additional demands will be made on the Gasconade and Big Piney Rivers. Canoeing, fishing, hiking, and camping activities are expected to increase within the region and along both rivers. Presently, four resorts are located near the rivers, and seven firms rent canoes and offer supporting services.

The projected water-based recreation demand for the six counties is described in Table 10. Recreation use as projected, and if uncontrolled, could severely threaten the scenic as well as the recreational qualities of both rivers.

Alternative Actions for the "Recreational" Segments

Many of the same alternative courses of action discussed for the "scenic" segments are applicable to the "recreational" segments. A "no action" alternative would allow present

trends in land use to continue. These trends are discussed above. The acceleration of existing Federal and State land acquisition programs as discussed on page 61 would also apply to the "recreational" segments.

Inclusion in the National Wild and Scenic Rivers System is a third alternative. Protection of the river segments by inclusion in the National System would involve many of the same considerations as described in the conceptual plan and the environmental and socioeconomic impact sections for the "scenic" areas of the Gasconade and Big Piney Rivers. Management objectives for "recreational" segments would be designed to protect and enhance existing recreational values. New structures for both habitation and intensive recreational use could be allowed. A full range of agriculture and other resource uses may also be permissible.

TABLE 10

PROJECTED WATER BASED RECREATION DEMAND
(THOUSANDS OF ACTIVITY DAYS)

County	1970			1985			Percent of Increase over 1970 Base		
	Beach Swimming	Boating	Fishing	Beach Swimming	Boating	Fishing	Beach Swimming	Boating	Fishing
Maries	31	20	61	102	47	146	229%	135%	139%
Phelps	43	25	85	190	66	225	342%	164%	165%
Texas	70	29	74	308	74	193	340%	155%	161%
Laclede	168	32	119	323	47	233	92%	47%	96%
Pulaski	38	40	105	73	60	192	92%	50%	83%
Osage	<u>0</u>	<u>35</u>	<u>84</u>	<u>0</u>	<u>81</u>	<u>210</u>	<u>0%</u>	<u>131%</u>	<u>150%</u>
TOTALS	350	181	528	996	375	1,199	185%	72%	127%
Summary of All Activities	1,059			2,570			143%		

Source: Data extracted from Missouri's State-wide Comprehensive Outdoor Recreation Plan (1973).

VII.
ALTERNATIVE
ADMINISTRATIVE ARRANGEMENTS
CONSIDERED

VII. ALTERNATIVE ADMINISTRATIVE ARRANGEMENTS CONSIDERED

Arrangements Considered for the "Scenic" Segments

Three other possible administrative arrangements for managing the "scenic" river areas of the Gasconade and Big Piney as components of the National

Wild and Scenic Rivers System which were considered involved the State of Missouri, joint State-Federal administration, and the establishment of regional or local government authorities.

State Administration

The river areas could be protected as a State administered river by either the Missouri State Park Board, the Department of Conservation, or through another State governmental arrangement. Under this alternative, the State of Missouri would have to first enact State scenic river legislation identifying the Gasconade and Big Piney Rivers as components of the State system. Section 2(a)(ii) of the Wild and Scenic Rivers Act provides that State rivers which are designated as wild, scenic, or recreational river areas by or pursuant to an Act of the State legislature, and which are to be permanently administered as such by an agency or political subdivision of the State at no cost to the United States, and which meet the criteria in the Act and the Guidelines may, upon application by the Governor, be included as State-administered components in the National System by the Secretary of the Interior.

Acquisition, development, and management of the river corridor would be the total responsibility of the State government. Cooperative agreements for continued Forest Service management of Federal lands consistent with State administration of the "scenic" river areas could be entered into by the two parties. The remaining river corridor lands which would have to be controlled would be acquired by the State.

A river advisory board for the river areas could be established by the State. Board membership would consist of representatives from appropriate Federal, State, local, and private organizations. Its purpose would be to advise the involved State agency in all matters pertaining to administration of the riverway. In addition, the board would periodically evaluate and then advise the Governor of river management efforts.

Joint State-Federal Administration

Under this administrative alternative, responsibilities for acquisition, development, operation, and maintenance of the riverway would be divided between the two levels of government by mutual agreement. This would be accomplished by cooperative agreements which would clearly define the river management areas and the specific responsibilities to be assumed by each party.

Regional or Local Government Authorities

Under this alternative, Laclede, Texas, and Pulaski Counties would have the primary responsibility for administering the river areas and would acquire, plan, and develop the lands necessary to assure appropriate protection and development of the rivers. Again, it would first be necessary for the State to enact State scenic river legislation identifying the rivers as components of the State system.

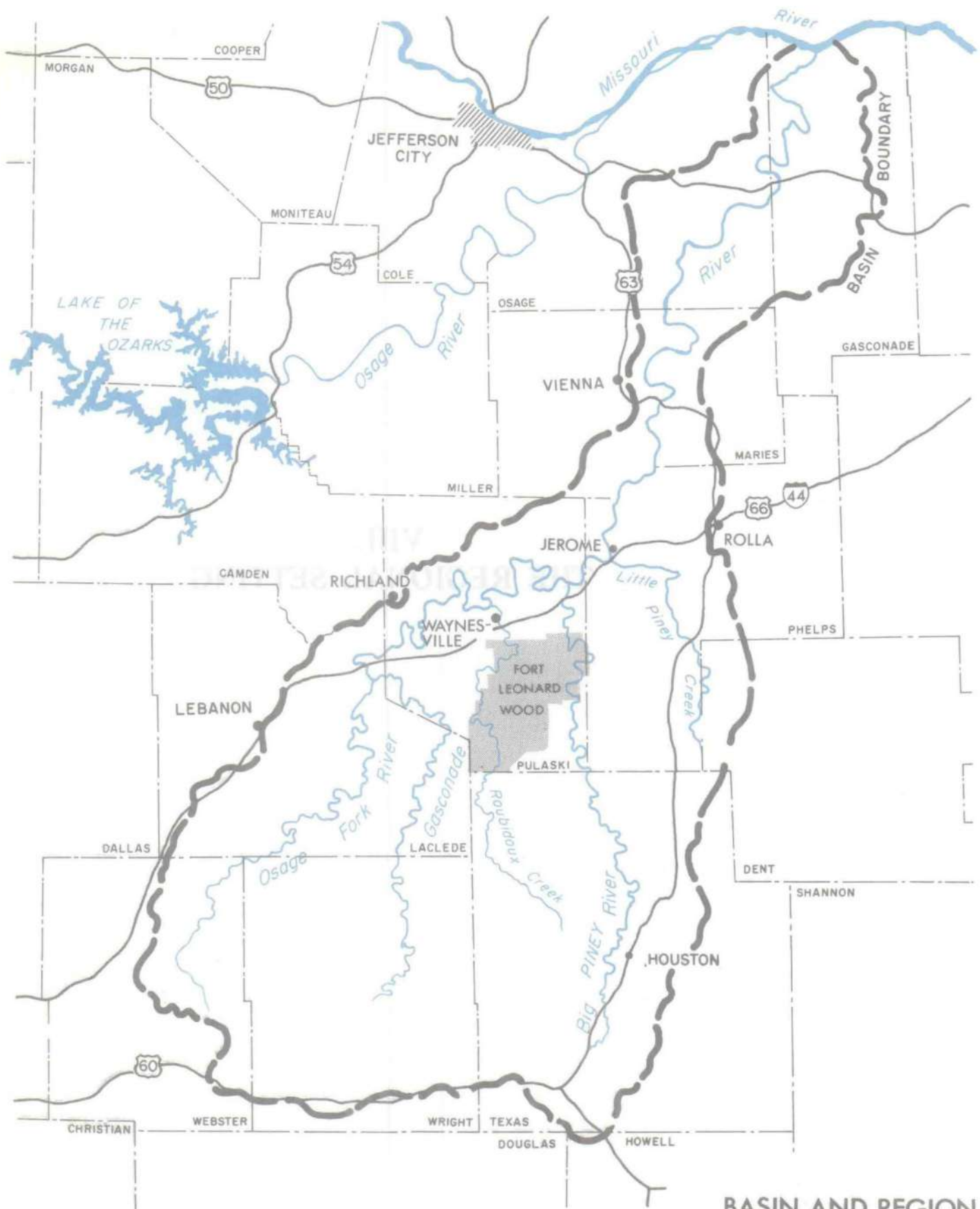
All counties in Missouri may acquire, develop, and maintain parks. Appropriations for this purpose are limited to five percent of the county income. In addition, the counties may cooperate and contract with other units of government to carry out and accomplish purposes common to both. Similar to the State administration alternative, cooperative agreements regarding continued Forest Service management of Federal lands would have to be made, and the acquisition of other lands needed would be the responsibility of the counties. Cooperation with the State in the administration of the rivers would also be required in areas where public river access sites managed by the State are located. Necessary funds would be provided by the county, but additional financial assistance may be available from the State, or possibly through the use of Land and Water Conservation Fund (LWCF) monies.

At the regional level, another administrative alternative could be created through the establishment of a water conservancy district. State law regarding conservancy districts provides authority for the district to develop and manage recreation facilities. The conservancy district would assume responsibility for acquiring, planning, developing, and managing the "scenic" river areas. As in the other administrative alternatives, cooperation with local, State, and Federal governmental units would be necessary. Monies from the LWCF through the State could be provided for financial assistance. In order to include the river areas within the National System under this arrangement, the State would have to enact State scenic river legislation identifying the rivers as components of the State system, and then comply with the provisions of Section 2(a)(ii) of the Act.

Arrangements Considered for the "Recreational" Segments

Although several alternatives to local administration of the lower Gasconade were considered, those determined most appropriate, and therefore worthy of consideration, included administration by the State of Missouri, joint State-Federal administration, and Federal administration. The important facets of these administrative arrangements are discussed in this chapter and in the conceptual river plan for the Gasconade and Big Piney "scenic" river areas.

VIII.
THE REGIONAL SETTING



BASIN AND REGION

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI



STUDY LOCATION

VIII. THE REGIONAL SETTING

Physical Environment

The Gasconade River basin, located in the Ozark Highlands of south-central Missouri, lies approximately 100 miles southwest of St. Louis and 200 miles southeast of Kansas City. The basin is roughly triangular shaped--50 miles at its widest point and 130 miles in length.

The watershed of the basin consists of approximately 3,600 square miles (2,304,000 acres) principally in Osage, Gasconade, Maries, Pulaski, Phelps, Laclede, Wright, and Texas Counties. Small parts of Webster and Dent Counties are also included. The Gasconade is one of the major streams in the northern portion of the Ozark Highlands.

The headwaters area of the basin is in rough broken country, characterized by many steep, sheer bluffs and numerous caves and springs. From the headwaters midway to the mouth of the Gasconade, the streams of the basin have eroded narrow valleys. From this point to the mouth of the Gasconade, the valley widens and sheer bluffs give way to rolling hills which become more prominent as the Missouri River is approached.

The general land elevation varies from 1,500 feet above sea level at the basin's headwaters to about 850 feet at the Gasconade River's confluence with the Missouri River. The highest elevation of 1,744 feet is on the southern portion of the basin divide and the lowest point at the mouth of the Gasconade River.

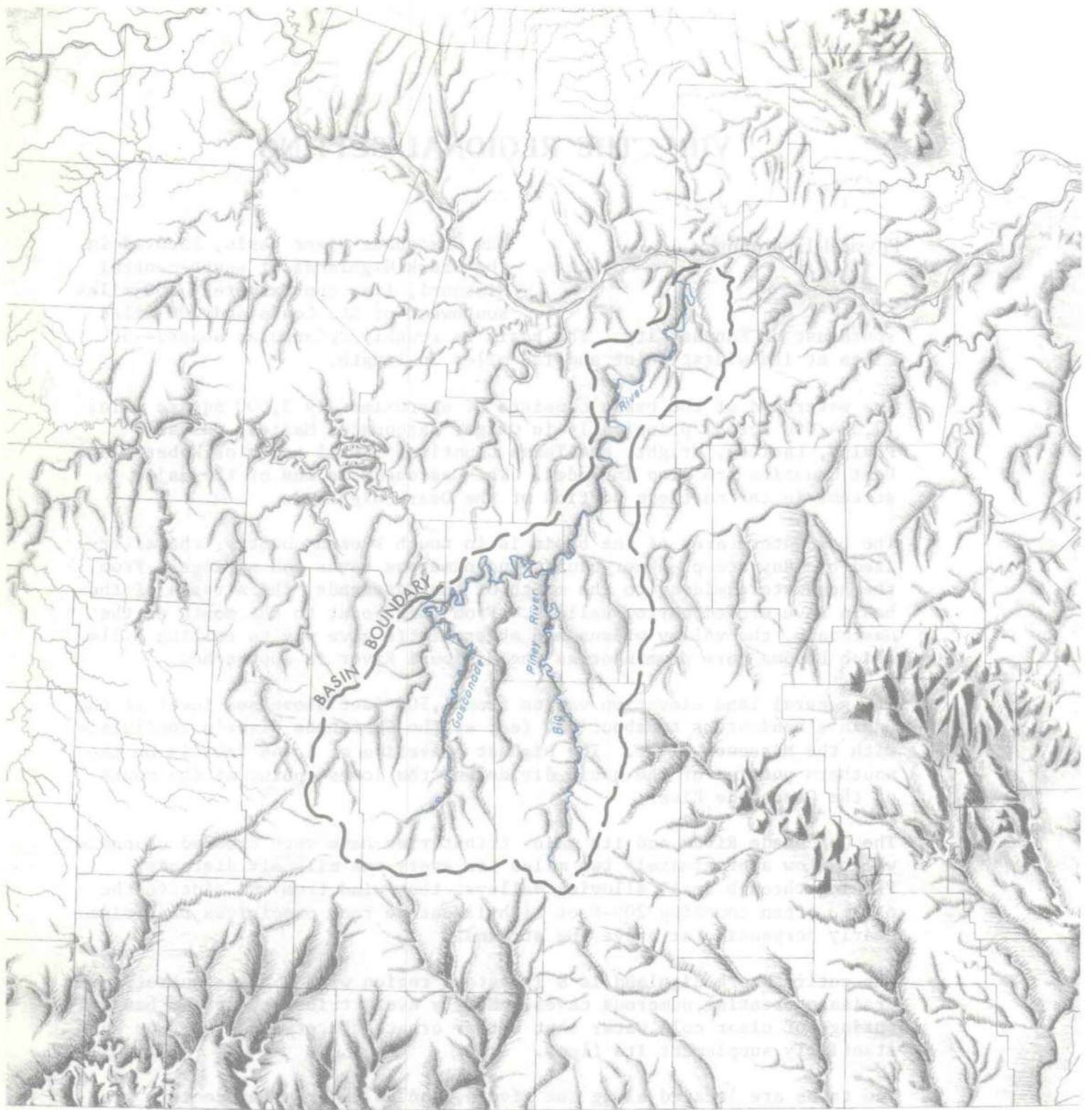
The Gasconade River and its major tributaries have very crooked channels which flow approximately two miles for every one mile air distance. Flowing through small alluvial valleys, they wind from one side to the other, often touching 200-foot high limestone rock precipices that rise nearly perpendicular above the streams.

The entire Ozark Highland is a limestone region with a large subterranean drainage creating numerous caves. Nearly every tributary stream has many springs of clear cold water that either create the stream itself or substantially supplement its flows.

Few towns are located along the rivers, and no major urban centers are located in the watershed. In essence, the basin may be characterized as rural, farm, and forest country.

Population and Economy

Population--In 1970 approximately 4,218,000 people lived within a 100-mile radius of the Gasconade River and approximately 17,058,000 people lived within a 250-mile radius. The river is somewhat centrally located between four Standard Metropolitan Statistical Areas (SMSA's) with a total

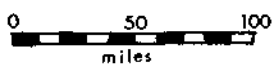
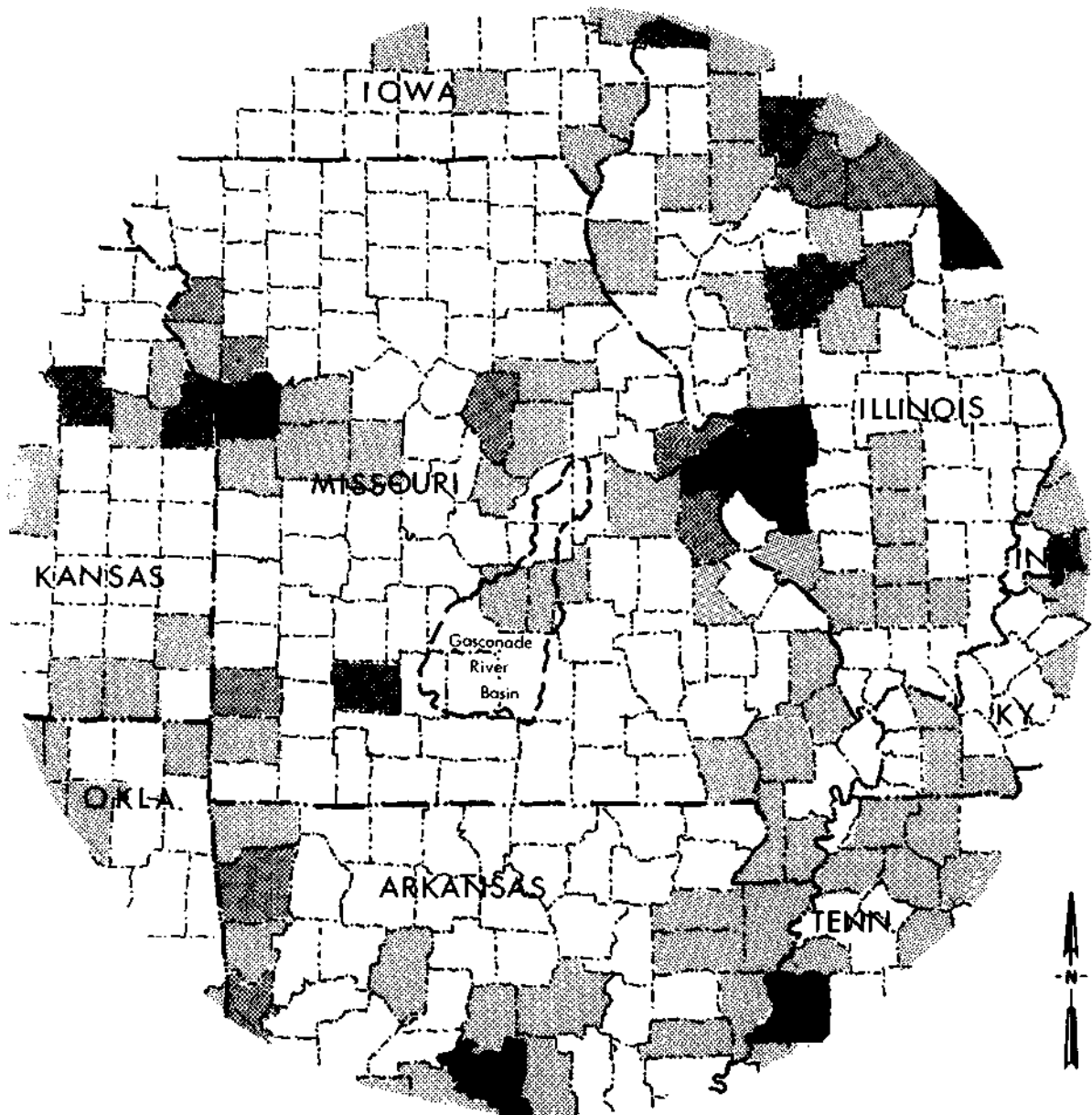
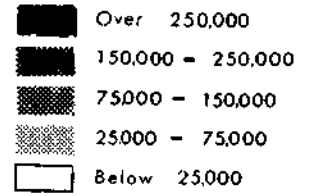


PHYSIOGRAPHY

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI



Legend



GASCONADE RIVER, MISSOURI
REGIONAL POPULATION DISTRIBUTION
BY COUNTY

1970 population of 3,859,500. They are St. Louis, Springfield, Kansas City, and St. Joseph, Missouri. All four lie within four hour's driving time of the Gasconade, with Springfield and St. Louis close enough for weekend use. Within a 250-mile radius of the Gasconade are eighteen other SMSA's with a combined 1970 population of nearly nine million people. A list of these SMSA's, their present population, and projected population through 2020 is included in the Appendix.

The eight counties that have all or a significant portion of their boundaries within the Gasconade River basin--Gasconade, Osage, Maries, Pulaski, Phelps, Laclede, Texas, and Wright--had a 1970 population of over 180,500. Pulaski County accounted for approximately 33 percent of this population and had a density of approximately 98 residents per square mile. This includes Fort Leonard Wood, a military installation, which has a population of nearly 34,000. Phelps County had approximately 45 residents per square mile, and the remainder of the counties had much lower population densities.

Phelps and Pulaski Counties showed the largest population gains (approximately 15 percent per county from 1960 to 1970), while the remaining six counties showed much smaller gains or losses during the same period. Some of the counties along the rivers appear to be following the national trend of rural area population losses while the more urban areas continue to gain.

Since there are no communities with populations over 14,000, other than Fort Leonard Wood, there is no immediate major threat from urban expansion and development. The majority of towns within the basin are small agriculturally oriented communities.

The 1970 population of incorporated communities with over 1,000 inhabitants within or immediately adjacent to the basin is shown in Table 11.

Economy--With the exception of the Fort Leonard Wood area, the economy of the Gasconade River basin is predominantly agriculturally oriented. The area immediately surrounding the Fort is closely tied to activities providing goods and services to the army and its personnel. Many persons and businesses are solely dependent on Fort Leonard Wood for their livelihood.

In the eight-county area of the Gasconade basin, two-thirds of the land is in farmland. Only about 15 percent of the farmland, however, is cropland, with the remainder in pasture and woodlands. Approximately 50 percent of the basin is forested. Cattle and dairy farming account for the greatest portion of farm income, and raising of hogs and sheep is of minor importance. The primary grain crop is corn followed by wheat, sorghum, and soybeans. Area trends show the number of farms decreasing, while the average farm size is increasing.

Food processing, textiles, transportation equipment, production of posts, charcoal, and other wood products and the publishing and printing

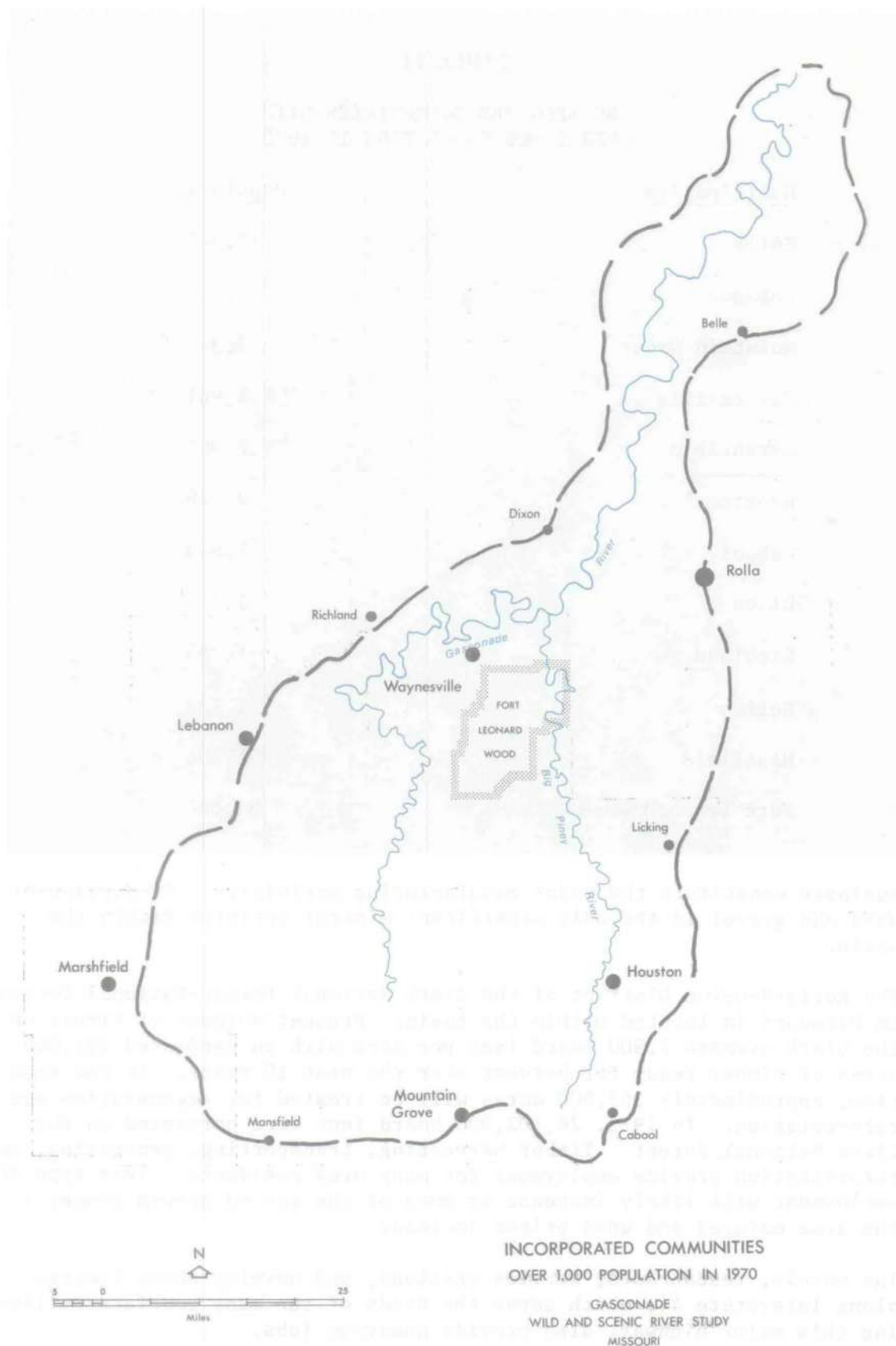


TABLE 11

INCORPORATED COMMUNITIES WITH
OVER 1,000 POPULATION IN 1970

<u>Municipality</u>	<u>Population</u>
Rolla	13,245
Lebanon	8,616
Mountain Grove	3,377
Waynesville	2,961
Marshfield	2,961
Houston	2,178
Cabool	1,848
Dixon	1,387
Richland	1,783
Belle	1,133
Mansfield	1,056
Fort Leonard Wood	34,000

business constitute the major manufacturing activities. Production of sand and gravel is the only significant mineral activity within the basin.

The Rolla-Houston District of the Clark National Forest-National Forests in Missouri is located within the basin. Present volumes of timber on the Clark average 1,900 board feet per acre with an estimated 281,000 acres of timber ready for harvest over the next 10 years. At the same time, approximately 365,000 acres will be treated for regeneration and reforestation. In 1973, 26,102,000 board feet were harvested on the Clark National Forest. Timber harvesting, transporting, processing, and reforestation provide employment for many area residents. This type of employment will likely increase as more of the second growth timber in the area matures and wood prices increase.

The motels, restaurants, service stations, and novelty shops located along Interstate 44, which serve the needs of the many tourists utilizing this major highway, also provide numerous jobs.

Transportation Network

The Gasconade River basin is readily accessible by automobile. Interstate 44, connecting St. Louis and Springfield, provides good northeast-southwest movement through the region. Interstate 70, an east-west route, passes 15 miles north of the Gasconade River between St. Louis and Kansas City. U. S. 63 runs north-south and intersects I-44 at Rolla. U. S. 50 crosses east-west in the northern section of the basin. As shown in Table 12, several urban areas lie within weekend driving distance of the Gasconade and Big Piney River areas.

Numerous State highways provide access from the regional network to the entire Gasconade River watershed. State Routes 5, 17, 19, 28, 89, 95, and 133 serve as principal north-south arteries, while State Routes 7, 32, 38, 42, and 100 run east-west across the basin. Many other paved highways provide access between these major routes and frequently cross the river to connect them. The primary road network of the river areas is illustrated on page 90 and on vicinity map on page 2.

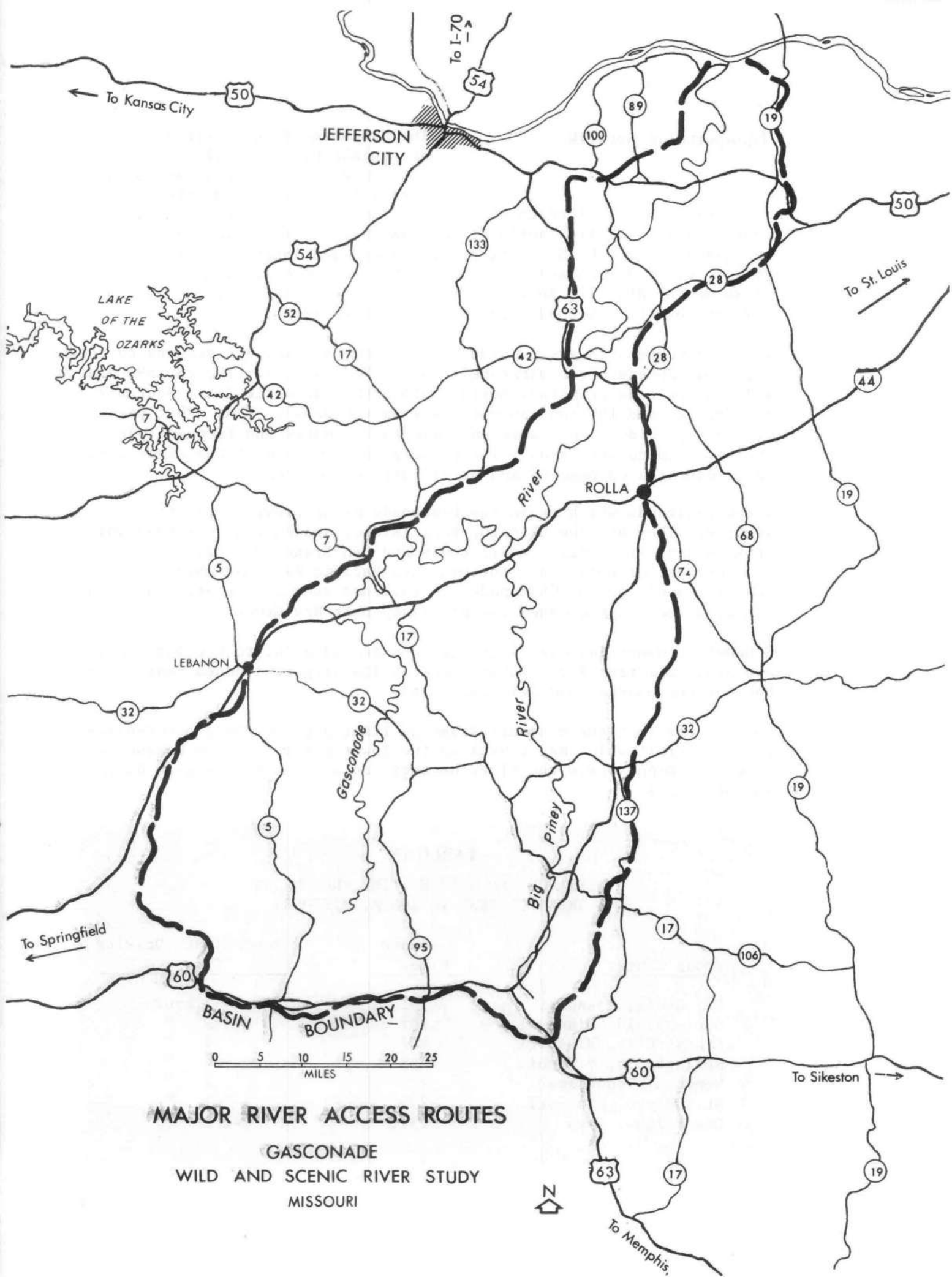
Three railroads which cross the Gasconade River provide only freight service. They are the Chicago, Rock Island, and Pacific Railroad which crosses near Freeburg; the St. Louis and San Francisco Railroad which crosses west of rolla; and the Missouri Pacific Railroad which crosses near the mouth of the Gasconade. A railroad spur of the St. Louis and San Francisco also crosses the Big Piney near Dry Creek.

Scheduled commercial air flights within and adjacent to the basin area are available from Fort Leonard Wood, Rolla Airport located near Vichy, Lake of the Ozarks, and Jefferson City.

Boat access from the Missouri River is limited to outboard motor-driven pleasure craft which may travel up the lower portion of the Gasconade River to Jerome where the river becomes too shallow to navigate during summer months.

TABLE 12
DISTANCE AND DRIVING TIME FROM MAJOR
URBAN CENTERS TO ROLLA, MISSOURI

<u>Urban Center</u>	<u>Distance Miles</u>	<u>Approximate Driving Time</u>
St. Louis, Missouri	92	2 hours
Springfield, Missouri	107	2 "
Kansas City, Missouri	207	4 "
Springfield, Illinois	208	4 "
Memphis, Tennessee	225	4 "
St. Joseph, Missouri	235	4-1/2 "
Des Moines, Iowa	237	4-1/2 "



MAJOR RIVER ACCESS ROUTES
GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

Recreation Resources

The Ozark region and surrounding areas in Missouri are endowed with many natural and man-made areas that provide a wide array of recreational opportunities. These include its waterways, reservoirs, caves, springs, and overall topography. Along with these features, its strategic location in the Mid-west and favorable climate have attracted vacationers from other States.

Rivers--The Current River (including its tributary the Jacks Fork) located in southeastern Missouri was designated as the first National Scenic Riverway by Public Law 88-492. The resulting Ozark National Scenic Riverways include 140 miles of these rivers, administered by the National Park Service. The upper limits of the riverway lie approximately 25 miles southeast of the Gasconade River basin.

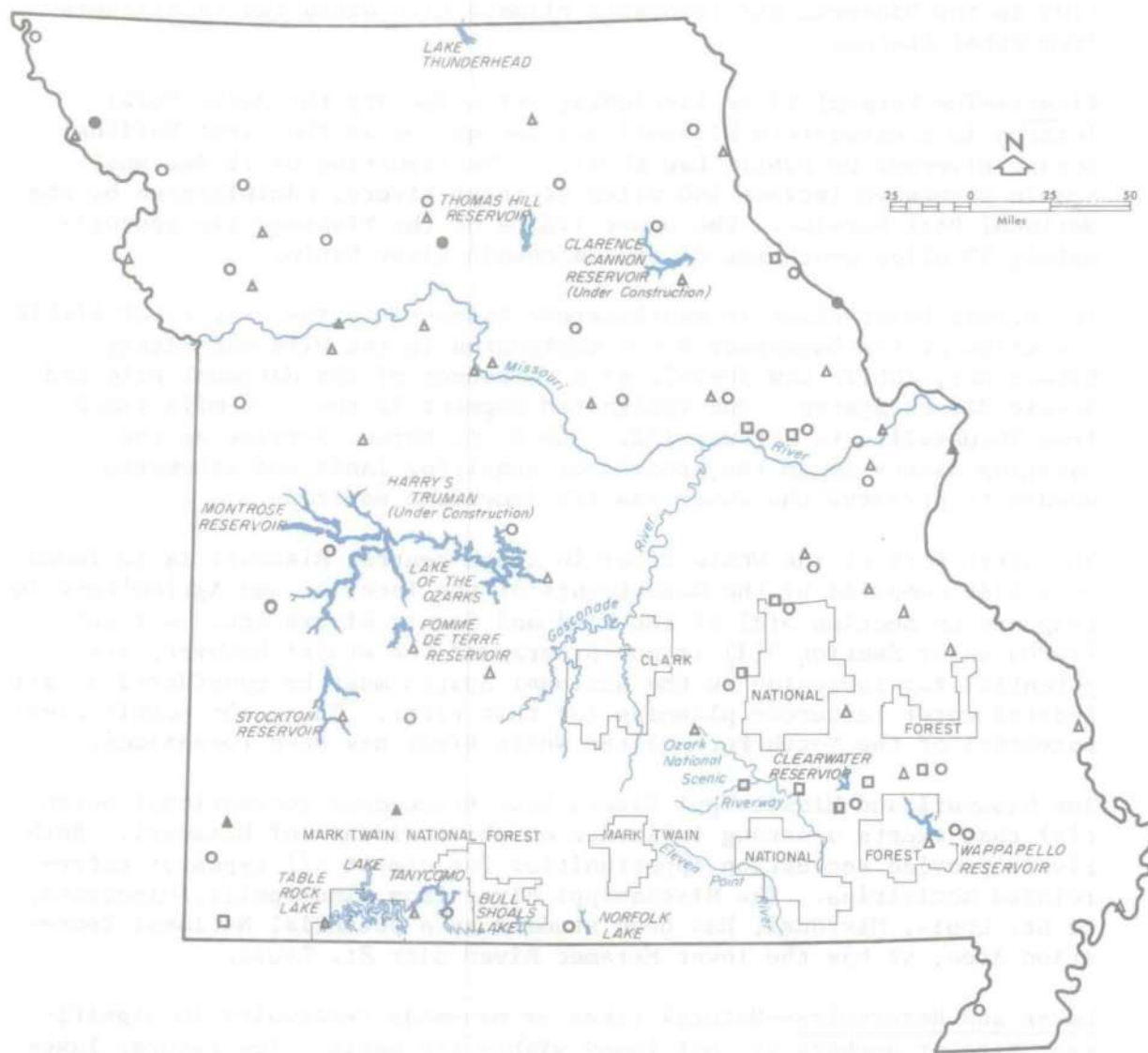
The Eleven Point River in southeastern Missouri is the only river within 250 miles of the Gasconade River designated in the Wild and Scenic Rivers Act, Public Law 90-542, as a component of the National Wild and Scenic Rivers System. The designated segment is the 44.4-mile reach from Thomasville to Highway 142. The U. S. Forest Service as the managing agency is in the process of acquiring lands and easements needed to preserve the river and its immediate environs.

The North Fork of the White River in south-central Missouri is included on a list compiled by the Departments of the Interior and Agriculture in response to Section 5(d) of the Wild and Scenic Rivers Act. A river listed under Section 5(d) is not programmed for study; however, its potential for inclusion in the National System must be considered in all Federal water resources planning for that river. Thus, the scenic river potential of the North Fork of the White River has been recognized.

The Missouri and Mississippi Rivers have tremendous recreational potential that exerts a strong influence on the residents of Missouri. Both rivers provide recreation opportunities for almost all types of water-related activities. The Mississippi River from Minneapolis, Minnesota, to St. Louis, Missouri, has been studied as a potential National Recreation Area, as has the lower Meramec River near St. Louis.

Lakes and Reservoirs--Natural lakes or man-made reservoirs in significant size or numbers are not found within the basin. Few natural lakes are found outside the basin due to the well-defined drainage patterns. However, the Corps of Engineers and privately owned utility companies have constructed 10 large reservoirs south of the Missouri River and within a 100-mile radius of the basin. These reservoirs, listed in Table 13, account for approximately 212,615 acres of surface water available for general recreation.

Many of these reservoirs have extensive public and private recreational facilities which receive heavy use. This use, however, is of a different character than is normally provided on rivers and streams due to



FEDERAL FACILITIES

- Forest Service Purchase Area
- Wildlife Refuge
- △ Parks and Monuments

STATE FACILITIES

- Forests
- Wildlife and Fishing Areas
- △ Parks

RECREATION RESOURCES
GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

TABLE 13

EXISTING LARGE RESERVOIRS
WITHIN 100 MILES OF STUDY AREA*

<u>Reservoir</u>	<u>Normal Pool Acres</u>
Bull Shoals	45,400
Clearwater	1,630
Lake of the Ozarks	59,920
Montrose	1,665
Norfolk	22,000
Pomme de Terre	7,820
Stockton	24,900
Table Rock	43,100
Taneycomo	2,080
Wappapello	4,100
	<hr/>
	212,615

* Excludes reservoirs located north of the Missouri River

TABLE 14

AUTHORIZED RESERVOIR PROJECTS
WITHIN 100 MILES OF STUDY AREA*
(Over 2,000 Acres)

<u>Reservoir</u>	<u>River</u> (Under Construction)	<u>Surface Acres</u>
Harry S. Truman	Osage River	55,600
Meramec Park	Meramec River	12,600
Union Lake	Meramec River	6,600
	(Currently Undergoing Reevaluation)	
Arlington Lake	Gasconade River	**
Richland Lake	Gasconade River	**

* Excludes reservoirs located north of Missouri River.

** Kansas City District, U. S. Army Corps of Engineers has recommended both projects be de-authorized.

Source: Water Resources Development, Missouri, U. S. Army Corps of Engineers, January 1973.

their different physical environments. Although the large reservoirs provide water-oriented recreation opportunities outside the basin, there are few water-related recreation opportunities available within the basin except for the rivers. In addition to the existing reservoirs, other large reservoir projects have been authorized by Congress (Table 14).

Other Resources--State and Federal managed forests, waterfowl refuges, and parks in the surrounding region provide significant recreational opportunities.

The system of State parks and historic sites administered by the Missouri State Park Board is diverse and provides a variety of environmental opportunities for outdoor recreation enjoyment. Within 100 miles of Rolla, there are 17 State parks totaling approximately 49,000 acres. The largest of these are the Lake of the Ozarks and Meramec State Parks, covering 16,469 and 7,153 acres, respectively. Facilities at these parks and many others within this region include swimming beaches, boat launching ramps, foot and horse trails, and family and group campings. Many of the State parks have been developed around man-made and unique natural features.

The Missouri Department of Conservation has the responsibility for managing State forests. Within 100 miles of Rolla, there are seven State forests, totaling approximately 167,314 acres. The largest of these is Deer Run State Forest, located on the Current River. Indian Trail State Forest is located approximately 30 miles southeast of Rolla. Development and management of these lands are generally based on the multiple-use concept similar to that of the national forests. Special emphasis is oriented to both game and nongame species of fish and wildlife.

The Missouri Department of Conservation also has the responsibility for managing 20 State wildlife areas, totaling 91,400 acres, all located within 100 miles of Rolla. In addition, fish access points and fishery management areas total 1,449 acres of land, 174 acres of water, and 26.95 miles of specially managed streams.

The U. S. Department of Agriculture, Forest Service, owns and manages approximately 1.4 million acres in southern Missouri with the National Forests of Missouri--the Clark and Mark Twain National Forests. National Forest areas are managed under the principal of multiple use, including timber production, watershed protection, wildlife habitat management, and recreation. Major recreational uses on the National Forests in Missouri are driving for pleasure, sightseeing, fishing, and hunting. Other recreational activities provided for in these forests include swimming, picnicking, nature study, boating, canoeing, camping, horse-back riding, hiking, mushroom hunting, and spelunking.

The U. S. Department of the Interior, Fish and Wildlife Service, owns and manages approximately 43,000 acres in Missouri, consisting of four

separate refuges, the Clarence Cannon, Mingo, Squaw Creek, and Swan Lake National Wildlife Refuges. The Federal refuge closest to the Gasconade River basin is the 21,000-acre Mingo National Wildlife Refuge which lies approximately 95 miles southeast of Rolla. Because of its southern location, it provides food, rest, and protection for wintering waterfowl as well as for waterfowl passing through during the fall and spring migrations. It also provides excellent opportunities for people to observe wildlife in its natural setting and to become familiar with the various wildlife management programs. A portion of this refuge is being considered as a potential addition to the National Wilderness System.

Recreation Resource Needs--Volume 5 of the Appendix to the *Missouri River Basin Framework Study*, December 1971, contains a general evaluation of the outdoor recreation needs in a subarea which covers a large portion of Missouri, including the Gasconade and Big Piney Rivers, and extends into the States of Kansas and Iowa. According to the study, there will be a moderately high need for additional recreational surface waters by the year 2000 in the St. Louis-Columbia-Jefferson City influence area. The scenic river potential of the Gasconade River was acknowledged and included in the framework plans.

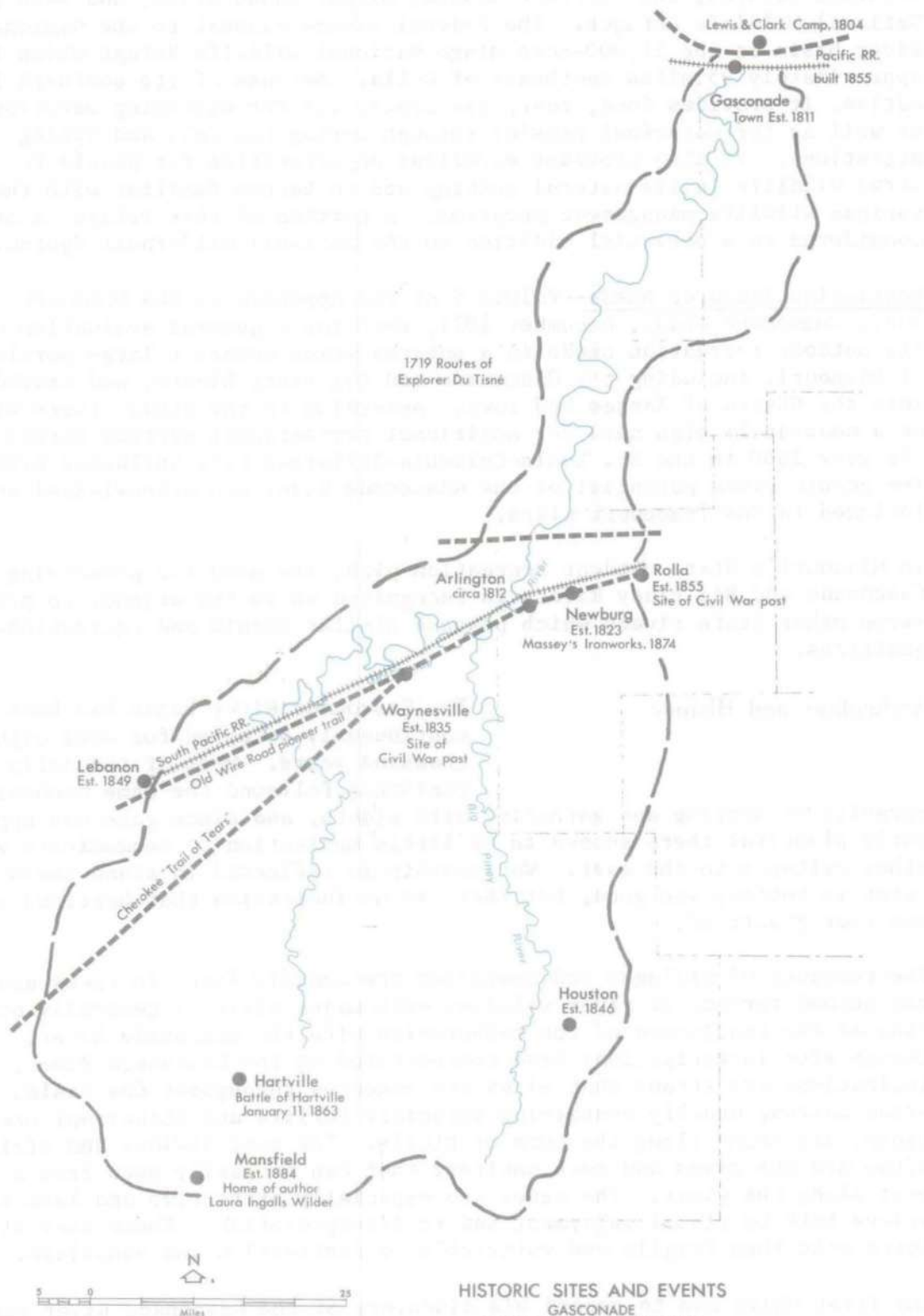
In Missouri's State outdoor recreation plan, the need for preserving the Gasconade and Big Piney Rivers is recognized as is the urgency to preserve other State rivers which possess similar scenic and recreational qualities.

Archeology and History

The Gasconade River basin has been continuously occupied for some eight thousand years. Most of the early residents followed the same economic pursuits of hunting and gathering wild plants, and since game was apparently plentiful there seemed to be little motivation to communicate with other cultures to the east. Workmanship as reflected in stone tools and later in pottery was good, but there is no indication that horticulture was ever practiced.

The remnants of villages and campsites are usually found in caves and on the second terrace of river valleys, with major villages generally occurring at the confluence of the tributaries with the Gasconade River. Although site investigations have concentrated on the Gasconade River, indications are strong that sites are numerous throughout the basin. Stone cairns, usually containing secondary burials and occasional cremations, are found along the tops of bluffs. The most obvious and striking sites are the caves and rock shelters that can be easily seen from a boat along the river. The caves are especially attractive and lend themselves both to visual enjoyment and to interpretation. These very attributes make them fragile and vulnerable to destruction and vandalism.

The first white man to record his discovery of the Gasconade River was the French trader-explorer Charles Claude du Tisne' who passed the river's mouth on his way up the Missouri River in 1719. He later made two over-



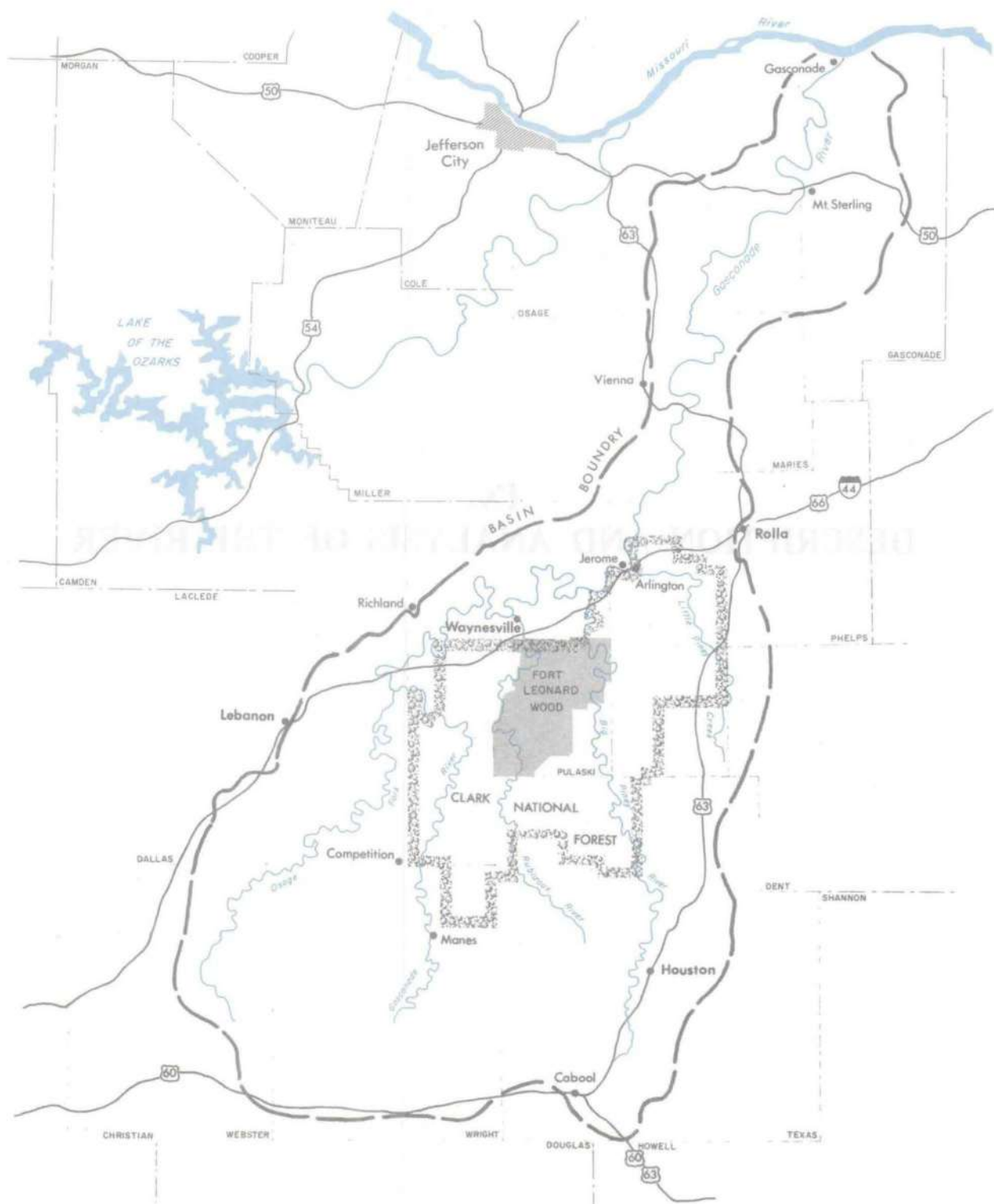
HISTORIC SITES AND EVENTS
GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

land journeys across the Gasconade River naming it "Blue River." The explorer du Tisne' was soon followed by other Frenchmen eager to secure the Missouri wilderness for its rich fur resources, and it was one of these adventurers, perhaps from the French province of Gascony, that gave the river its present name.

By the 1740's French trappers and traders were searching the lower Missouri and its tributaries for beaver, otter, and muskrat. In the spring of 1804, Lewis and Clark camped at the mouth of the Gasconade River on the epic expedition to the Pacific Ocean. Four years later two white families had settled at the mouth of the Gasconade River, and by 1813 enough settlers had gathered to support a grist and saw mill. Lumbering became important to the region in the 1820's, about the same time the fur trade began its decline. Although the Gasconade River basin's resources suffered from serious misuse by early trappers, lumbermen, and farmers, it remained outside the main stream of settlement and much of its wilderness character has remained.

Historic sites and structures along the rivers and throughout the Gasconade basin relate more to regional, State, or local history and appear to lack national significance. However, four historic properties are presently listed on the National Register of Historic Places. These are the furnace stack from Massey's Iron Works at Newburg, the home of the noted author Laura Ingalls Wilder located near Mansfield, Gourd Creek Cave Archeological site in Phelps County, and the Decker Cave Archeological site in Pulaski County. A brief summary of noteworthy historical sites in the Gasconade River basin is graphically portrayed on the opposite page.

IX.
DESCRIPTION AND ANALYSIS OF THE RIVER



REGIONAL MAP

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

IX. DESCRIPTION AND ANALYSIS OF THE RIVER

Riverscape

The Gasconade River rises on the rolling uplands of the central Ozark plateau and is eventually joined by Big Piney in its journey northward to the Missouri River. Large segments of these rivers are relatively undeveloped, unpolluted, and free-flowing. With the exception of their headwaters, wooded banks prevail throughout most of their length. Normally, one side of each stream is level to rolling, with bluffs or steep terrain on the other.

Stream bottoms along the Gasconade and Big Piney Rivers characteristically consist of bedrock, boulders, rubble and gravel, with little sand or mud. Pools are shorter and riffles more frequent in their headwaters where the gradient is higher and become progressively longer as the river gradient decreases downstream.

Thirty-nine named springs rise along the Gasconade River and its major tributaries, including the Big Piney River. There are countless unnamed

Typical terrain through which the rivers flow.





Although cleared almost to the water's edge, a fringe of trees still remains.

The Gasconade River as seen from Portuguese Point.



smaller springs, seeps, and wet-weather springs in the major tributaries and numerous other springs in the smaller tributaries of the Gasconade River.

The area through which the Gasconade and Big Piney Rivers flow is one of the most cavernous regions in the Nation--131 caves have been located and named. These caves vary in size from several miles in length to mere solution cavities where the line must be drawn between what is a cave and what is a bluff overhang. The size of cave entrances as they appear to the river traveler is frequently misleading. Those caves with the largest entrances may in fact be far smaller in linear extent than other caves with small entrances.

Timber species adjacent to or visible from the rivers are a mixture of hardwoods and shortleaf pine. The predominant hardwood species are sycamore, maple, butternut, hackberry, willow, and oaks. During the summer these forests provide a rich green background for the river scene. In April, the forest comes alive with the blooms of spring wildflowers and such understory trees as redbud, serviceberry, and dogwood. The coming of fall and the associated blaze of color makes the forested areas a valuable scenic resource.

Each stream bears some resemblance to the other, yet each has individual characteristics and will be discussed separately.

Gasconade River--Main Stem--The Gasconade River flows 265 river miles in a northeasterly direction from its headwaters on the north flank of the Ozark Mountains, and drains a watershed of 2,042 square miles. It is extremely sinuous--at one place one can float for 15 miles, and yet be only two overland miles from the put-in point. Water depths vary from one foot in the upper river segment to 30 feet near the river mouth. The distance between the river's high banks averages 165 feet wide in the upper half and 310 feet in the lower half. Average river gradient is 2.6 feet per mile with the highest gradient at 4.1 feet per mile near the Town of Manes.

Above Manes, the valley is narrow and the Gasconade is quite small and shallow (40 feet wide between high banks) and requires wading and boat dragging during the summer. In many areas, water willow and other plants on gravel bars encroach, threatening to choke the river. However, the river persists, twisting narrow passages through the vegetation and emerging into open pools.

In this area the forest has been cleared nearly to the river's edge. Open pastures, and occasionally buildings, can be viewed through the remaining timber strip. Here the river corridor does not exhibit the large bluffs and other natural features which exist downstream.

From Manes to the southern boundary of the Clark National Forest, the river remains extremely shallow and narrow, but with a steeper gradient

which results in a faster flow of water. Public access in this 12-mile stretch is limited to four road crossings. Although bluffs, shoreline timber, and other natural features begin to appear, scenery along this segment is not outstanding.

Downstream from the Clark National Forest boundary and the nearby community of Competition, the river flows 34 miles through the national forest to where it eventually forms the northwest boundary of the forest. Within this segment there are few homes or cottages, only five road crossings, four public access areas (Forest Service), two private boat rentals, and national forest and private lands interspersed throughout the river corridor. Here the river has carved deep, narrow valleys into the bedrock exposing cave systems which were once underground waterways. Where the river cuts into active water passages, springs result, adding clear, cool waters to the rivers.

The beauty of the river becomes apparent in these valleys as it meanders between towering bluffs and through quiet pools and turbulent shoots. Also part of the river scene are forested hills, open gravel bars, and caves located within the bluffs.

Near Hazelgreen and about two miles downstream from where the river leaves the Clark National Forest, the Osage Fork River enters the Gasconade. From this point 68 river miles north to the mouth of the Big Piney River, the Gasconade twists and turns through some of its most scenic portions. Located in this area are the tallest bluffs (200-300 feet) and the sharpest bends in the river--in one area the distance around a river bend is 6.5 miles but only 0.2 miles across land. The meandering nature of the river has formed backwater areas or bayous which provide interesting areas for exploration. Also located here are several islands, the largest approximately 80 acres in size.

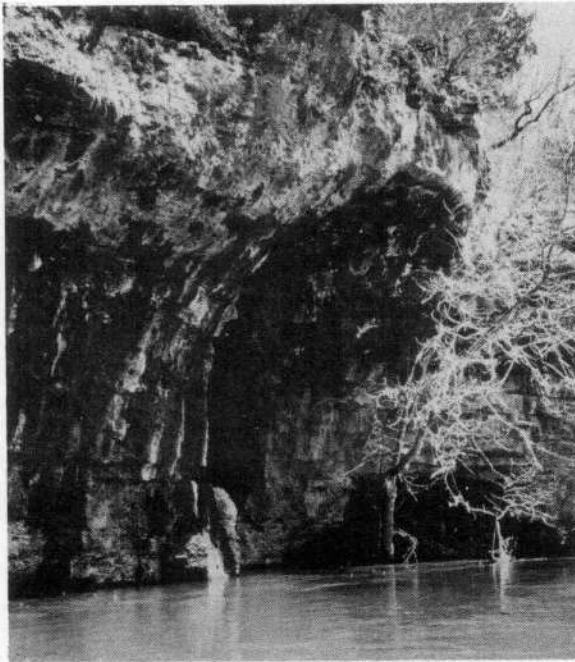
Two areas along this portion--McCann Cave and the Portuguese Point and Arch Cave Complex--exhibit exceptional natural features. McCann Cave is a large and interesting natural feature which would be suitable for public use if appropriate access and interpretative facilities were provided. Portuguese Point is located on one of the highest bluff areas (more than 250 feet high) and among bluffs recognized as the most scenic along the Gasconade River. Five caves are also located within these bluffs.

In this region the character of the river changes considerably. In addition to the Osage Fork, the Gasconade gathers another tributary, Roubidoux Creek, giving it more size and strength.

Although few of the road crossings involve extensive development, the nine highway crossings in this stretch, including Interstate Highway 44, are the most detracting features. Two public access sites have been established by the Missouri Department of Conservation at Hazelgreen and Riddle Bridge.

Interstate Highway 44, Wanesville, and Fort Leonard Wood are located from two to seven miles south of the river in this area. The influence of these developments is shown by an occasional cluster of homes and other buildings around bridge crossings.

The Big Piney River enters the Gasconade two miles north of the community of Devils Elbow. Downstream from the mouth of the Big Piney are located two unique natural areas--Bruce Cave and the Onyx Cave, Saltpeter Cave, Boiling Springs complex.



Bruce Cave is a complex and scenic cave with about two miles of large passages and an underground stream. Perhaps the most cavernous region along the Gasconade River is the cave complex within one mile of Boiling Spring, where no less than 11 caves are located. One of these caves, Onyx Cave, is among the largest and most scenic caves along the Gasconade River. There have been several unsuccessful attempts at commercialization, and it was even considered at one time as a site for a jet propulsion laboratory. Onyx Cave is one of the best sites along the entire Gasconade for interpreting the numerous characteristics of Karst topography and underground drainage that are so prevalent in the basin. Also lo-

cated here is Boiling Spring, probably the largest spring along the Gasconade, which rises with an average discharge of about 45,000,000 gallons a day beneath a high bluff in the edge of the river channel.

From a point five miles below Big Piney to Duncan Creek is located the most heavily developed and congested area along the river. Visible from the river are County Highway D and the St. Louis-San Francisco Railroad which parallel and eventually cross the Gasconade near the mouth of Little Piney Creek. Also viewed from the river are a private boat rental, numerous cabins, and portions of the unincorporated Town of Jerome (population 200). Interstate Highway 44 parallels within a half mile of the river and is partially visible from the Gasconade for approximately one mile. In this area, the river is fronted by closely spaced year-round dwellings, with over 50 summer cottages located along a two-mile stretch.

Several miles below Jerome two private lodges and several cottages have been constructed. The presence of other homes and cottages along this area results from the influence of Interstate Highway 44 and the Town of Rolla (population 13,245) located 11 miles east of the river.

From Duncan Creek downstream to the Missouri River, the Gasconade exhibits different characteristics. Bluffs become less numerous, the river is more pastoral in nature, and the width of the valley increases from one-half mile to eventually one and one-half miles wide at the river mouth. In this 96-mile stretch are located seven Missouri Department of Conservation access points, three major powerline crossings, five highway crossings, one railroad crossing, and two active gravel extraction operations.

In the 54-mile stretch between Duncan and Pointers Creek, scattered cottages and cabins located within one-quarter mile of the river average four cottages per mile. All of these are not visible from the water, however, and are usually found in clusters averaging from three to five per area. Two major powerlines and three highways cross the river in this portion, and located along the river above Pointers Creek in the vicinity of the Rollins Ferry Public Access Site is a small commercial gravel operation.

Large bluffs rising near the river become less numerous in the downstream portion of this segment. Here the valley widens, 300-foot distances prevail between high riverbanks lined with a narrow band of trees, and the river flows through farmed flood plains. Existing man-made developments do not significantly impair the attractive pastoral scene or the excellent recreation experience which this river area offers.

Proceeding downstream from Pointers Creek, cottage and homesite development increases noticeably, especially below Mt. Sterling (population 70) where cabins and homesites are almost continuously viewed in several one- to two-mile stretches. A thin fringe of vegetation bordering the river reveals extensive agricultural activities on broad flood plains. A major powerline and two highways cross the river, and clearly visible is an in-stream commercial sand and gravel dredging operation located near the Fredericksburg Ferry.

Approximately two miles above the mouth a levee parallels the north side of the river. Between the river and the levee, lots have been leased to summer homeowners where approximately 25 cabins are now situated. At the river mouth, the city limits of Gasconade (population 235) extend to the river area, which is congested with private boat docks, a railroad bridge, and a highway bridge crossing.

Big Piney River--With a drainage area of approximately 600 square miles, the Big Piney is the largest tributary of the Gasconade. Although it has an overall length of 90 miles, it is considered floatable for only 79 miles, beginning at a point one mile above the Highway 17 crossing. The average gradient of the Big Piney from Highway 17 to the river mouth is 4.1 feet per mile. River depths range from one foot in the headwaters to 15 feet in the deeper pools of the lower river, and distances between the high banks of the river average 120 feet.



Typical chute on the upper Big Piney.

In many respects, the Big Piney has many of the same characteristics of the upper and middle portions of the Gasconade River. The upper portion of the Big Piney is a small, shallow river winding through a picturesque valley, with open pasture and timber on the adjacent hills. Low water flows are common during the summer, and boating here means wading and dragging the shallows. Bordering the river is a small fringe of timber through which are viewed large acreages converted to crop or pasture. The river flows through the small Town of Cabool (population 1,284) and then through a valley between Cabool and Houston almost entirely devoted to cattle production. Few if any, bluffs or caves exist within this segment.

Downstream from the Highway 17 crossing, the river first begins to unfold its spectacular scenery. Magnificent limestone bluffs rising abruptly from the water's edge become increasingly prominent. Among the many rock bluffs situated along the stretch, none are more uniquely located than Gap Bluff and Bell Bluff. Both share the distinction of occurring on or very near sharp river bends where the river traveler faces the bluffs almost head-on and obtains an excellent view of the rock strata.

Visible from the river and located along many of the bluffs on this portion are cave entrances which provide an air of mystery to the scene. Some of the more significant and interesting caves include Miller Cave, Saltpeter Cave, the Biscuit Bluff Caves Area, and the Buzzard Caves Area. Petroglyphs are associated with Miller Cave which is one of the most impressive archaeological sites in the Gasconade basin.

Several springs in this portion add considerably to the river flow and are extremely attractive. A listing of the more important springs would include the Slabtown, Miller, Boiling, and Prewett Springs. The latter two springs each provide a daily flow of 10,000,000 gallons, with Prewett Springs considered one of the most attractive springs along the river.

In this 52-mile stretch from Highway 17 to the southern boundary of Fort Leonard Wood, the first 16 river miles are located outside the Clark National Forest boundary. The most visible evidence of man's activities are roads which parallel five miles of the river's length. There are



Missouri Dept. of Conservation access site at Dog's Bluff on Big Piney.



*Tall bluffs near
High Log Eddy,
Big Piney River,
at Mile 49.*

also nine road crossings and one underground pipe line. Seven public access sites have been established--five of these are administered by the Missouri Department of Conservation and the remaining two by the U. S. Forest Service.

Most of the developments visible from the river are cottages or are related to farming operations. Open cattle pastures are generally well screened by thick fringes of streamside vegetation, and in only a few areas has the vegetation been cleared to the water's edge. There are several islands, the largest encompassing approximately 60 acres and the smallest being one to two acres in size.

Evidence of man's activities becomes quite obvious when the river enters Fort Leonard Wood. Encountered first are day use recreation areas for Fort Leonard Wood personnel, which include two picnic grounds, a swimming pool, golf courses, and an access road which parallels the river's edge on the east side for one and a half miles.

Farther downstream the river has been impounded in two places. The first dam, a 10-foot structure, is constructed of concrete rubble and was built to service a water supply intake for the Fort. Canoes and boats must be walked through the rubble dam due to steep riverbanks which prohibit portaging.

The second dam, also 10 feet high, was built to provide a greater span of water for training Army personnel in Pontoon bridge construction. Boaters must portage around this dam in order to proceed downstream. Both impoundments have replaced the natural river flow with slow moving water in deep, slack pools.

Two bridges, many old buildings, and several houses are encountered before Spring Creek, the Big Piney's largest tributary, enters the river. In this area the Big Piney is bordered by a road for one-half mile. A seven-mile stretch above Dry Creek is relatively attractive and undeveloped.

The most obvious and disruptive developments on the lower river begin north of Fort Leonard Wood at the mouth of Dry Creek and continue to the Gasconade River. From Dry Creek a railroad parallels the Big Piney for two miles and then crosses the river. Numerous residences, some on stilts in the flood plain, are frequently in poor condition. Roads almost continuously parallel the river along this stretch. Indiscriminate garbage dumps are also observed, as are two recreation facilities which rent boats and provide other services. The small community of Devils Elbow is visible from the river, line and cable crossings are numerous, and the Interstate Highway 44 and Old Highway 66 cross the river.

Flow Characteristics

The amount of water which flows throughout the year is important when considering the recreation potential of the Gasconade and Big Piney Rivers.

Rate of flow is particularly important during summer months when recreation is at a yearly peak and water volume is at a minimum. An analysis of flow statistics for the study streams is necessary to determine the variability of flow, historical monthly averages and extremes of high and low flows, and minimum flows considered adequate for good floatability.

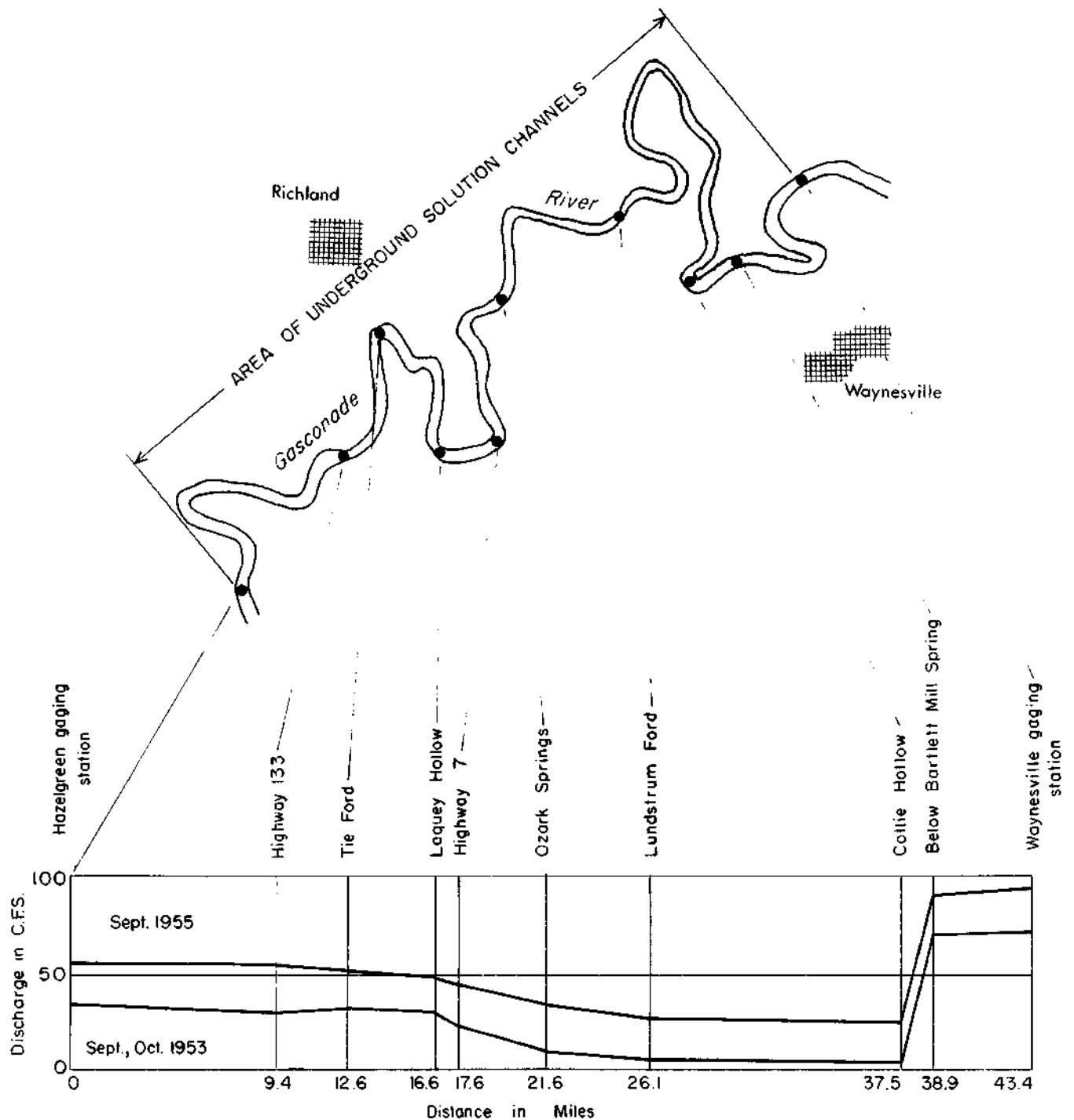
Gaging stations used in this analysis were located on the Gasconade near Hazelgreen, Waynesville, and at Jerome and on the Big Piney near the community of Big Piney. At least 43 years of record were available for each station.

The Gasconade River and its tributaries have relatively large base flows characteristic of most Ozark streams. This is primarily due to the cavernous type geology of the region and the many springs which help sustain flows during dry periods. However, in the reach between the gage near Hazelgreen and the gage at Waynesville the Gasconade is a "sinking river." During periods of low flow, the volume of water begins to diminish below the Hazelgreen gage and continues to diminish until the low point is reached at the vicinity of Collie Hollow. The river flow then shows a dramatic increase at a point just below Bartlett Mill. This phenomenon is illustrated on page 111 which shows the conditions of September 1953. This condition is not readily observed during periods of normal or above normal flows and is therefore significant only during periods of low flow.

There are distinctive seasonal variations in average flow within the basin--the periods of highest flow usually occur in the spring and early summer and periods of lowest flow occur in late summer and early fall. Mean monthly flows for April and May are generally from four to seven times the magnitude of those occurring in August and September. Most floods occur during the months of February through June, although floods can and do occur at any time during the year. Maximum and minimum mean monthly flows of record, the mean monthly flow which can be expected to be equaled or exceeded 50 percent of the time, and the average flow for each station are graphically shown on pages 114 through 117.

Canoes and other recreational type watercraft with similar shallow drafts are most suitable for use on the shallow upper portions of the Gasconade and Big Piney Rivers. On the middle portion of the Gasconade, both canoes and flat-bottomed "jon" boats are suitable but, due to the faster moving current, canoes are preferred. From Jerome to the mouth of the Gasconade River, large boats with outboard motors may be used throughout the year.

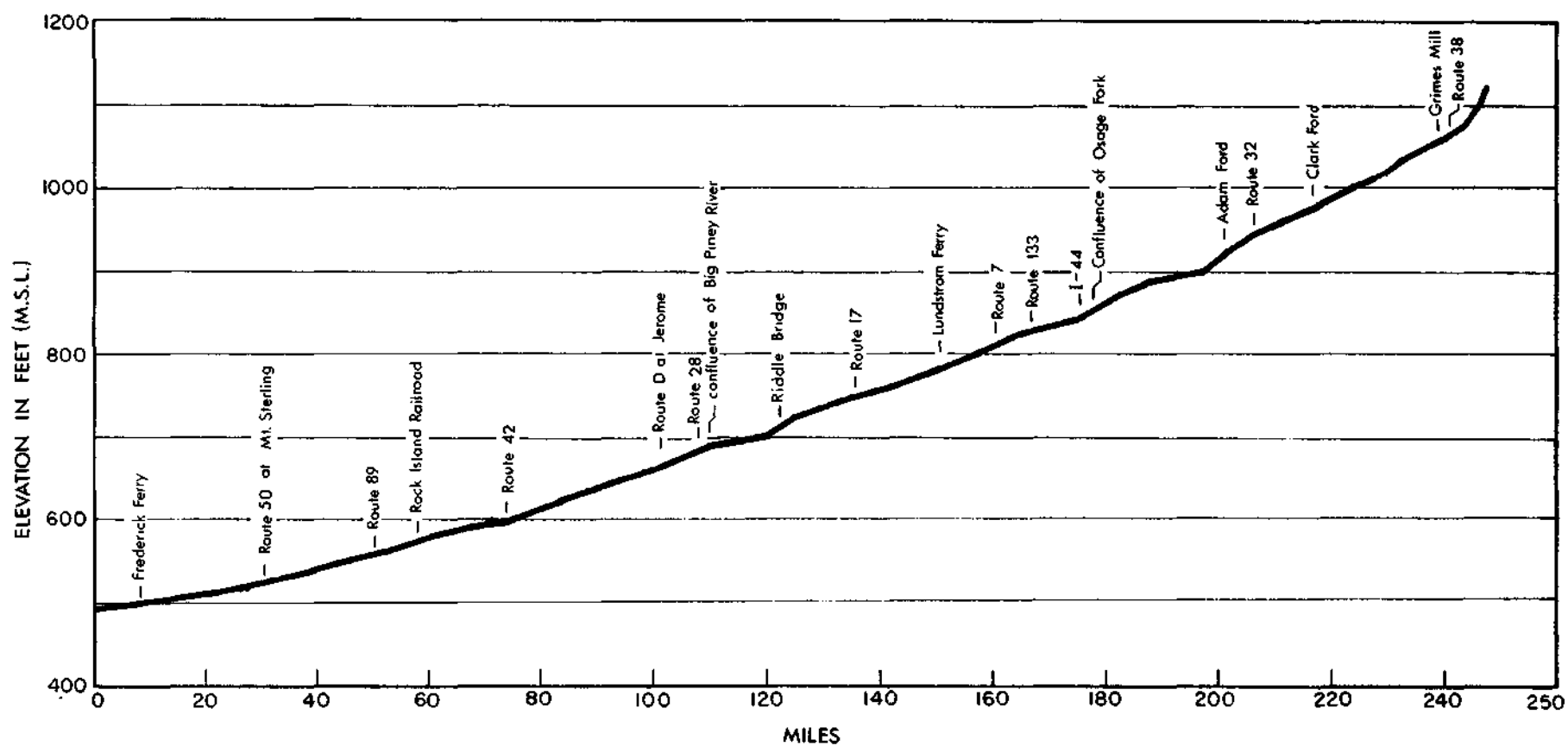
In the analysis of their suitability for floating, the rivers were divided into reaches, and the minimum cubic feet per second (cfs) flow



The Ozark Plateaus generally have abundant surface water; but, because solution phenomena such as springs, caves, and sinks are so common in the area, many streams follow courses which are partly surface and partly sub-surface, making it very difficult to predict areal low-flow patterns. For example, a series of discharge measurements during base flow periods in 1953 and 1955 showed that large water losses occur in a reach of the Gasconade River which is known to be underlain by underground solution channels.

Source: "Low-Flow Characteristics of Missouri Streams," by John Skelton, Missouri Geological Survey and Water Resources.

UNDERGROUND SOLUTION CHANNELS GASCONADE RIVER



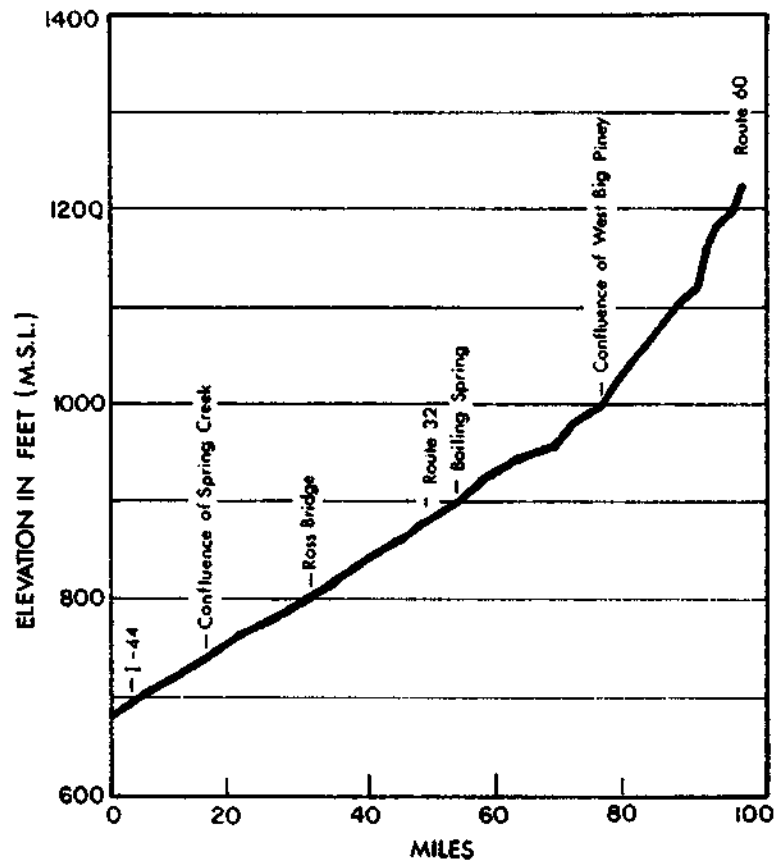
Note: Mile 0 is the point where the Gasconade River enters the Missouri River.

Source: Missouri Water Resources Board

GASCONADE RIVER PROFILE

GASCONADE

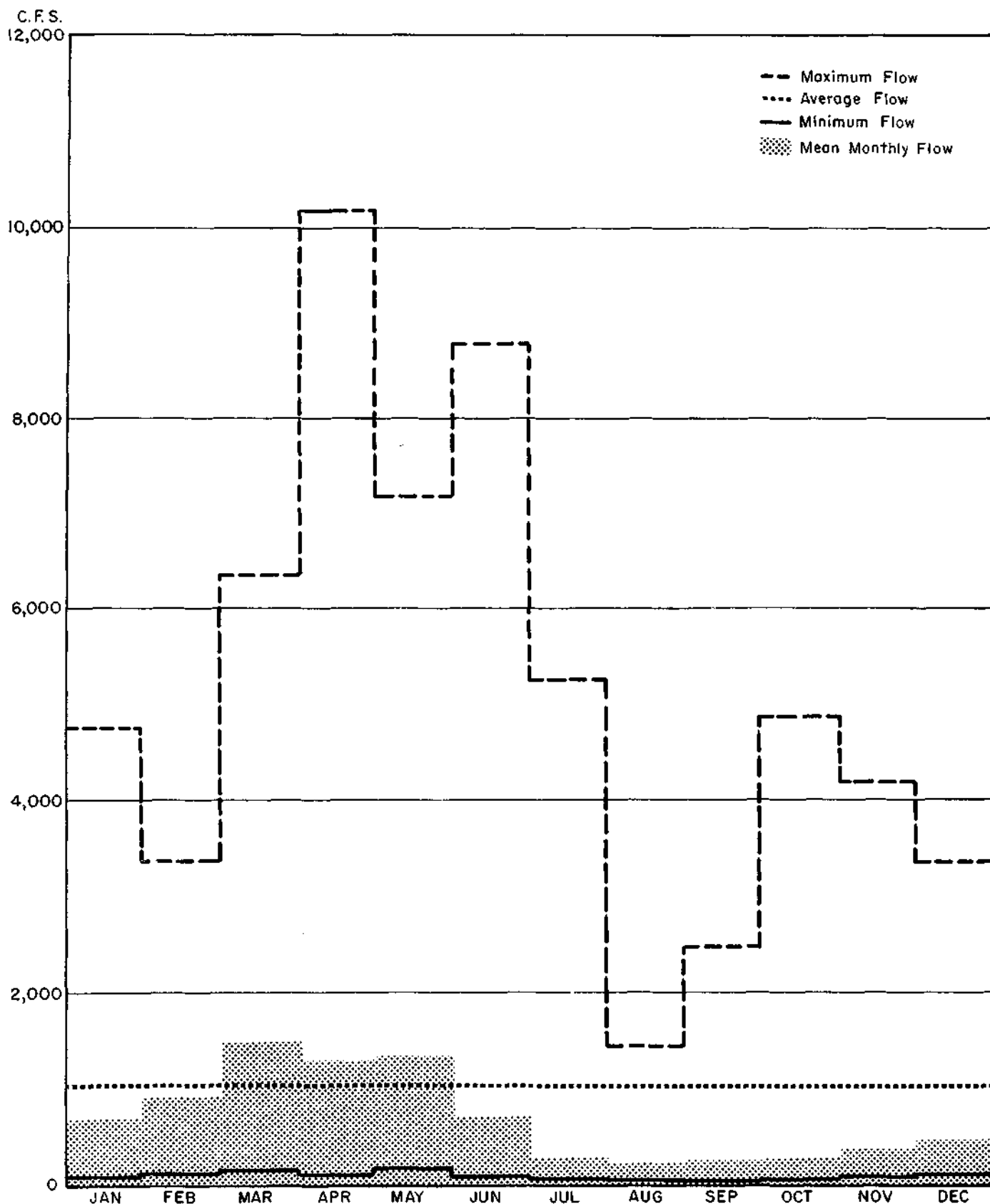
WILD AND SCENIC RIVER STUDY
MISSOURI



Note: Mile 0 is the point where the Big Piney River enters the Gasconade River.

Source: Missouri Water Resources Board

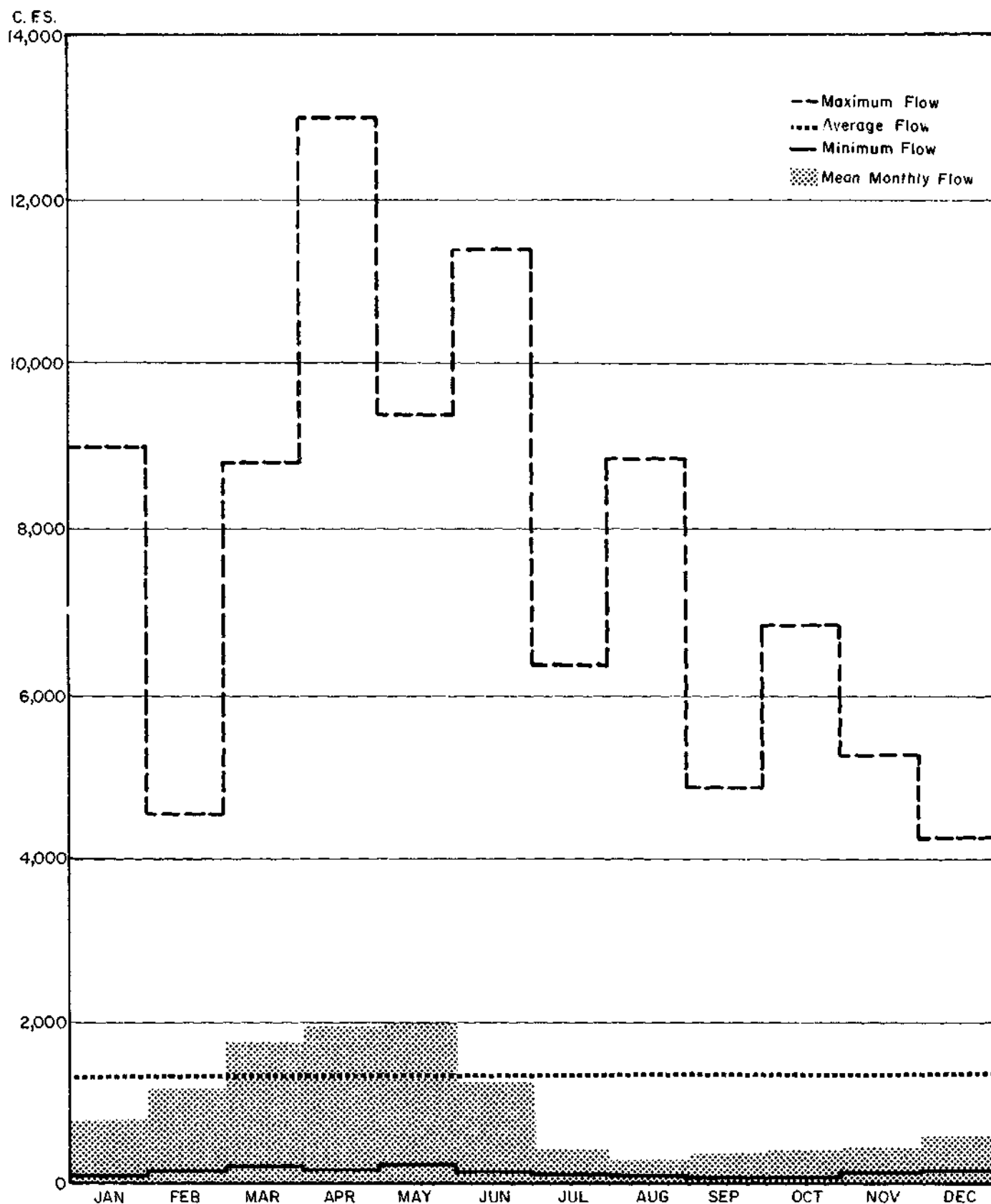
BIG PINEY RIVER PROFILE
GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI



Note: Mean monthly flow expected to be equaled or exceeded 50 percent of the time.

Source: Missouri Water Resources Board

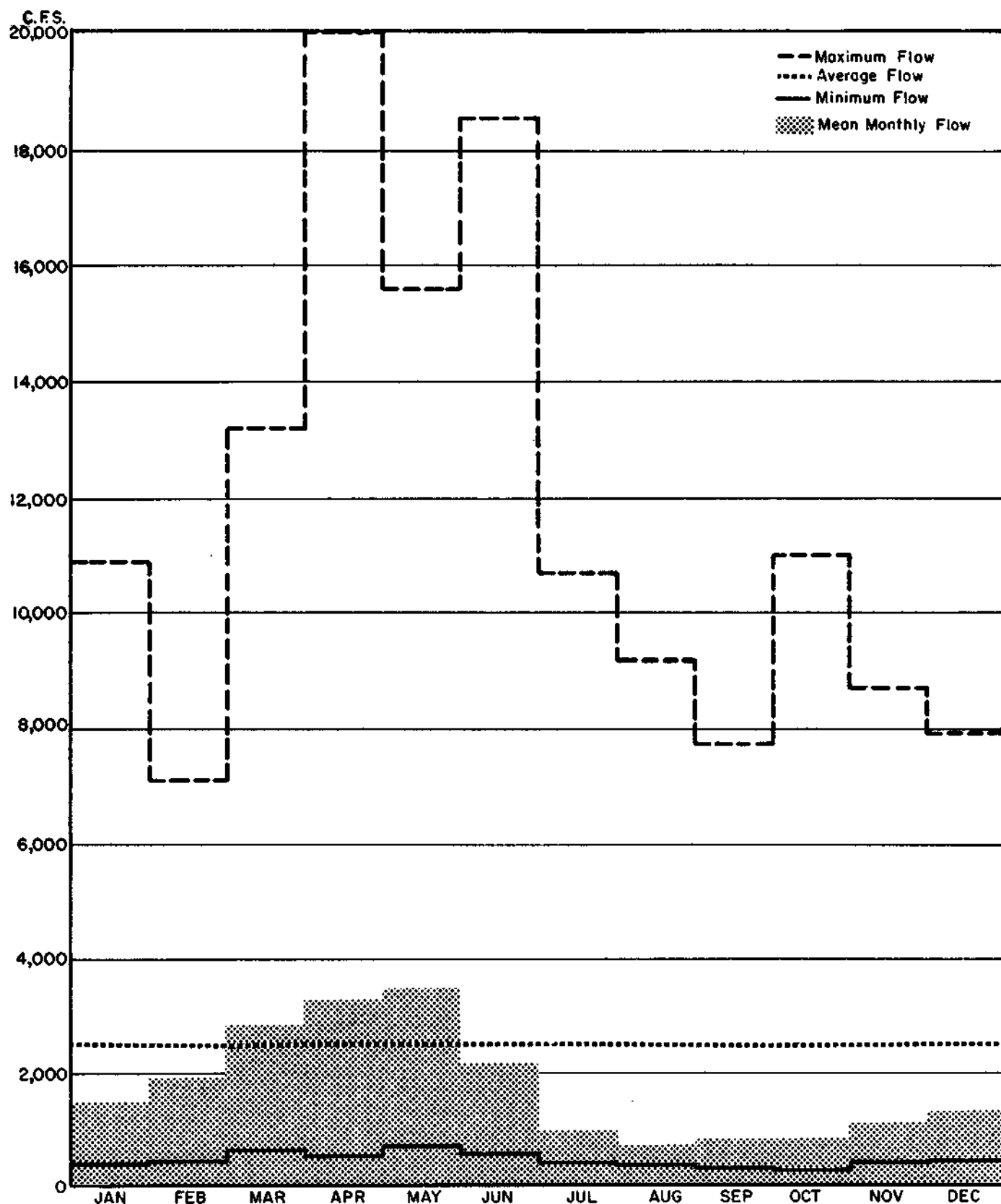
GASCONADE RIVER
NEAR HAZELGREEN
MONTHLY FLOW
1929 - 1972 Data



Note: Mean monthly flow expected to be equaled or exceeded 50 percent of the time.

Source: Missouri Water Resources Board

GASCONADE RIVER
NEAR WAYNESVILLE
MONTHLY FLOW
1929 - 1972 Data

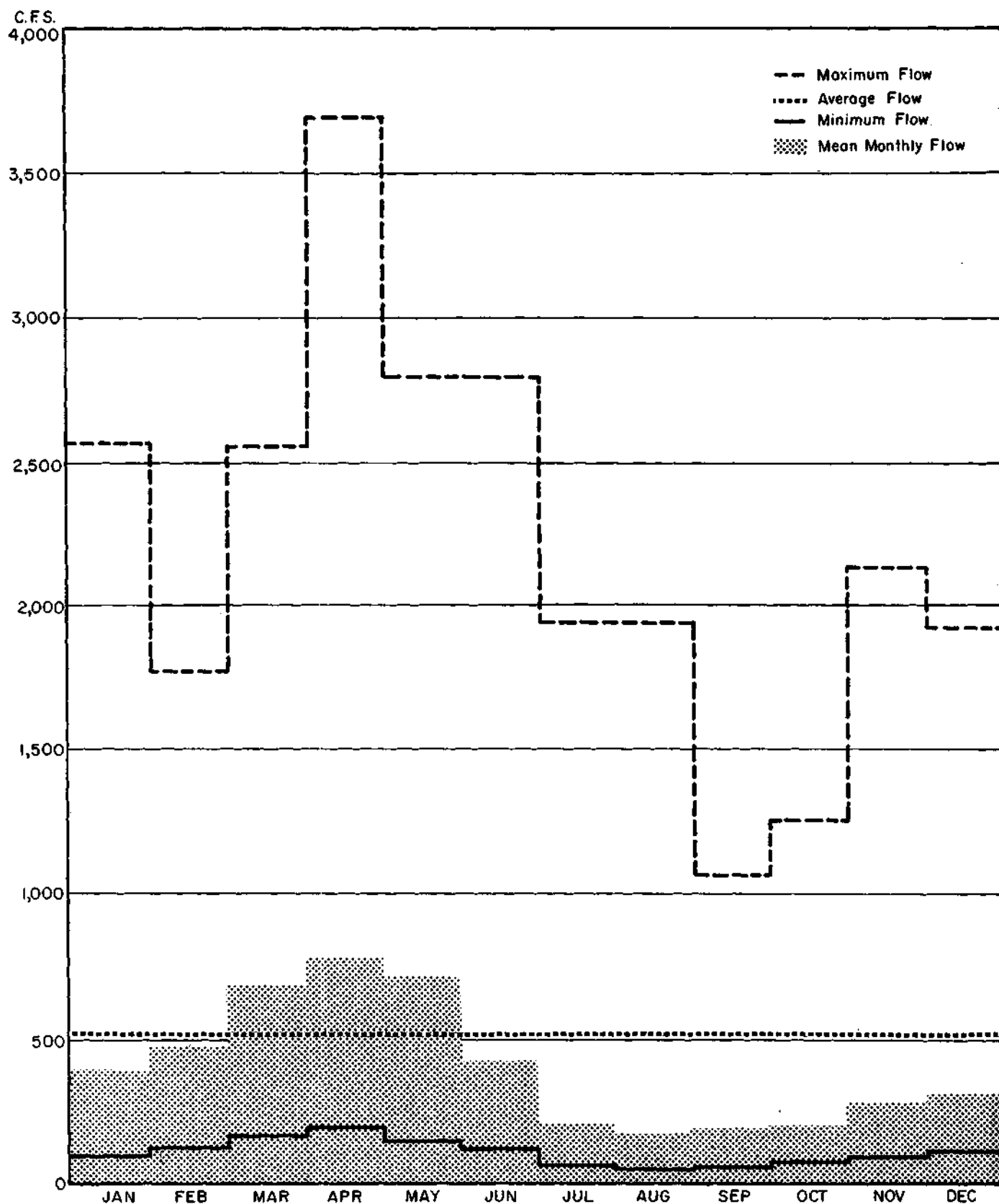


Note: Mean monthly flow expected to be equaled or exceeded 50 percent of the time.

Source: Missouri Water Resources Board

GASCONADE RIVER
AT JEROME

MONTHLY FLOW
1929 - 1972 Data



Note: Mean monthly flow expected to be equaled or exceeded 50 percent of the time.

Source: Missouri Water Resources Board

BIG PINEY RIVER
NEAR BIG PINEY

MONTHLY FLOW
1929 - 1972 Data



Debris left above the river and eroded banks reflect past high water levels.

High volume flow in the spring on the Big Piney.



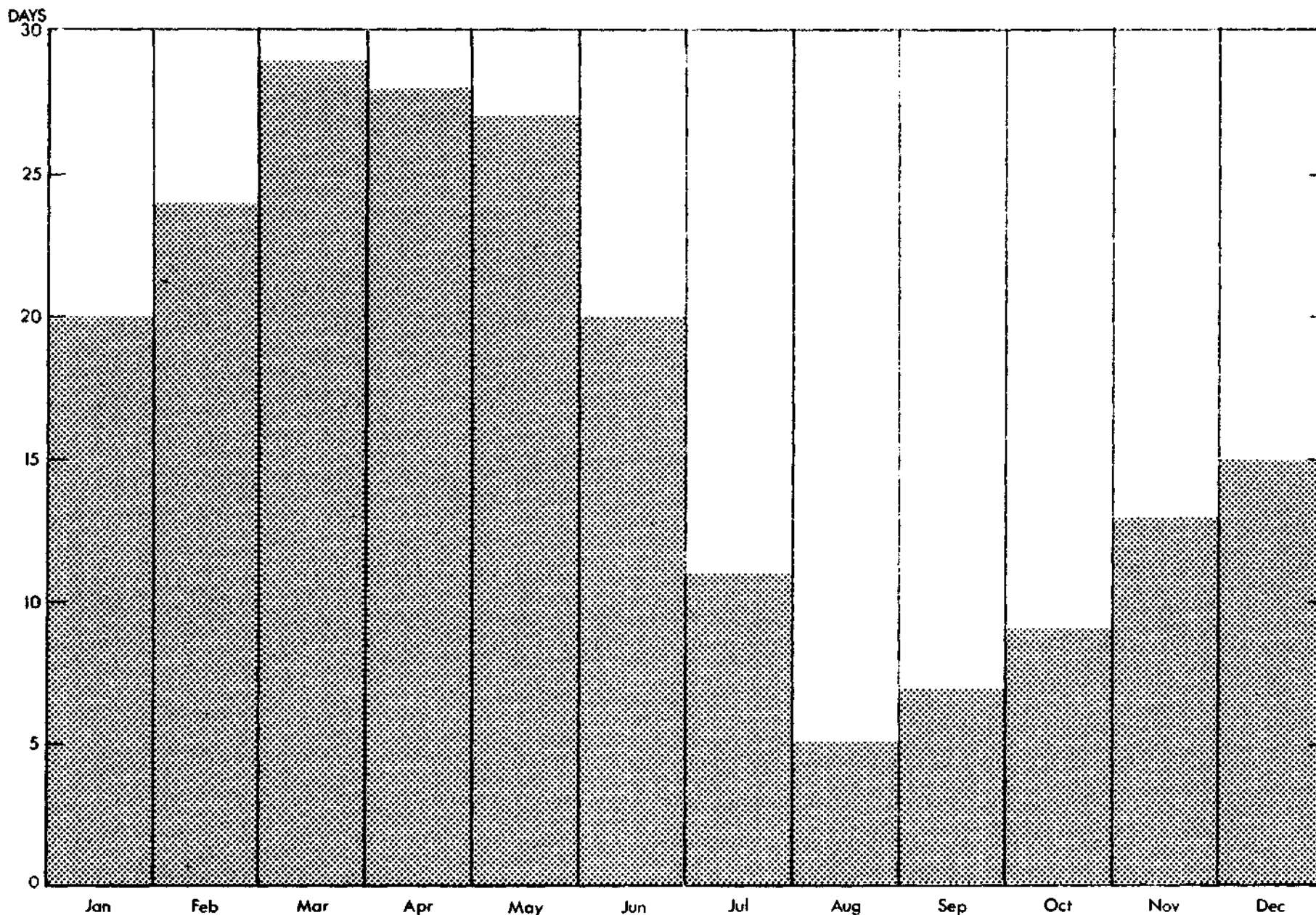
required for good floating conditions was estimated based on readings at the nearest stream gage. This was done by comparing field observations made by the study team with flows at the appropriate gaging stations. In considering the floatability of any given reach of river, it must be remembered that throughout most of the Gasconade system there are long deep water pools separated by relatively short shoals. The pools, even in the most extreme drought conditions, are nearly always floatable. The minimum flow required for good floating conditions was considered as the minimum flow at which canoes or jon boats could negotiate the river with minimal dragging over shallow stretches.

It is difficult to determine what constitutes ideal floating conditions. Factors such as the draft of a watercraft under various loads, stream velocity, the nature of the streambed, and the tolerance of the recreationist for dragging, towing, or portaging must be considered. Although difficult to analyze, these factors were used to determine the minimum flow in cfs needed for satisfactory float conditions on various river stretches. The probability of encountering these minimum flows or better and thus favorable floating conditions during each month for specific river segments are graphically illustrated on pages 120 through 124.

Conditions in the Gasconade River system are seldom particularly hazardous to floaters. Due to relatively steep valley slopes and resulting rapid runoff during rainfall of high intensity, however, hazardous conditions can develop within a matter of a few hours. Increases in stage of from five to eight feet in one day have been recorded.

A deep, quiet pool on the Gasconade.

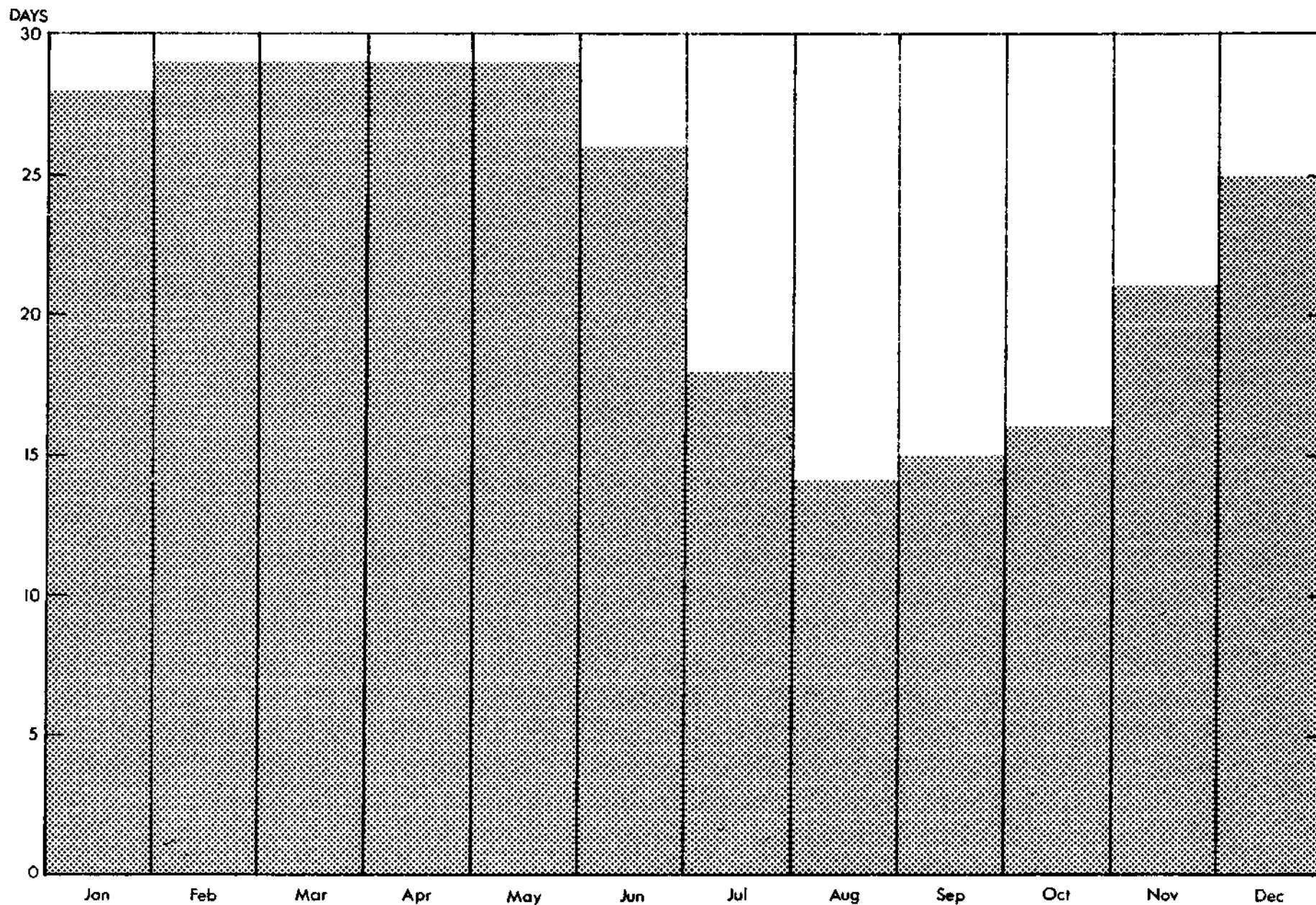





■ DAYS OF GOOD CANOEING
(BASED UPON A FLOW OF 450 cfs AT HAZELGREEN)

Source: Missouri Water Resources Board

GASCONADE RIVER
WATER LEVELS FOR CANOEING
ABOVE HIGHWAY 32
1929 - 1972 Data

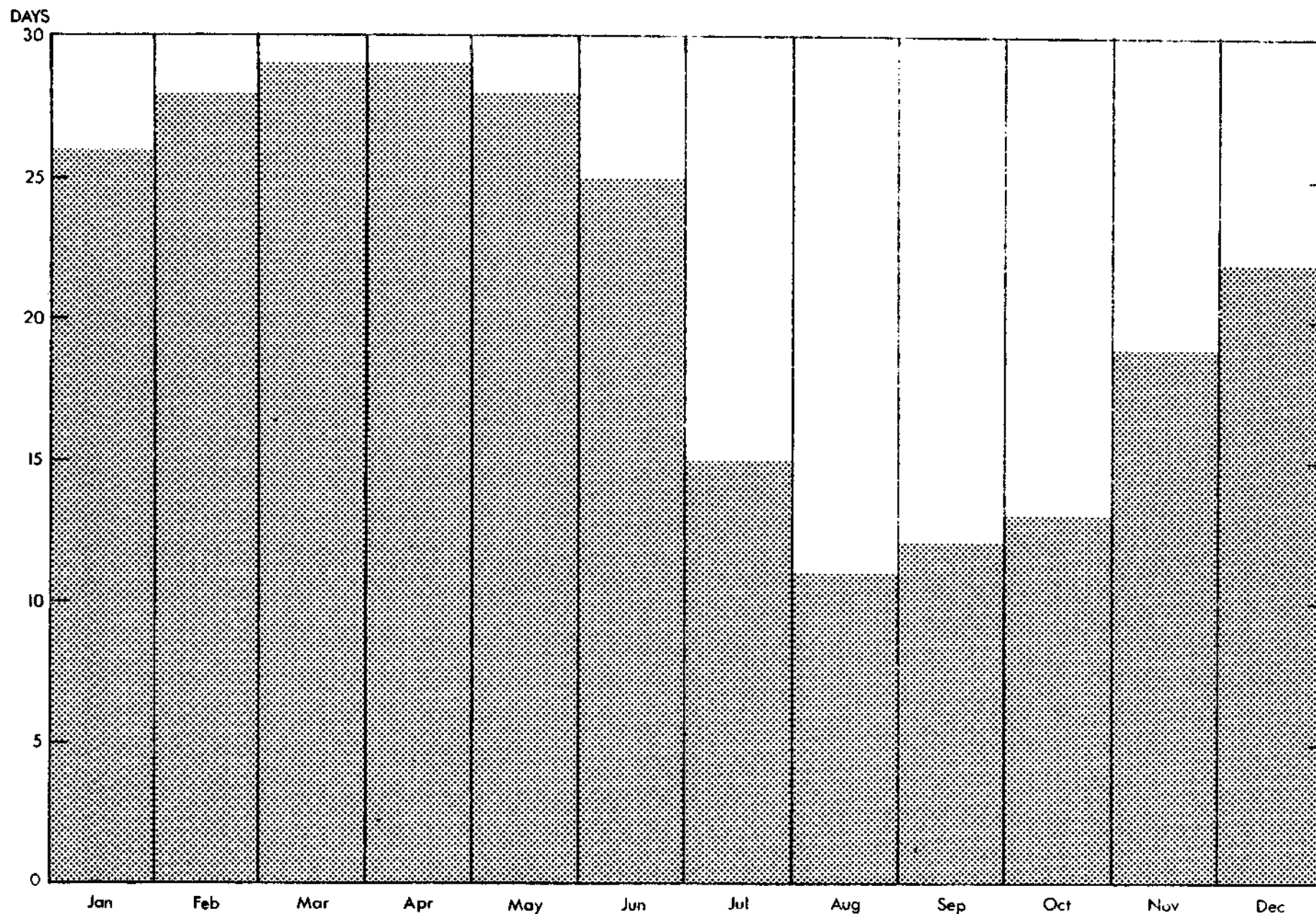



 DAYS OF GOOD CANOEING
(BASED UPON A FLOW OF 215 cfs AT HAZELGREEN)

GASCONADE RIVER
WATER LEVELS FOR CANOEING
CONFLUENCE WITH OSAGE FORK TO OZARK SPRINGS

1929 - 1972 Data

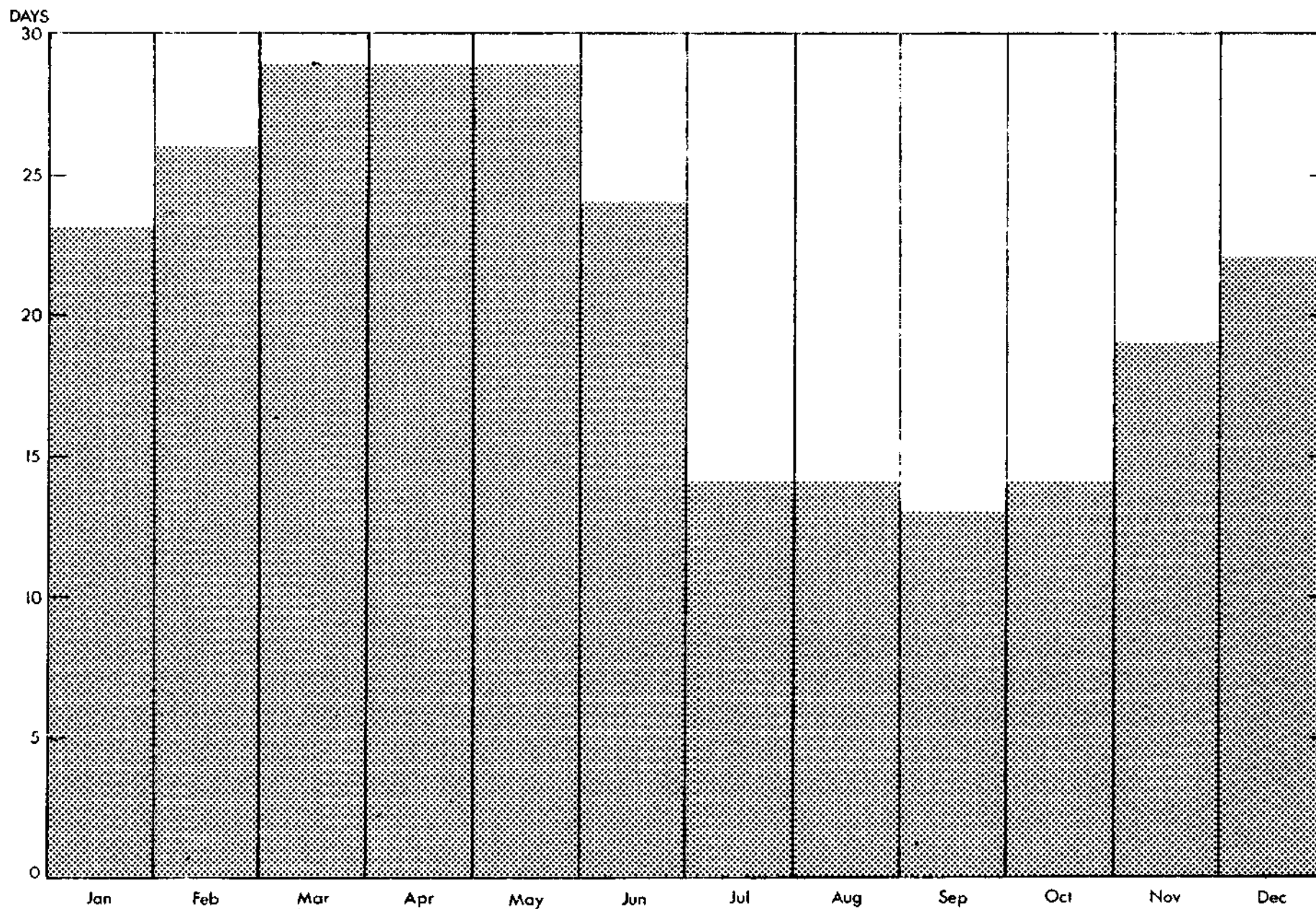
Source: Missouri Water Resources Board



 DAYS OF GOOD CANOEING
(BASED UPON A FLOW OF 280 cfs AT HAZELGREEN)

Source: Missouri Water Resources Board

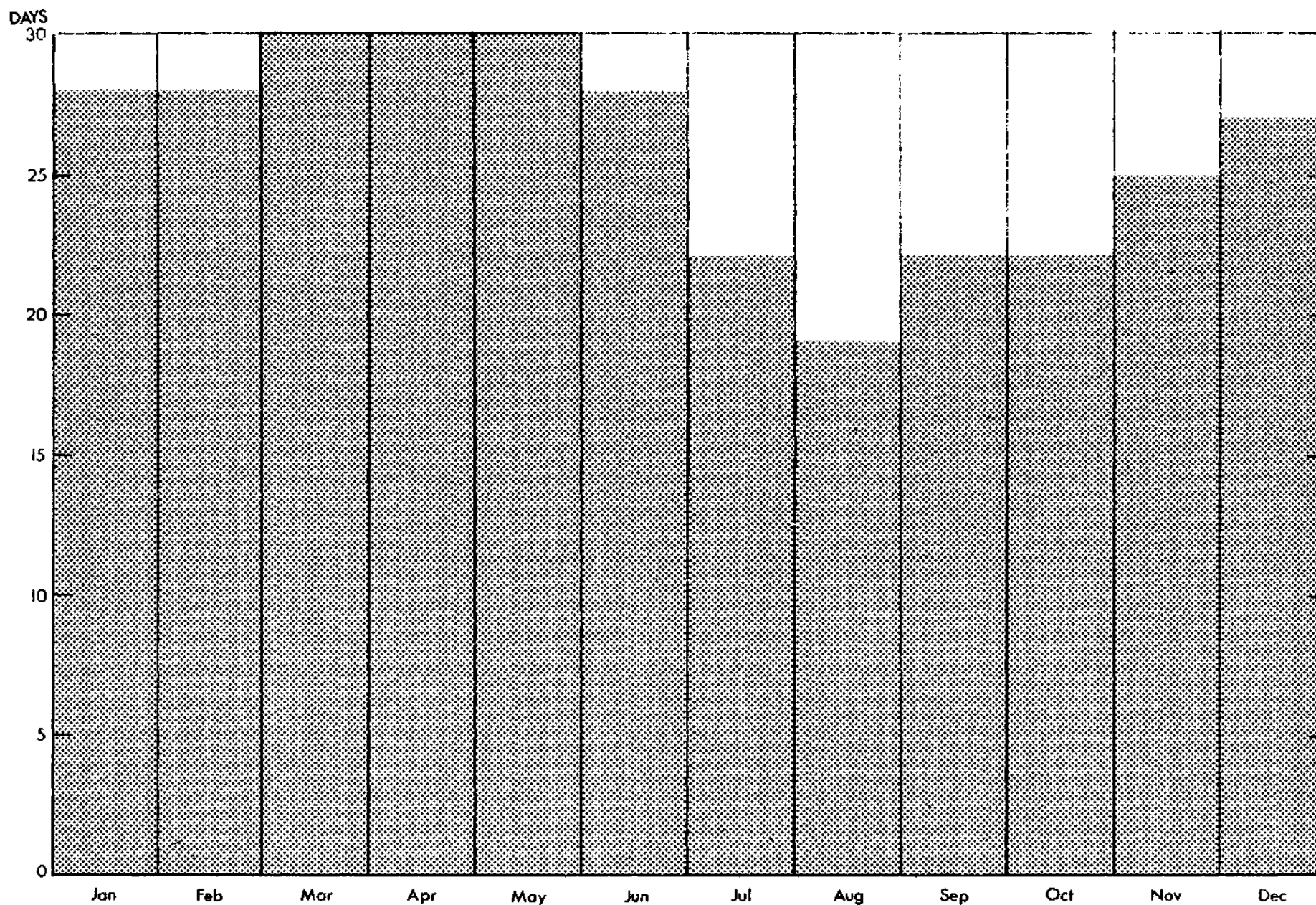
GASCONADE RIVER
WATER LEVELS FOR CANOEING
HIGHWAY 32 TO CONFLUENCE WITH OSAGE FORK
1929 - 1972 Data




■ DAYS OF GOOD CANOEING
(BASED UPON A FLOW OF 210 cfs AT BIG PINEY)

BIG PINEY RIVER
WATER LEVELS FOR CANOEING
BAPTIST CAMP TO MASON'S BRIDGE
1929 - 1972 Data

Source: Missouri Water Resources Board



 DAYS OF GOOD CANOEING
(BASED UPON A FLOW OF 115 cfs AT BIG PINEY)

Source: Missouri Water Resources Board

BIG PINEY RIVER
WATER LEVELS FOR CANOEING
MASON'S BRIDGE TO MOUTH
1929 - 1972 Data

Water Quality

The present water quality of the surface waters of the Gasconade River Basin is generally good, although there are areas where problems occur.

Numerous natural springs scattered throughout the basin and high ground-water inflow maintain a well-sustained base flow in the Gasconade and Big Piney Rivers that is moderately mineralized and fairly uniform in chemical characteristics.

The water in the upper Gasconade River is of high quality and considered to be in compliance with the adopted State Water Quality Standards for the stream. The water in most of the Big Piney River is considered to be good quality, with dissolved oxygen concentrations in excess of the five milligrams per liter specified in these standards. The lower portion of the Big Piney River and the Gasconade River downstream from the mouth of the Big Piney are enriched due to drainage from soluble formations, effluents from municipal and industrial waste sources including Fort Leonard Wood, and runoff from forested and agricultural lands. The aesthetic quality is also affected in the Upper Big Piney River by dense mats of algae growing on rocks and in the Lower Big Piney and the Gasconade Rivers by an abundant growth of aquatic vegetation which interferes with the recreational uses of the streams.

Municipal and industrial wastes, soil erosion, and gravel dredging are considered to be the greatest threat to water quality within the basin. Nine communities and Fort Leonard Wood have secondary waste treatment facilities which discharge to streams in the basin. The Fort is the largest contributor of domestic wastewater within the basin. Its waste is presently treated in a trickling filter plant with chlorination of the final effluent. Discharge is to Dry Creek which flows into the Big Piney River six miles upstream from its mouth.

Other sources of municipal waste on the Big Piney River are Licking, Houston, and Cabool. Extreme nuisance conditions have been encountered below the Community of Cabool which is located near the headwaters. This is partially due to a large industrial flow contributed by Mid-American Dairymen's operation. In accordance with P.L. 92-500, National Pollution Discharge Elimination System (NPDES) permits have been issued to dischargers to the Big Piney River. Cabool has been required to upgrade its treatment facility by adding nitrification. Houston and Licking have been required to meet secondary treatment effluent limitations. Fort Leonard Wood has been required to upgrade its treatment to include phosphorus removal.

The communities of Mansfield, Hartville, and Mountain Grove, which discharge to tributaries of the upper Gasconade River, have been issued NPDES permits for secondary effluent limitations. These communities are presently served by lagoons which may require upgrading in order to meet secondary effluent limitations.

The community of Waynesville presently discharges trickling filter effluent to Roubidoux Creek. This facility is nearing design capacity, and plans are currently being developed to construct a new wastewater treatment plant.

The nearby town of St. Robert has no municipal treatment facility at present but has made application to the Environmental Protection Agency (EPA) for a grant to build an interim facility. It is anticipated these two will be regionalized into one treatment facility in the future.

Agricultural patterns and uses in the basin have undergone considerable change in recent years. In the past, the flood plains were used largely for cultivated agriculture. Today a large percentage of this cropland as well as a large amount of forested area have been converted to grassland with production maintained by application of commercial fertilizer.. This increase in grassland has resulted in an increased number of cattle in the basin. Increased cattle numbers and fertilization will no doubt contribute increased nutrients to rivers in the basin, but the effect of agricultural runoff on water quality in the basin is difficult to quantify and define. Also, the amounts, types, and impacts of agricultural pesticides and herbicides on water quality are difficult to quantify and define. Use of herbicides and pesticides on national forest land must comply with the Federal Environmental Pesticide Control Act of 1972 (P.L. 92-516).

Enforceable State Water Quality Standards were adopted by Missouri in 1968 and revised on January 12, 1971, and again on August 11, 1971, and May 25, 1973. As a minimum, the standards require the Gasconade Basin streams be maintained. . .

- a. Free from substances attributable to municipal, industrial, mining, or other discharges or agricultural practices that will cause the formation of putrescent or otherwise objectionable sludge deposits.
- b. Free from floating debris, oil, scum and other floating materials attributable to municipal, industrial, mining or other discharges or agricultural practices in sufficient amounts to be unsightly or deleterious.
- c. Free from materials attributable to municipal, industrial, mining or other discharges or agricultural practices producing color, odor or other conditions in such degree as to create a nuisance.
- d. Free from substances attributable to municipal, industrial, mining or other discharges or agricultural practices that will have a harmful effect on human, animal, or aquatic life.

In order to ensure the waters are safe for recreation activities involving whole body water contact, the quality standards require that. . .

The fecal coliform count shall not exceed a geometric mean of 200/100 ml (either NPM or NF count) nor shall more than 10 percent of total samples during any 30-day period exceed 400/100 ml. These criteria will not be applicable when the stream or lake is affected by storm water runoff.

The adopted and revised State Water Quality Standards for the Gasconade River and its tributaries protect the rivers and creeks for the designated use of whole body water contact recreation, propagation and maintenance of warm-water sport fishery, public water supply, livestock and wildlife watering, and aesthetics.

Roubidoux, Spring Mill, and Little Piney Creeks have limited reaches that are protected for propagation and maintenance of a trout fishery. Thus, the high water quality standards required for portions of these tributary streams enhance the water quality of the Gasconade and Big Piney Rivers.

To further assist in abatement of pollution, the Clean Water Commission adopted certain effluent guidelines in 1971 and revised them in 1974. These guidelines are intended to be used as a basis for the initial planning of waste treatment needs. In developing the Effluent Guidelines, maximum values were set for each specific parameter which, if not exceeded in the effluent, should not cause a violation of the State Water Quality Standards.

The Missouri Clean Water Commission adopted the following no-discharge policy as part of its Water Quality Standards revision of May 25, 1973.

As a result of the hearing on the Big Piney River held in Houston, Missouri, on June 23, 1971, the Clean Water Commission (then Missouri Water Pollution Board) adopted a policy of no-discharge of municipal and/or industrial effluents, either treated or untreated, into the Big Piney River and its tributaries.

The public hearing, as well as personal observation of the Big Piney by the Board members, convinced the Board that the Big Piney is a highly valued recreational stream whose water quality is impaired by the discharge of treated wastewater.

By refusing to allow discharges of all wastewater, the Commission hopes to regain the good water quality so long

associated with the Big Piney and to diminish the overgrowth of aquatic vegetation which interferes with the uses of the River and its tributaries--namely, fishing, boating and canoeing, swimming, and aesthetic value. The pleasure this River and its tributaries can bring to the citizens of Missouri is a value not completely measurable in dollars and cents. This State needs the beautiful Ozark streams, including the Big Piney, in an unpolluted condition.

The removal of effluents from the Big Piney River and its tributaries shall be accomplished with all deliberate speed and in no case later than December 31, 1973.

EPA has approved the Missouri Water Quality Standards except for this no-discharge policy on the Big Piney River. The no-discharge policy was submitted by Missouri as a means of preserving this Ozark resource for future generations. The alternative suggested by the State is to spray irrigate treated wastes within the basin.

The EPA region's position is that disposal of wastes by irrigation in this basin is a costly and ineffective method of protecting receiving water quality, since the quality of the Big Piney River and tributaries can be fully protected by using conventional waste treatment with adequate treatment reliability and discharging the treated wastes to the receiving streams.

The EPA believes that spray irrigation will not meet a "no-discharge" criterion. Because of the geology of the basin, return flows would contaminate the groundwater and eventually return to the stream. The Missouri Geological Survey terms this area a "super aquifer" with extensive and deeply penetrating fracture systems and ubiquitous solution features - essentially an open structure. There are an estimated 600,000 private wells in this region, none utilizing treatment. Under spray irrigation procedures, water applied in excess of the consumptive use of the plants would either percolate through porous soil cover and reach groundwater directly, or would run off on impervious soil and travel horizontally before entering a fracture. Either situation would result in the contamination of groundwater which would most likely find its way back to surface streams.

The Missouri Clean Water Commission (MCWC) has certified the NPDES permits for Licking, Cabool, and Houston which will allow them to discharge treated effluents until September 1, 1977. The State recognized that due to the critical availability of Federal funds the goals of the MCWC for no discharge would not be realized prior to September 1977. The State encourages further studies and development of disposal techniques in order that the no-discharge policy can be achieved at a later date.

Air Quality

The eight major counties included in the Gasconade River drainage basin are rather sparsely populated and, hence, there are few major sources of air pollution. Most of the industry in the area is related to forest products--principally lumber and charcoal production. These industries may be classified as minor sources of air pollution and usually affect only the immediate area in which they are located.

The Missouri Air Conservation Commission has air pollution control regulations governing open burning, incinerators, the emission of visible air contaminants, and the emission of odors, as well as regulations governing emissions from industrial processes. The emissions from charcoal kilns may, at times, be considered unpleasant to some people. However, odor and visible air contaminant regulations do not, at this time, apply to charcoal kilns.

Solid Waste Disposal

Comprehensive solid waste management legislation was recently introduced and passed in the second regular session of the 76th General Assembly of Missouri. The legislation, which established the Division of Health as the administering agency for solid waste management, requires solid waste planning by cities and counties, and provides for regulation of all solid waste disposal facilities. By June 30, 1974, all counties are to have submitted solid waste management plans for review by the Division of Health.

The new legislation will replace existing solid waste disposal practices in the basin which provide little protection to the waters of the Gasconade and Big Piney Rivers. Twenty dumps and one sanitary landfill are located in the basin. Several of the small dumps are situated in sink holes where the potential exists for contamination of ground and surface waters. Contamination of the Gasconade River from this type of dump facility has been documented. Because solid waste is not covered daily at the 20 dumps, the potential exists at most of these sites for surface runoff to carry contamination to either river. The approximate locations of existing public and private solid waste disposal sites are illustrated on page

Since September 18, 1973, the Missouri Air Conservation Commission Regulation S-III, "Open Burning Restrictions," prohibits open burning of refuse at all solid waste disposal areas. Open burning of trade waste by any business or industry is also prohibited.

Littering is prohibited by State law, but effective enforcement of a litter law in rural areas is very difficult. Enforcement is especially difficult at river road crossings or similar areas which are indiscriminately used as public access to the rivers and at public use areas located close to major travel routes.

The eight major counties included in the Gasconade River drainage basin are rather sparsely populated and, hence, there are few major sources of pollution in the area as related to urban and industrial production. These industries may be located in the area and nearby effect only the immediate area in which they are located.

The Missouri Air Conservation Commission has air pollution control regulations governing manufacturing, construction, and the emission of vehicles, as well as regulations, site constraints, and the emission of noise, as well as regulations governing stationary and industrial processes. The regulations from stationary sources may, however, be considered applicable to some people. However, odor and vibration constraints regulations may, at this time, apply to certain areas.

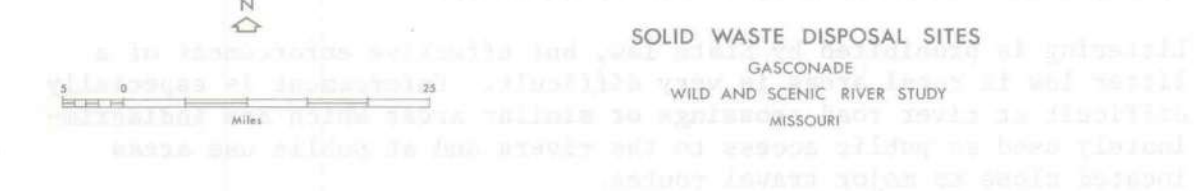
Solid Waste Disposal

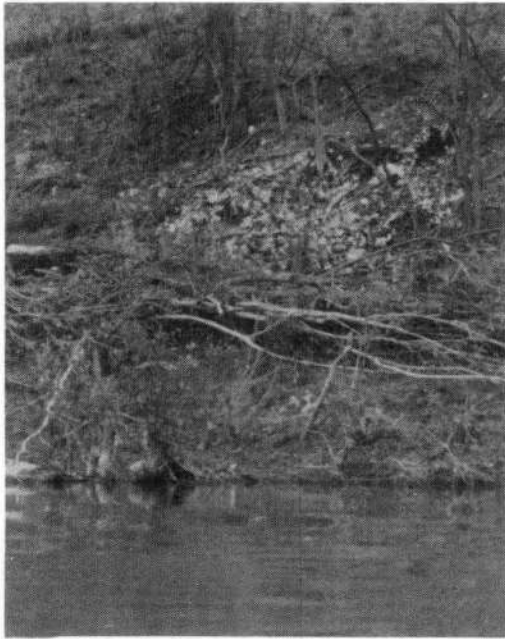
The regulation, The regulation, as the administering agency for solid waste planning by cities and counties, and by the regulation of all solid waste disposal facilities. By July 10, 1974 all counties are to have submitted solid waste management plans for review by the Division of Health.

The new regulation will require existing solid waste disposal practices in the basin which are in violation of the state of the law - county and city laws. Twenty days and one hundred days are allowed in the basin. Several of the solid waste disposal sites are located in the basin. The regulation of the Gasconade River from this type of dump waste has been the primary concern. Because solid waste is not covered daily at the 10 dumps, the regulation exists as most of these dumps are located in the basin. The regulation exists in other towns. The regulation exists of existing solid waste disposal sites and the regulation of existing solid waste disposal sites and the regulation of existing solid waste disposal sites.

Some September 18, 1974, the Missouri Department of Health and Senior Services, Division of Health, has been authorized to regulate the disposal of all solid waste disposal areas. The regulation of solid waste disposal areas is also regulated.

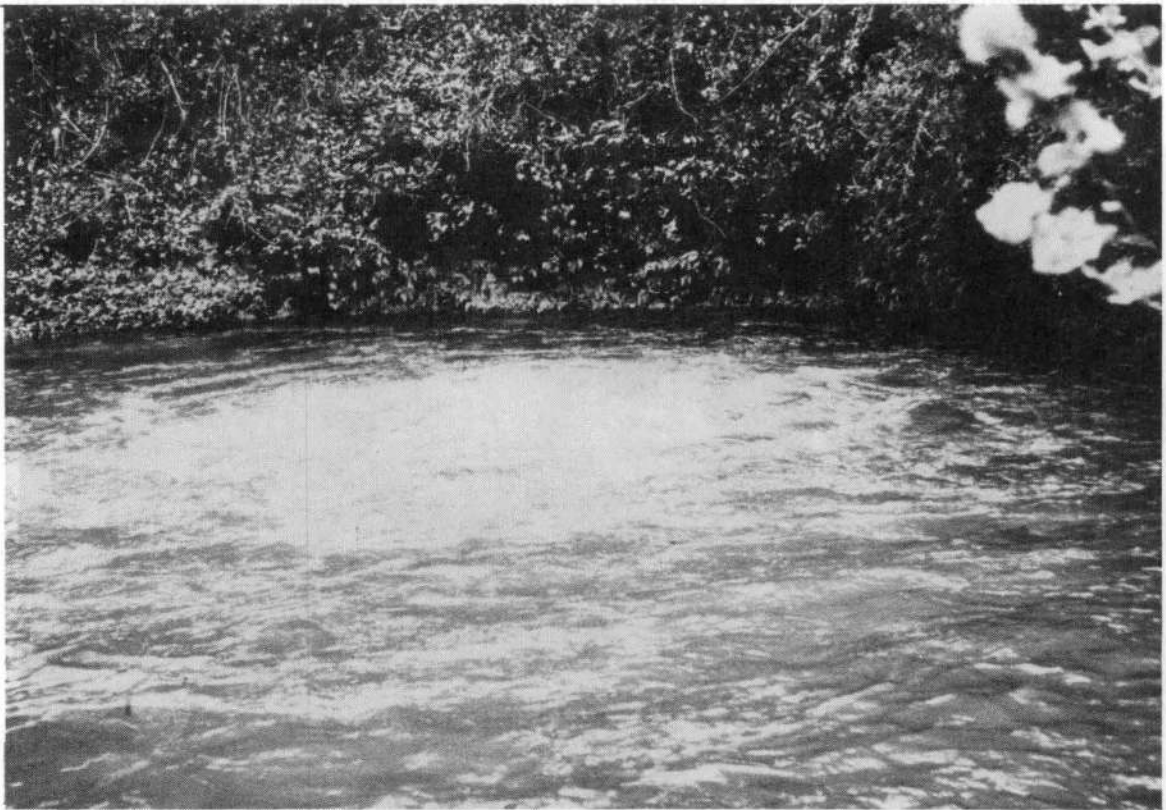
LEGEND
 ▲ PUBLIC
 ● PRIVATE





It's against the law to litter, but enforcement is difficult.

Springs which add clear, cold water help maintain good water quality in the rivers.



Climate

The climate of the basin is essentially continental with frequent changes in weather, both from day-to-day and season-to-season. The

frequent changes occur as cold or warm fronts move through the basin. The average temperatures for the three primary recreation months--June, July, August--are in the mid-80's during the day and mid-60's at night. A combination of uncomfortably high temperatures and humidity is likely for one or more periods of up to a week or more during the summer months. Spring and fall temperatures are normally moderate and comfortable for the recreationist.

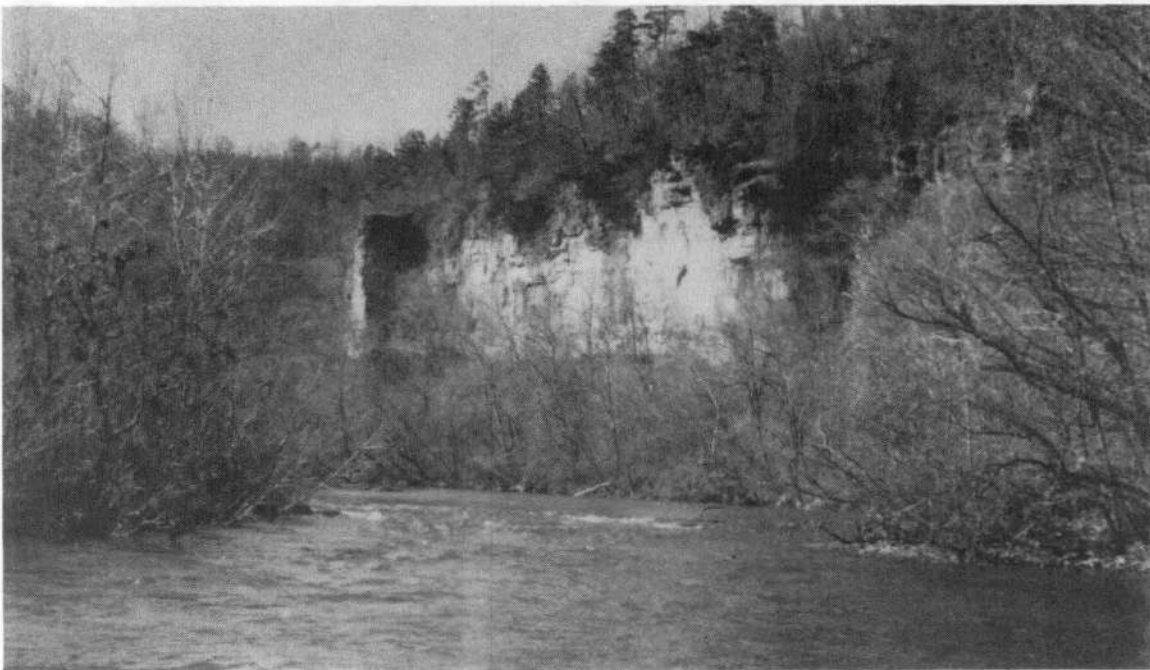
Annual precipitation averages 39 inches with April to October receiving about an even distribution of clear, partly cloudy, and cloudy days. Summer droughts often occur in July and August with four weeks of hot, dry weather. Snowfall is limited and rarely accumulates during the winter months. Heavy rains annually occur in April and May causing flooding conditions.

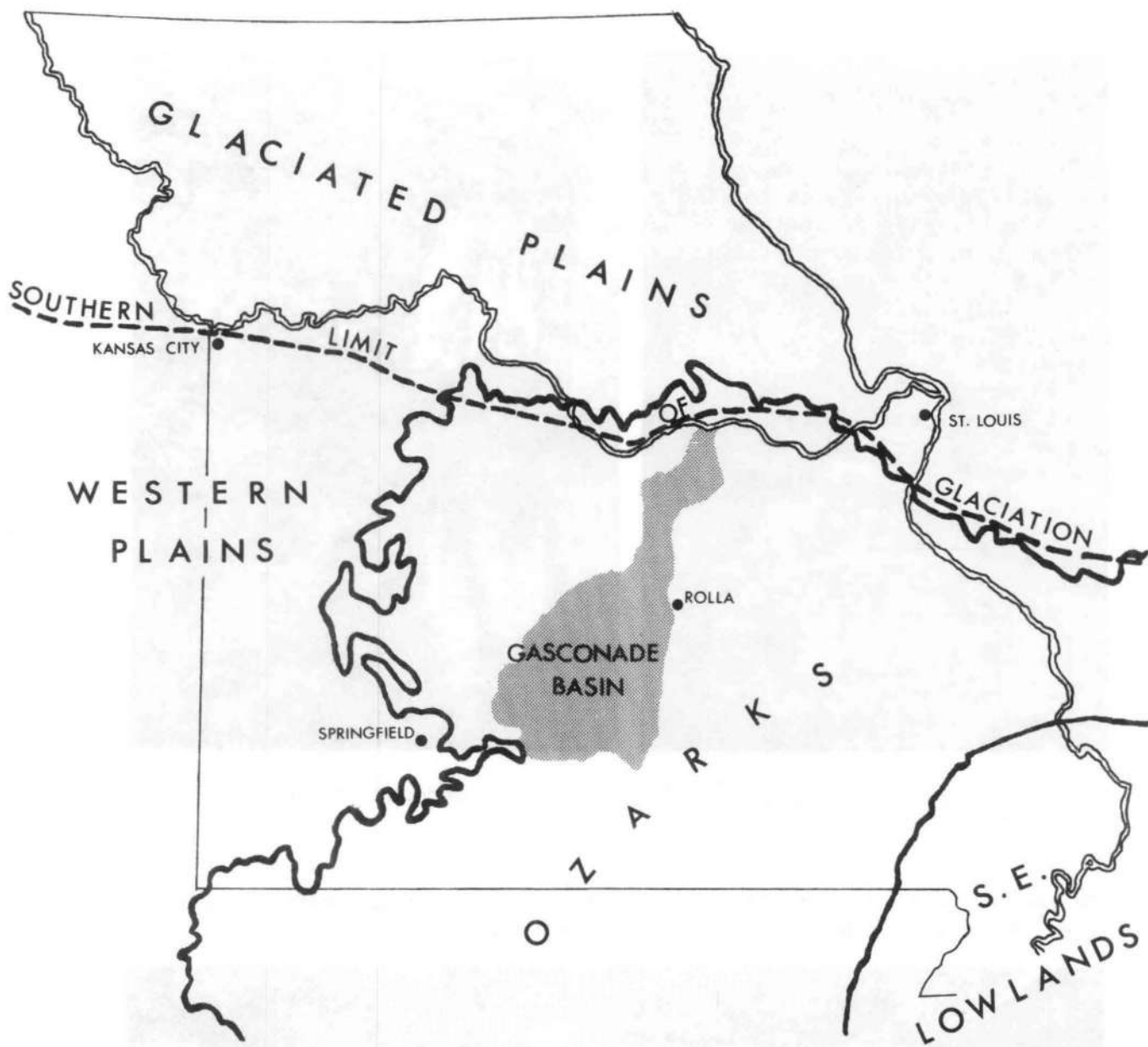
Geology and Mineral Resources

Geology--Within the Ozark Province of southern Missouri, repeated uplifts and continued erosion created the region of hills, plateaus, and

deep valleys of the Gasconade and Big Piney River areas. The northern part of Missouri was covered by glaciers during the Ice Age, but the southernmost extent of glaciation reached only to about the mouth of the Gasconade.

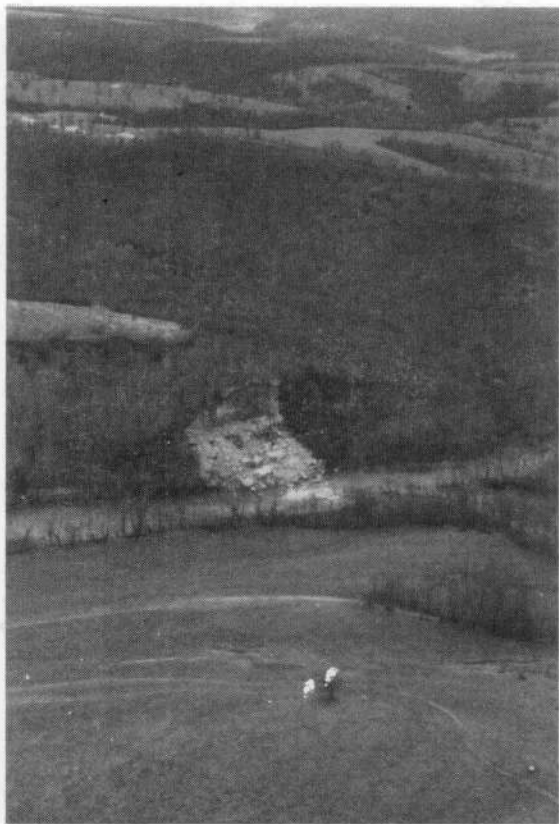
Tall bluffs near Paddy Creek on the Big Piney.





GEOLOGIC REGIONS

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI



A portion of this bluff fell into the Gasconade, creating rapids.



Rock overhang on the Big Piney.

In the vicinity of Devil's Elbow is one of the most extensively mined sand and gravel deposits along the Big Piney.



There is no general agreement among geologists as to the events which produced the highly sinuous character of the Gasconade and its major tributaries. By whatever theory one prefers to explain the sinuosity of the Gasconade, the river is still carving its valley, shaping its floodplain, and trimming back its bluffs following a timetable and plan as old as time itself. The dynamism of the river was dramatically shown in November 1971 when a large section of a bluff northwest of Waynesville collapsed and fell into the river, forming a partial dam and eventually producing a new rapids. This type of event has occurred countless times in the history of the river, as evidenced by areas where large rocks still occupy part of the river channel.




In addition to surface erosion, undermining of the upland regions by groundwater solution has been a constant activity. Evidence of this is present in the upland regions as sinkholes and water entering through cavernous channels to springs or spring-caves that open on the Gasconade valley. An example is shown at Ozark Springs, where a considerable amount of the Gasconade flow goes underground to rise again several miles downstream. The features resulting from the solution action of water on limestone--the caves, springs, underground rivers, sink holes--result in a landform type known as Karst topography.

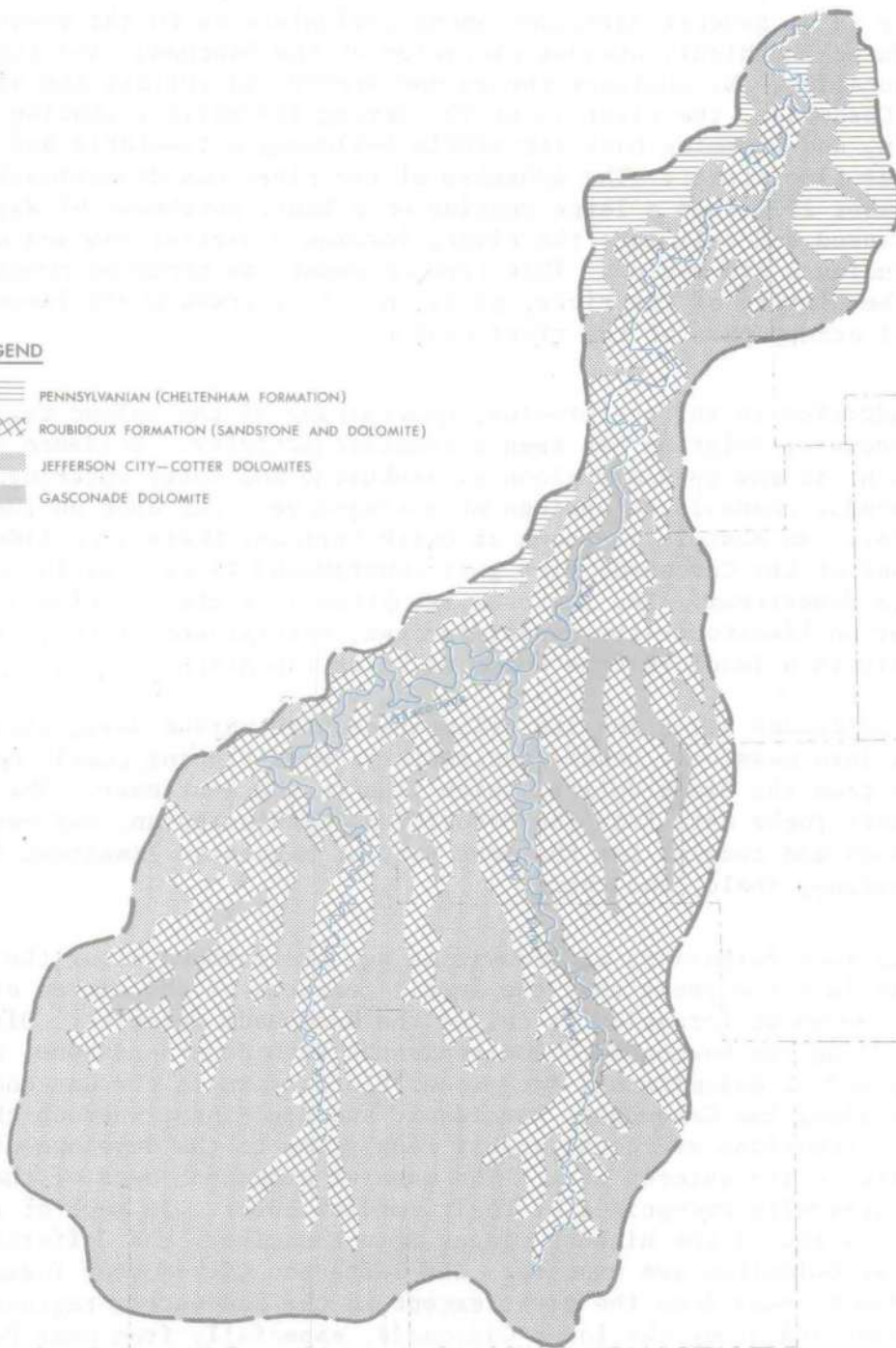
The Gasconade River and its tributaries have carved deep, sinuous valleys into massively bedded sedimentary rocks sloping gently northward away from the Ozark Uplift, which lies to the southeast. The sedimentary rocks date from the Ordovician, Mississippian, and Pennsylvanian periods and consist for the most part of magnesian limestone (dolomite), sandstone, shale, and chert.

Three rock formations of Ordovician age are exposed along the river, and it is in these rocks that the scenic features of the stream are developed. The lowermost formation is called the Gasconade Dolomite. Directly overlying the Gasconade Dolomite is the Roubidoux Sandstone, a formation composed of dolomite and sandstone. Bluffs form in the Gasconade Dolomite along the Gasconade, Roubidoux, and Big Piney, whereas the Roubidoux formations are considerably less prone to the development of bluffs in its outcrop area. The massive sandstone beds of the Roubidoux are generally recognized by their reddish color. In much of the upland regions and on the highest ridges near the river, the Jefferson City-Cotter Dolomites are exposed. The Jefferson City-Cotter formations can seldom be seen from the river except in the headwaters regions of the streams and along the lower Gasconade, especially from near Pershing to the mouth of the Gasconade.

The magnesian limestone or dolomite rocks of the Gasconade basin are highly susceptible to solution by groundwater, and it is for this reason that numerous springs and extensive caves have developed along the rivers. The caves and springs, as well as the many large, sheer bluffs along the rivers, are places of scenic interest and present an important part of the recreational resources of the river.

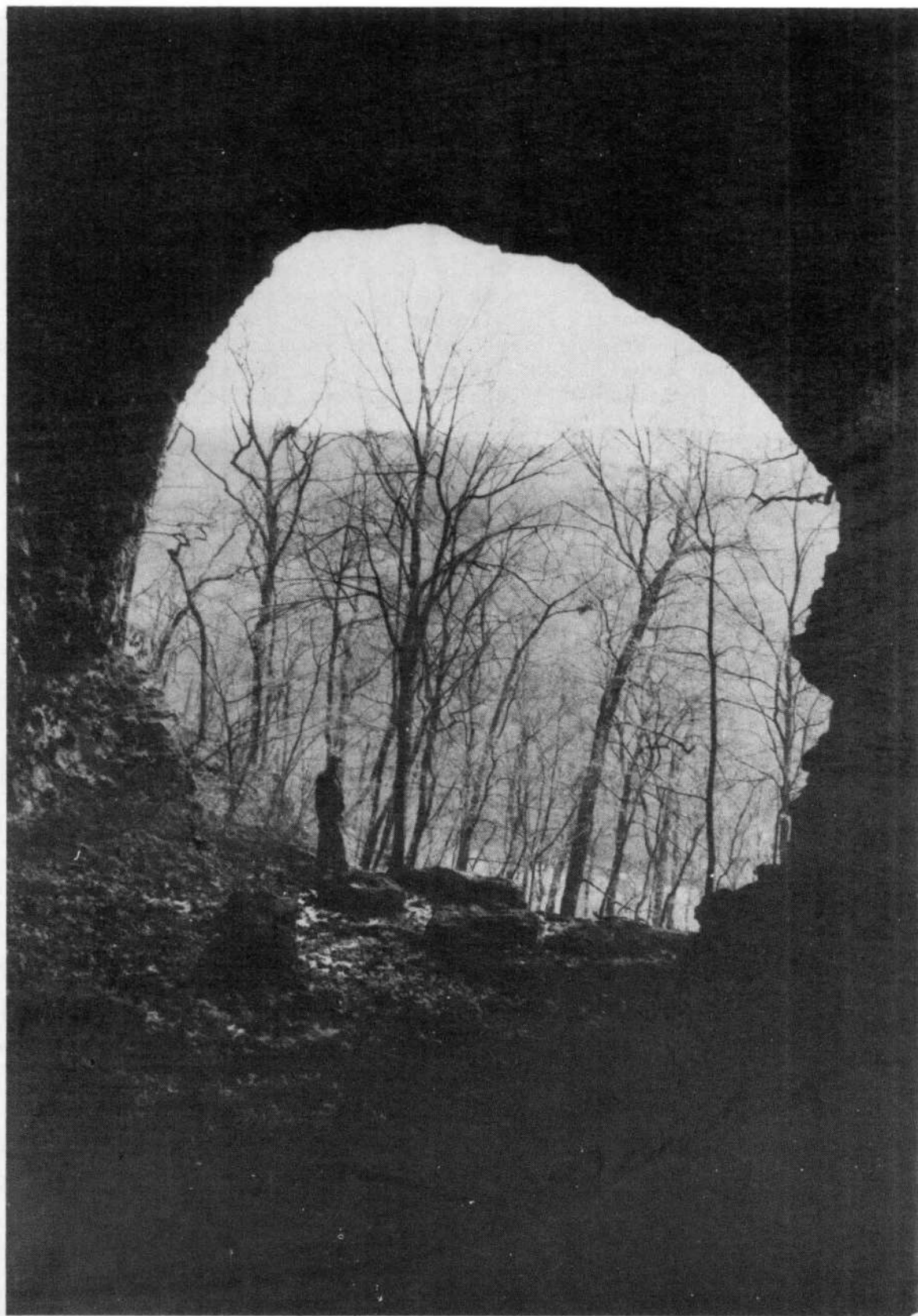
LEGEND

-  PENNSYLVANIAN (CHELTENHAM FORMATION)
-  ROUBIDOUX FORMATION (SANDSTONE AND DOLOMITE)
-  JEFFERSON CITY—COTTER DOLOMITES
-  GASCONADE DOLOMITE



BEDROCK GEOLOGY

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI



Mineral Resources--Mineral resources of the Gasconade and its tributaries consist primarily of sand and gravel dredged from the streams at various localities and stone quarried from one or more of the dolomite formations in the region. In the upland regions where Pennsylvania shales fill depressions in older land surfaces there are deposits of fire clay and clay for making common brick. Parts of the basin, particularly in the northern part of the main stem, are in what is referred to as the Southern Fire Clay District of Missouri, and there are numerous fire clay pits in the region, although none of these are along the river.

Much of the Gasconade basin lies in the Steelville Filled Sink Iron district. This is a region where in the past deposits of sedimentary iron containing the minerals limonite and hematite were found in filled sinks that are relics of an ancient Karst topography. Production of iron ore from such deposits ceased some years ago, and there is no indication that production will be resumed. Some localities in the vicinity of Newburg were investigated many years ago for zinc and lead deposits. There is now no production of lead and zinc from surface deposits in the area, and there is no known indication of deposits at depth in this region.

The Missouri Geological Survey has produced aeromagnetic maps of many parts of the State that show anomalously high magnetic intensities suggesting the presence of magnetic iron deposits at depth. One such anomaly exists in the vicinity of Orla on Osage Fork in Laclede County. This anomaly has been drilled by at least one mining company, but no deposits worthy of production have been discovered by the drilling exploration program.




The most extensive mining for sand and gravel deposits is along the Big Piney River in the vicinity of Devils Elbow and Hooker. In these areas, deposits of sand and gravel have been taken from the flood plain along the river, creating sizable recreational lakes which have been reclaimed in part through the encouragement and regulations of Clark National Forest. Conservation measures applied to sand and gravel dredging operations on the Piney in the vicinity of Fort Leonard Wood have included provisions for reclaiming the land after mining has been completed.

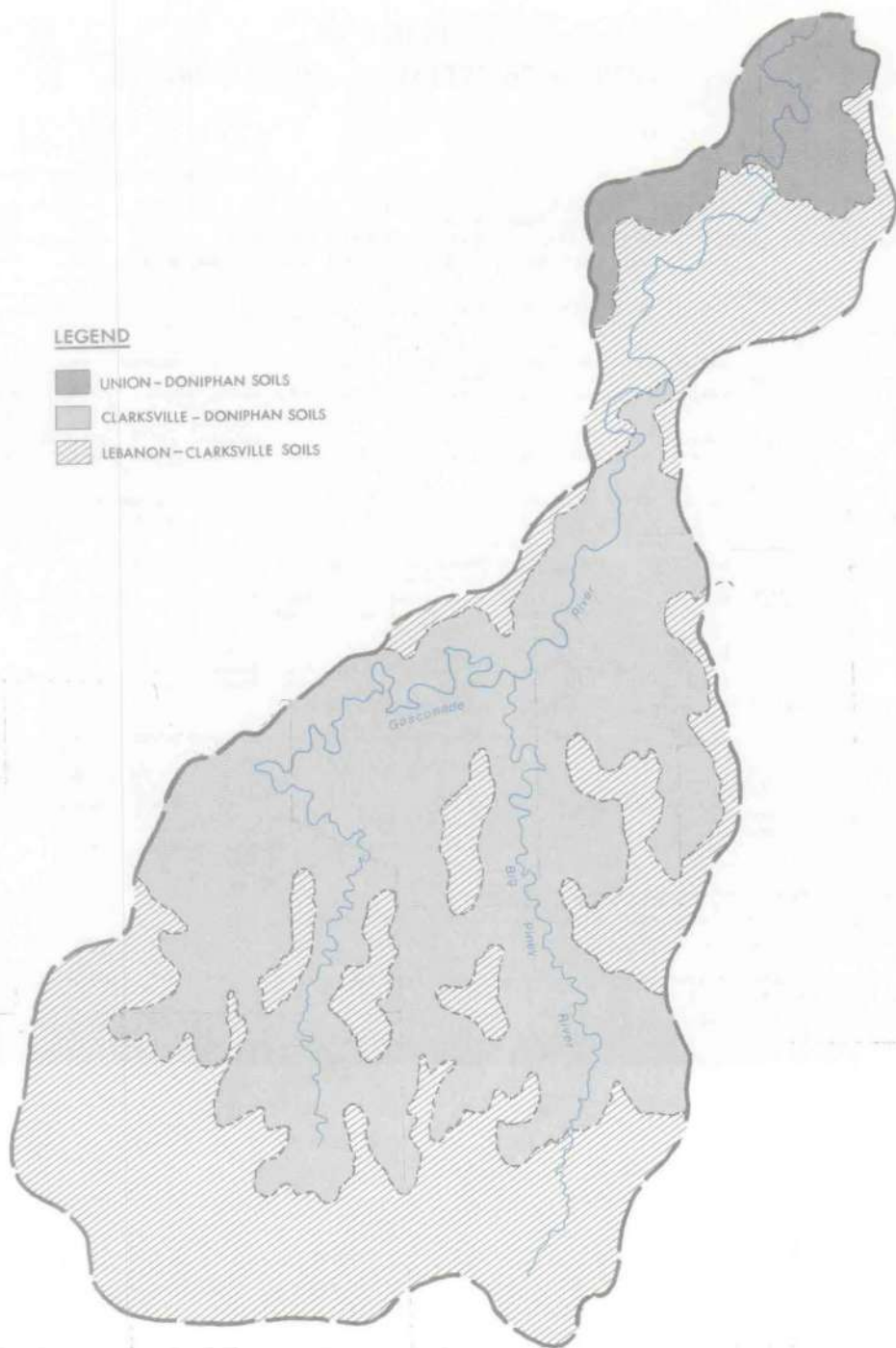
Soils

Soils within the study area are generally low in inherent fertility and are, for the most part, formed in cherty dolomite, sandstone, and

shallow loess. In many of the valley walls, the soils are very porous contributing to rapid percolation rates and low water-holding capacities. Some of the stream terraces have clayey subsoil layers in shallow depths that restrict root penetration and water movement and storage. The major management problems encountered are stoniness, droughtiness, fertility, and permeability. The Gasconade River basin lies within three major soil association areas of the Ozark Highland region which are illustrated on page 139.

LEGEND

-  UNION - DONIPHAN SOILS
-  CLARKSVILLE - DONIPHAN SOILS
-  LEBANON - CLARKSVILLE SOILS



MAJOR SOIL AREAS
GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

TABLE 15
SOIL CHARACTERISTICS AND LIMITATIONS

Soil Association (Refer to Map on Page 139.)	DEGREE AND KIND OF SOIL LIMITATIONS FOR:									
	Series	Location	Productivity	Major Uses	Erosion Hazard	Flood Risk	Septic Field	Sewage Lagoon	Landfill for Solid Waste Disposal	Recreation & Homesite Development
Union - Doniphan	Union	Ridge tops	Low	Forage Production	Severe	None	Moderate	Moderate	Slight	Moderate: erosion & poor drainage
	Uplands	Doniphan	Valley walls	Low	Forest lands or pasture	Slight	None	Severe	Moderate-severe	Moderate to Severe: Steep Slopes & Stoniness
	Bottom-lands	Moniteau	River Terr.	Med.	Grain & Forage Crops	Slight	Slight	Moderate	Moderate	Severe: Bad Drainage
		Hunting-ton	Floodplain	High	Grain & Forage Crops	None	Mod - Severe	Severe	Severe	Severe: Flooding
		Clarks-ville	Valley walls	Low	Forest lands	Slight	None	Moderate	Severe	Moderate to Severe: Steep slopes & stoniness
Clarksville-Doniphan	Uplands	Doniphan	Valley walls	Low	Forest lands	Slight	None	Severe	Moderate-Severe	Moderate to Severe: Steep slopes & stoniness
	Bottom-lands	Ashton	River Terr.	Med.	Forage and grain crops	Slight	Slight	Moderate	Moderate-Severe	Slight
		Sharon	Floodplain	High	Forest (hard woods)Forage & grain crops	None	Mod-Severe	Severe	Severe	Severe: Flooding
		Razort	River Terrace	Med.	Forage Production	Slight	Slight	Severe	Severe	Slight
	Uplands	Lebanon	Ridge tops	Low	Forage Production	Mod.	None	Moderate	Slight	Moderate: Erosion & Poor drainage
Lebanon-Clarksville		Clarks-ville	Valley walls	Low	Forest lands	Slight	None	Moderate-Severe	Severe	Moderate to Severe: Steep slopes & stoniness
	Bottom-lands	Cedargap	Floodplain	Low	Forage Production	None	Mod-Severe	Severe	Severe	Moderate: occasional flooding
		Razort	River Terrace	Med	Forage Production	Slight	Slight	Moderate-Severe	Severe	Slight

Slight - No limitations or limitations are easily overcome.

Moderate - Has limitations that require good design and management to overcome.

Severe - Has limitations that are very difficult and costly to overcome, maintenance is a continuing problem.

*Recreation development includes public and private development which may involve picnic, boat access, sanitation, and camping facilities.

Source: U.S. Forest Service

The upland soils of the entire basin are generally low in productivity due to low inherent fertility and water-holding capacities. However, much of the lands within the Lebanon-Clarksville and Union-Doniphan Soil Associations are now being used for forage production and do have a fair potential for this use. Conversely, the upland soils of the Clarksville-Doniphan Association have very low potentials for agricultural uses other than wood crop production.

The bottomland soils within the Lebanon-Clarksville Association area are low to medium in productivity due to low water-holding capacities. They have good potentials for forage production and fair to good potentials for wood crop production. The bottomland soils within the Union-Doniphan and Clarksville-Doniphan Associations are medium to high in productivity and have good potential for both agricultural and woodland uses.

The relative production, degree of some common hazards, and the degree and kind of limitations for some selected uses for each of the major upland and bottomland soils are described in Table 15. In general, the basin soils present moderate to severe limitations for sanitation facilities such as septic fields, sewage lagoons, and landfills. These limitations are very important considerations in land use planning within the area. Intensive development within the area, using these methods of waste disposal, could cause severe pollution problems. Although the soils of the river terraces generally provide the best sites for recreation and homesite development, their porosity contributes to rapid percolation rates and low water-holding capacities. For this reason, vault type toilets rather than septic tanks must be used to prevent contamination of nearby streams or groundwater.

Flora

The Gasconade and Big Piney River areas have never been glaciated and have remained a continuous land surface available for plant occupation since the end of the Paleozoic Era. There is increasing evidence of a dry period occurring along both rivers beginning in the 13th century. During this time, the grasslands advanced eastward, annual precipitation increased, and the forests advanced once again. This phenomena accounts in part for the presence of relic prairie areas, some of which are located near the river areas.

Because their numbers were small, the Indians had little effect upon the Ozark Forests. Beginning about 1880, however, logging companies began to remove the original forest. In 1899, at the peak of logging activities, a record 723,754,000 board feet were removed from the Ozarks. Thus the present forest within the Gasconade watershed is primarily second growth.

Within the past 10 to 15 years, the vegetative character of the river valley has significantly changed through farming, timber cutting, construction, and other forms of man's use. The rich bottomlands were

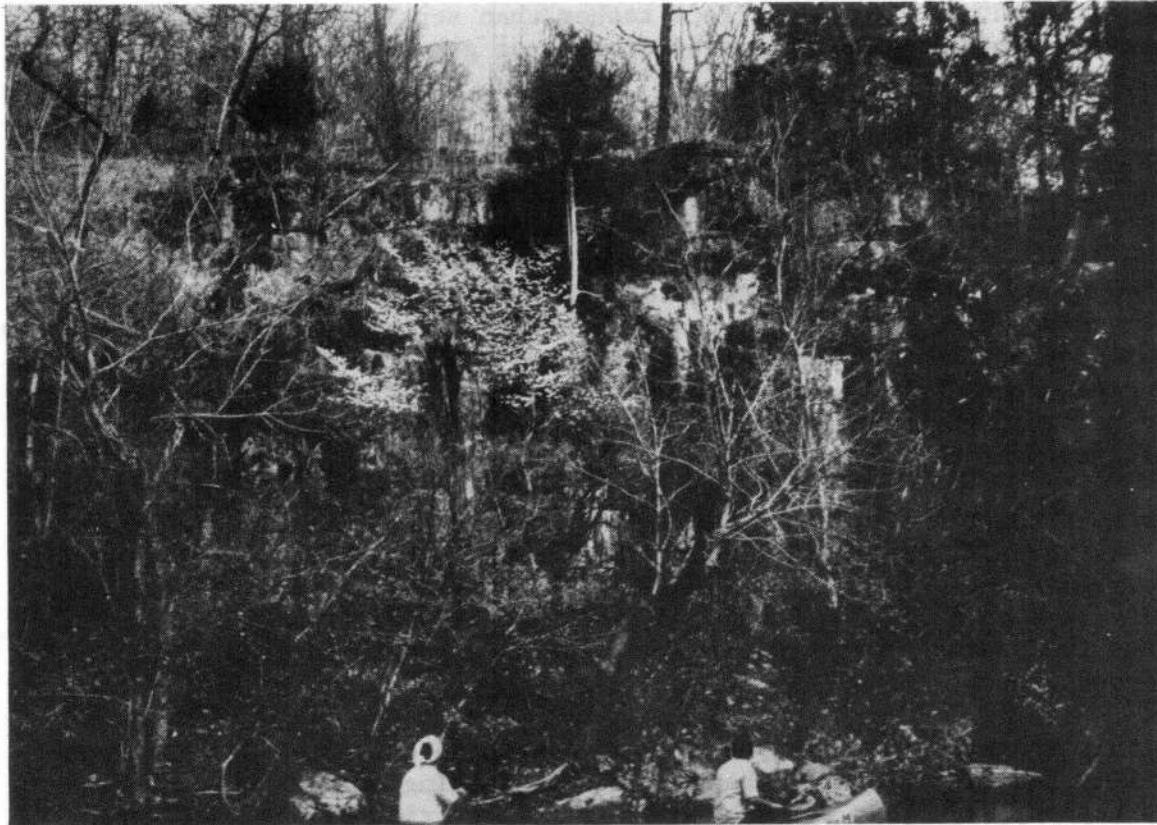
cleared for agriculture, eliminating much of the original forest cover. Spraying to kill timber for conversion of land into pasture is widespread, especially along the upland areas of the rivers. It is estimated that one million acres of Ozark forest lands have been eliminated in the last decade. However, the flora of the Gasconade River watershed which still remains along segments of both rivers is extremely diverse and richly abundant. Approximately 148 species of trees, wildflowers, and other plants have been identified by the Missouri Department of Conservation.

Vegetative cover along the river areas consists primarily of deciduous forest species. The presence of this forest type is attributable to soil conditions and also to a number of climatic conditions, principally temperature and annual precipitation.

From the rivers, the upland forests are seen blanketing the hills that line the river valley. Four distinctive plant associations exist in this upland forest--Oak-Pine Forest, Oak-Hickory Forest, White Oak-Red Maple Forest, and Sugar Maple-White Oak Forest.

The presence of the Oak-Pine Forest in the river area is due to the Roubidoux sandstone formations from which are formed the acid soils of the Lebanon-Clarksville Soil Association. Short leaf pine is generally

Flowering Dogwood.





Oak-pine forest along the Eig Piney.

Deciduous forest forms a dense cover along most of the Gasconade.



found here in association with white oak, black oak, mockernut hickory, and black hickory. The natural range of short leaf pine covers the middle portion of the Big Piney River but terminates after following the Big Piney northward (illustrated on page 145).

The Oak-Hickory Forest also rises from acid soils and is commonly found on the upland slopes and ridges of the upper reaches of the Gasconade and Big Piney Rivers. The dominants of the Oak-Hickory Forest may vary locally, but generally include black oak, northern red oak, and black hickory.

A third plant association which develops from acid soils is the White Oak-Red Maple Forest found in the headwaters and on the slopes of draws and ravines along the river areas. Because of its restricted habitat, the White Oak-Red Maple Forest is quite localized but can be found scattered along the upland areas of both rivers where acid soil conditions exist. In addition to white oak and red maple, other species of this forest include mockernut hickory, flowering dogwood, and serviceberry.

The final upland forest type is the Sugar Maple-White Oak Forest which is found along the high river bluffs, on the plateau of the upper watershed areas, and near the mouth of the Gasconade. This forest develops in alkaline soils that have originated from either the dolomitic Gasconade formation or the limestone of the Jefferson City formation. Some of the more dominant species to be found in this forest type are sugar maple, white oak, northern red oak, linden, and butternut.

The upland forests of the river areas are quite complex, featuring a great diversity of plant species. All add to the character of the forest in numerous ways--products, food and cover for wildlife, diversity of colorful flower, fruit, and foliage displays. Within the river valley is another forest known as the Sugar Maple-Bitternut Hickory Forest. Because this is a flood plain forest, its nearness to the water table provides it with an abundance of moisture, and its soils are deeper and richer than the cherty-thin soils of the uplands. In this habitat, not only are climate and soils important factors affecting the vegetation, but also the maturity or stage of development of the river valley itself. Thus, in the upper reaches of the Gasconade and Big Piney Rivers, unfavorable conditions restrict the growth of some of the tree and plant species found in the lower river valleys.

From the river, the closest component of the flood plain forest is viewed on newly deposited gravel bars, usually on the inside of river meanders. In this harsh and frequently flooded environment, water willows grow at the water's edge by securing their root systems in the loose gravel bars. Along the lower Gasconade, black willow and sandbar willow are found on gravel bars where soil is mixed with the gravel.



LEGEND



PRAIRIE



OAK-PINE



DECIDUOUS FOREST

PLANT COMMUNITIES

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI



Gravel bars built higher by sand and silt deposited by floods provide a better habitat, and thus allow a greater variety of plants to grow. Tree species such as river birch and buttonbush appear along with silver maple and green ash. The forest floor is covered with a variety of wildflowers including such late summer species as the cardinal flower, blue mist flower, and goldenrod.

Additional alluvial deposition eventually forms high riverbanks which are the location of the most common and frequently viewed forest along both rivers. An even richer diversity of plant life is found here, including silver maple and black willow which are joined by other species such as shumard oak, bur oak, and box elder. Due to the presence of Dutch elm disease in the watershed, green ash and silver maple are the most frequently viewed tree species on this site. In the spring the forest floor is colored with the blooming of May apples, blue phlox, bloodroot, and violets.

In certain restricted, well-drained, and seldom flooded parts of the flood plain, the forest may contain a still richer flora, including sugar maple, butternut hickory, butternut, and the passion flower. Black walnut, a most important species for its fruit, wood, and food for wildlife, is also found here. Occurring infrequently, this forest will usually merge with the upland forests at the edge of the valley.

In undisturbed sections of this forest and in the forest found along high riverbanks, several varieties of mushrooms grow. Some of the more common edible species found include the jack-o-lantern, inky caps, shaggy mane, American lepiota, edible bolete, and morel mushrooms. Coral mushrooms, which usually occur in the upland forests, are the best known edible fall species, while morels are the most common spring mushroom.

Flowering dogwood is the most abundant fruit producing tree, with sassafras second in abundance. Along both rivers, these understory species and redbud provide extremely attractive spring color displays.

Generally, aquatic plants are scarce along the rivers, probably because of the unstable gravel substrata and the scouring action of floods. The aquatic vegetation which does occur within both rivers includes species of pondweeds, naiads, arrowheads, waterweeds, water lilies, and algae.

A list of many of the upland and flood plain tree and plant species is shown in the Appendix.

Fauna

The generally good water quality of the Gasconade and Big Piney Rivers together with the excellent habitat along the river corridors provide an environment supporting an impressive variety of fish and wildlife.

Water quality in both rivers is above average and well-suited to support a warm water fishery. Both rivers are highly regarded smallmouth and largemouth bass streams. Other game fish sought by sport fishermen are rock bass, green sunfish, longear sunfish, channel catfish, redhorse sucker, freshwater drum, and black bullhead. A study¹ conducted on the Big Piney from 1951 to 1958 demonstrated the poor return from stocking fingerling smallmouth bass. Thus, the excellent sport fishery is a result of natural reproduction and not any stocking program.

In addition to the excellent warm water fishery, springs and their flowing branches, with uniform low temperatures year-round, provide habitat suitable for trout, thus adding diversity to the river fishery. One such area, Stone Mill Spring on the Big Piney, is an established trout management area where catchable size rainbow trout are stocked.

One hundred and nine species of fish have been recorded in the Gasconade drainage (see Appendix). Most of these species are also widespread in clear, upland Mississippi valley streams. However, four of these species--bleeding shiner, wedgespot shiner, Missouri saddled darter, and stippled darter--are limited to the Gasconade drainage and adjacent Ozark upland stream systems.

The blue-striped darter, Percina cymatotaeni, is restricted to the Gasconade and Osage Rivers in Missouri, and very occasional specimens are found in Kentucky, Arkansas, and West Virginia. Only the Gasconade and Osage River populations are considered of substantial enough size to contribute to the continued existence of this species. The blue-striped darter is a candidate for the official list of Worldwide Endangered Fauna published by the Secretary of the Interior in accordance with provisions of the Endangered Species Act of 1973. It is presently contained on the list of Rare and Endangered Species of Missouri, 1974, published by the Missouri Department of Conservation.

Four other species in the Gasconade drainage are also contained on the Missouri list. Two are considered rare: the southern brook lamprey, Ichthyomyzon gagei, and the Alabama shad, Alosa alabamiae. The other two are considered endangered: the pugnose minnow, Opsopoeodus emiliae, and the blacknose shiner, Notropis heterolepis.

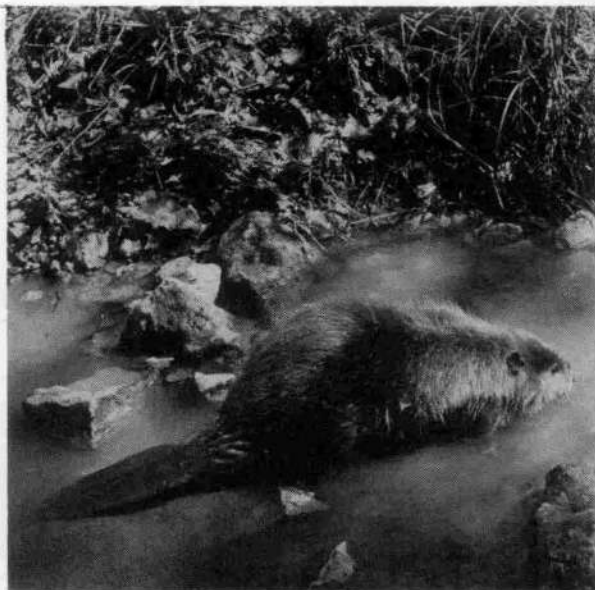
The following species of mussel are also candidates for the Worldwide Endangered Fauna list:

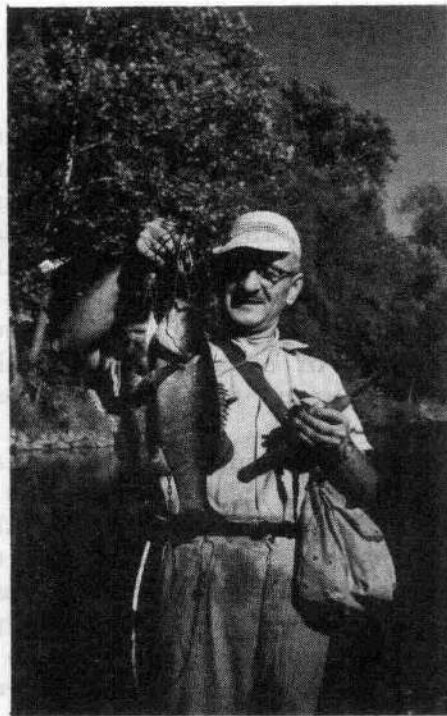
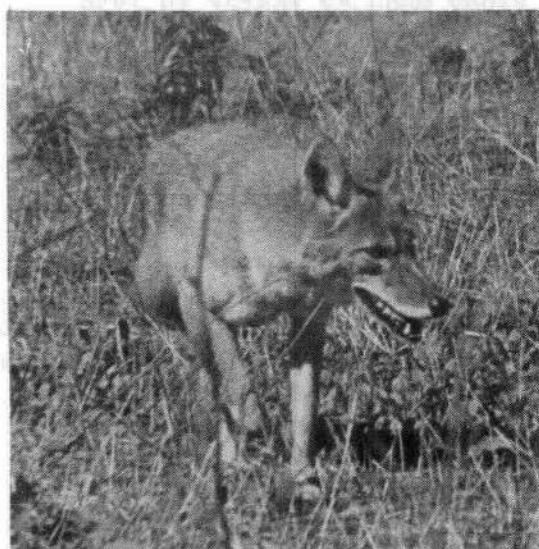
1. The spectacle-case pearly mussel, Cumberlandia monodonta, has been greatly reduced in distribution from its former range. It particularly merits preservation because it is the only species in the genus.

¹Fleener, George G., John L. Funk, and Perry E. Robinson, The Fishery of a Missouri Ozark Stream, Big Piney River, and the Effects of Stocking Fingerling Smallmouth Bass, Missouri Department of Conservation, Fisheries Research Report (unpublished).



*A variety of fauna
inhabits the area.*





2. The Gasconade Higgins-eye pearly mussel, an undescribed subspecies of Lampsilis higginsi, is known only in the Gasconade River.
3. The Gasconade pig-toe pearly mussel, an undescribed subspecies of Fusconaia flava, is known only in the Gasconade River.
4. The scale pearly mussel, Leptodea leptodon, has been found in substantial populations only in the Gasconade and Meramec Rivers in Missouri and the Kiamichi River in Oklahoma. It is jeopardized in these rivers by channelization, pollution, and impoundments.

A study of benthic organisms in the Big Piney made by Foster in 1956 revealed that mollusks predominated by weight for the 142 forms (genera or species) which were identified.

Numerous species of reptiles and amphibians are found along the banks of the Gasconade and Big Piney Rivers--42 different kinds of snakes, six of which are poisonous; 19 species of frogs and toads; and snapping, soft-shelled, and box turtles (Appendix).

The river corridors furnish a natural travel lane, as well as a permanent home for many furbearers, game, and nongame mammals--61 species of mammals have been recorded in the basin (Appendix). Forest types lacing the upper reaches of the Gasconade and Big Piney provide an abundance of mast and browse which support good populations of deer. Gray and fox squirrels are also abundant, particularly along the riverbanks where they harvest a rich supply of acorns and nuts from the hickory, walnut, and oak.

As the Gasconade and Big Piney Rivers leave the upland plateaus, the interspersions of open land with forested land increases, improving conditions for the cottontail rabbit. Hunter bag checks and road surveys indicate high rabbit populations in these lower river reaches.

The variety of animal life is enhanced by the presence of bobcat, coyote, gray and red fox, beaver, muskrat, mink, raccoon, skunk, opossum, and woodchuck. Many of these furbearers provide income for local trappers, especially in the upland areas of the rivers which consistently rank high in the statewide fur harvest.

Caves in the river bluffs are important to the preservation of several species of bats, including the tree, hoary, and red bats which inhabit only four or five known caves in Missouri.

Both rivers support an outstanding variety of birdlife--approximately 290 species of birds use the river areas during the year, including the American osprey and the southern bald eagle. Kingfishers, herons, and ospreys are found along the stream edges. Between 25 and 30 species of birds are classified as permanent residents of the river areas. They include five species of woodpecker; three of the sparrow family (in addition to the common house sparrow); along with many individual species such as titmouse, mockingbird, cow bird, American gold finch, cedar

waxwing, and the redwinged blackbird. Added to this variety are the many summer resident species, including five species of vireos; nine species of warblers, as well as the orchard and Baltimore orioles; and the scarlet and summer tanagers. As fall changes to winter, cold weather species such as the Purple finch, the tree sparrow, ruby crowned and golden crowned kinglets, the Whitethroated sparrows, as well as the fox sparrow are observed along the rivers. Some 15 species of warblers as well as waterfowl and shore birds migrate through the area each year. The basin lacks extensive marshes and other wetland characteristics typical of good waterfowl habitat. However, a high population of wood ducks is sustained along the lower reaches of the Gasconade River.

Upland game birds find good habitat in the interspersed trees, brush, river bottoms, and adjacent crop fields within the river corridors. These characteristics are the basis for the high bobwhite quail population along the river areas. A 1969 bobwhite quail study¹ showed this area ranked second in the State in hunting success. Substantial populations of turkey are also found along the Gasconade and Big Piney.

The diverse and interesting animal life of the river areas provides outstanding opportunities for nature interpretation (education and recreation), in conjunction with compatible hunting and fishing use. The rate at which forested upland areas along the rivers are being cleared is of some concern. This activity could have a significant effect on wildlife species found in the watershed, particularly deer and turkey.

Access

General access to and circulation along the Gasconade and Big Piney Rivers as provided by major and secondary highway systems is ex-

cellent. From its headwaters near County Highway 0 to the river's mouth, the Gasconade is crossed by 34 roads, three railroads, and one car ferry. Fourteen roads and one railroad cross the Big Piney from State Highway 17 to the river's mouth (Table 16).

Most highway crossings provide some form of access. In some cases, however, such access is carry-in only. Many of these points have developed through continued public use and not as a result of any formal plans. Included in the number of river crossings are low-water fords, but roads that terminate at the river are not included.

Major highway crossings along the Gasconade are Missouri Routes 50, 63, 28, 17, 133, 32, U.S. Route 66, and Interstate Highway 44. Along the Big Piney River, the primary highway crossings include State Highways 32 and 17, Interstate Highway 44, and U.S. Highway 66. All other river crossings along both rivers serve lightly used county and township roads.

¹Missouri Department of Conservation.

TABLE 16

PUBLIC TRAVEL ROUTES ACROSS
THE GASCONADE AND BIG PINEY RIVERS

Type of River Crossing	Number of Crossings Over:	
	Gasconade River ¹	Big Piney River ²
Railroad	3	1
Car Ferry	1	0
Roads*	34	14
Federal	2	2
State	7	2
County & Local	25	12
TOTALS	38	15

*Includes bridges, low-water bridges, and fords.

¹From County Highway 0 to river mouth.

²From State Highway 17 to river mouth.

A number of public and private access points have been developed along both rivers. The Missouri Department of Conservation has established 15 access points at various locations on the Gasconade and Big Piney Rivers. One of these sites is under lease, and the remaining 14 are owned in fee title.

The Clark National Forest has acquired tracts of land along the Big Piney and Gasconade, thereby providing access at three points on the Gasconade and two on the Big Piney. Only the two access sites on the Big Piney have been developed. The remaining three areas on the Gasconade River are merely points where a person can gain access to the water. Recreation facilities are not provided at these locations.

Twelve private boat liveryies are located along the Gasconade and Big Piney. Many of these private facilities provide guides, camping equipment and provisions, in addition to renting boats. In some instances, the private liveryies use existing public access sites. However, most of the livery operators have developed their own access sites where for a minimum fee the public may gain access to the river. Tables 21 and 22 (pages 172 and 176) show public and private access to the rivers.

Most, if not all, private cottages and homes along the rivers have private access points and boat launch facilities, but these are generally not open to the public.

Landownership

The following data in Tables 17 and 18 show the landownership patterns occurring along the Gasconade and Big Piney Rivers. No attempt was made to determine the area in township, county, and State-owned highways and roads.

TABLE 17

**LANDOWNERSHIP ALONG THE
GASCONADE¹ AND BIG PINEY² RIVERS**

River	Ownership	Acres	Percent
Gasconade	National Forest Lands	1,438	2
	Private Lands	66,734	97
	State of Missouri Lands	<u>75</u>	<u>1</u>
	TOTAL	68,247	100
Big Piney	National Forest Lands	2,263	9
	Military Lands ³	5,127	20
	Private Lands	17,511	70
	State of Missouri Lands	<u>200</u>	<u>1</u>
	TOTAL	25,101	100

¹Within a half-mile wide corridor 235 miles in length (River mouth to County Highway I).

²Within a half-mile wide corridor 87 miles in length (River mouth to State Highway 63).

³Includes 2,023 acres of National Forest land within the Fort Leonard Wood boundary.

TABLE 18

OWNERSHIP OF RIVER FRONTAGE LANDS ALONG
BOTH SIDES OF GASCONADE¹ AND BIG PINEY² RIVERS

River	Ownership	Miles of River Frontage	Percent
Gasconade	National Forest Lands	8.75	1+
	State of Missouri	1.50	1
	Private Lands	<u>459.75</u>	<u>98</u>
	TOTAL	470.00 (235 miles both sides)	100
Big Piney	Military Lands ³	33.50	20
	National Forest Lands	12.25	7+
	State of Missouri Lands	1.00	1
	Private Lands	<u>117.25</u>	<u>72+</u>
	TOTAL	164.00 (87 miles both sides)	100

¹Along a river corridor 235 miles in length (River mouth to County Highway H).

²Along a river corridor 87 miles in length (River mouth to State Highway 63).

³Includes 13 miles of frontage along National Forest land inside Fort Leonard Wood boundary.

Land Use

Land use patterns along the Gasconade and Big Piney Rivers have changed significantly in the past 10 years due primarily to the conversion of timber lands to pasture. As a result, land use for agricultural purposes has increased and is now the dominant land use along the Gasconade and the second major use along the Big Piney River.

In order to more thoroughly evaluate land adjacent to the rivers, land use data are presented for the corridors along each river. Within a half-mile corridor, there are approximately 68,000 acres of land along a 235-mile stretch on the Gasconade and 25,000 acres of land along an 87-mile segment of the Big Piney River. Present land use within these river corridors are presented in Tables 19 and 20. The land use categories used in both tables are defined as follows:

Agriculture

Pasture and cropland are combined in this category. No distinction was made between the two because both types of farmland uses are often rotated on the same piece of land.

Recreation

Federal recreation areas consist only of the areas developed for recreation use, while State recreation areas include only developed access points. Private recreation areas include canoe rental and private resort establishments but do not include private summer homes and cottages used for recreation.

Private Timber and Rural Residence

Included under this category is all the private timbered land not devoted exclusively to agriculture or public and commercial recreation activities. Also included under this category are summer homes and cottages.

Urban

This category includes all small communities located within the river corridors.

Sand and Gravel Extraction

No differentiation is made within this category between sand and gravel operations which extract material from the river bed and those which extract from areas located immediately along the rivers.

National Forest Lands

Lands administered by the Clark National Forest, exclusive of any land specifically developed for recreation purposes, are included in this category. However, all National Forest lands are open to the public and used for hunting, camping, picnicking, and other types of dispersed recreation use, as well as for timber management purposes.

Military

Lands within the boundary of the Fort Leonard Wood Military Reservation are included within this category. Land use of this type occurs only along the Big Piney River.

The final two columns on each table describe the dominant land use(s) within each river segment and the land use(s) most visible from the rivers. In several instances, various activities and developments by man are a very minor land use, but their location close to the river shoreline makes them more visible than the dominant land uses.

TABLE 19

LAND USE ALONG THE GASCONADE RIVER
WITHIN A HALF-MILE CORRIDOR

		RIVER MOUTH TO POINTERS CREEK 42 Miles	POINTERS CREEK TO DUNCAN CREEK 54 Miles	DUNCAN CREEK TO PHELPS-PULASKI COUNTY LINE 10 Miles	PHELPS-PULASKI COUNTY LINE TO OZARK SPRINGS 50 Miles	OZARK SPRINGS TO COMPETITION 66 Miles	COMPETITION TO HIGHWAY H 13 Miles	TOTAL 235 Miles
Agriculture	Acres	5,340	7,022	1,408	6,358	9,885	2,175	32,188
	Percent	44	44	44	44	52	58	47
Recreation	Federal	Acres	0	0	0	20	0	20
		Percent	0	0	0	<1	0	<1
	State	Acres	20	35	10	5	0	79
		Percent	<1	<1	<1	<1	0	<1
	Private	Acres	20	40	40	80	0	340
		Percent	<1	<1	<1	<1	0	<1
Private Timber and Rural Residence	Acres	6,553	8,583	1,547	7,946	7,568	1,575	33,772
	Percent	53	55	48	55	40	42	49
Urban	Acres	200	0	150	0	0	0	350
	Percent	2	0	5	0	0	0	<1
Sand and Gravel Extraction*	Acres	5	10	5	0	0	0	20
	Percent	1	1	1	0	0	0	<1
National Forest Lands	Acres	0	0	40	66	1,372	0	1,478
	Percent	0	0	<1	<1	7	0	2
Totals	Acres	12,138	15,690	3,200	14,459	19,010	3,750	68,247
	Percent	100	100	100	100	100	100	100
Dominant Land Use		Private timber, rural residence, and agriculture					Agriculture	
Land Use Most Visible From River		Private tim- ber, rural residence. Urban	Agriculture	Private tim- ber, rural residence. Urban	Private tim- ber, rural residence.	Agriculture	Agriculture	

* Acreage figure is for area occupied by equipment and does not include the river area affected downstream.
Source: U. S. Forest Service.

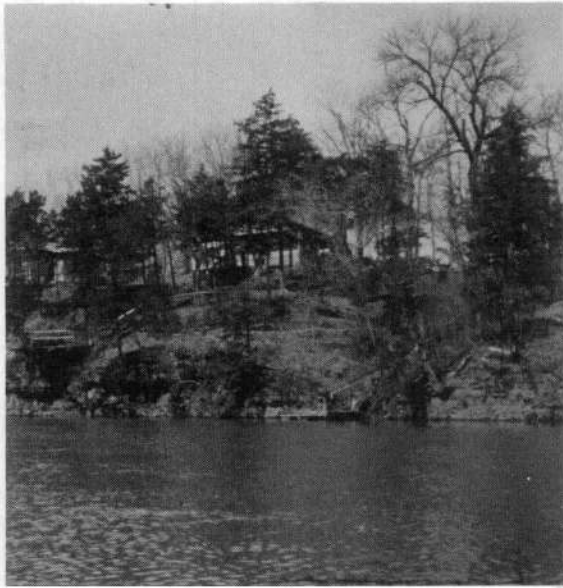
TABLE 20
LAND USE ALONG BIG PINEY RIVER
WITHIN A HALF-MILE CORRIDOR

		RIVER MOUTH TO FT. LEONARD WOOD NORTHERN BOUNDARY 8 Miles	FT. LEONARD WOOD NORTHERN BOUNDARY TO FT. LEONARD WOOD SOUTHERN BOUNDARY 19 Miles	FT. LEONARD WOOD SOUTHERN BOUNDARY TO THE NARROWS 52 Miles	THE NARROWS TO HIGHWAY 63 8 Miles	TOTAL 87 Miles
Agriculture	Acres	623	670	5,055	800	7,148
	Percent	25	11	34	35	28
Recreation	Federal	Acres	20	320	20	360
		Percent	<1	6	<1	1
	State	Acres	0	0	25	170
		Percent	0	0	<1	7
	Private	Acres	320	0	200	0
		Percent	12	0	1	0
Private Timber and Rural Residence	Acres	1,017	200	7,450	1,340	10,007
	Percent	40	0	50	58	40
Urban	Acres	80	0	0	0	80
	Percent	3	0	0	0	<1
Sand and Gravel Extraction*	Acres	230	0	0	0	230
	Percent	9	0	0	0	1
National Forest Lands**	Acres	240	2,017	2,025	0	4,282
	Percent					
Military	Acres	0	2,283	0	0	2,283
	Percent	0	42	0	0	9
Totals	Acres	2,530	5,490	14,775	2,310	25,105
	Percent	100	100	100	100	100
Dominant Land Use(s)		Private timber & rural resi- dence.	Military National Forest lands.	Private timber & rural resi- dence. Agricul- ture.	Private tim- ber & rural resi- dence. Agricul- ture.	
Land Use(s) Most Visible From River		Private timber & rural resi- dence. Urban Sand & Gravel Extraction	Military	Private timber & rural resi- dence. National Forest lands.	Private timber & rural resi- dence. Agri- culture.	

* Acreage Figure is for area occupied by equipment and does not include the river area affected downstream.

** Entire 2,017 acres located within Fort Leonard Wood boundary, but owned and administered by U. S. Forest Service.

Source: U. S. Forest Service.



Private timber and rural residences.



Recreation. U. S. Forest Service.





*Agriculture; private timber
and rural residences.*



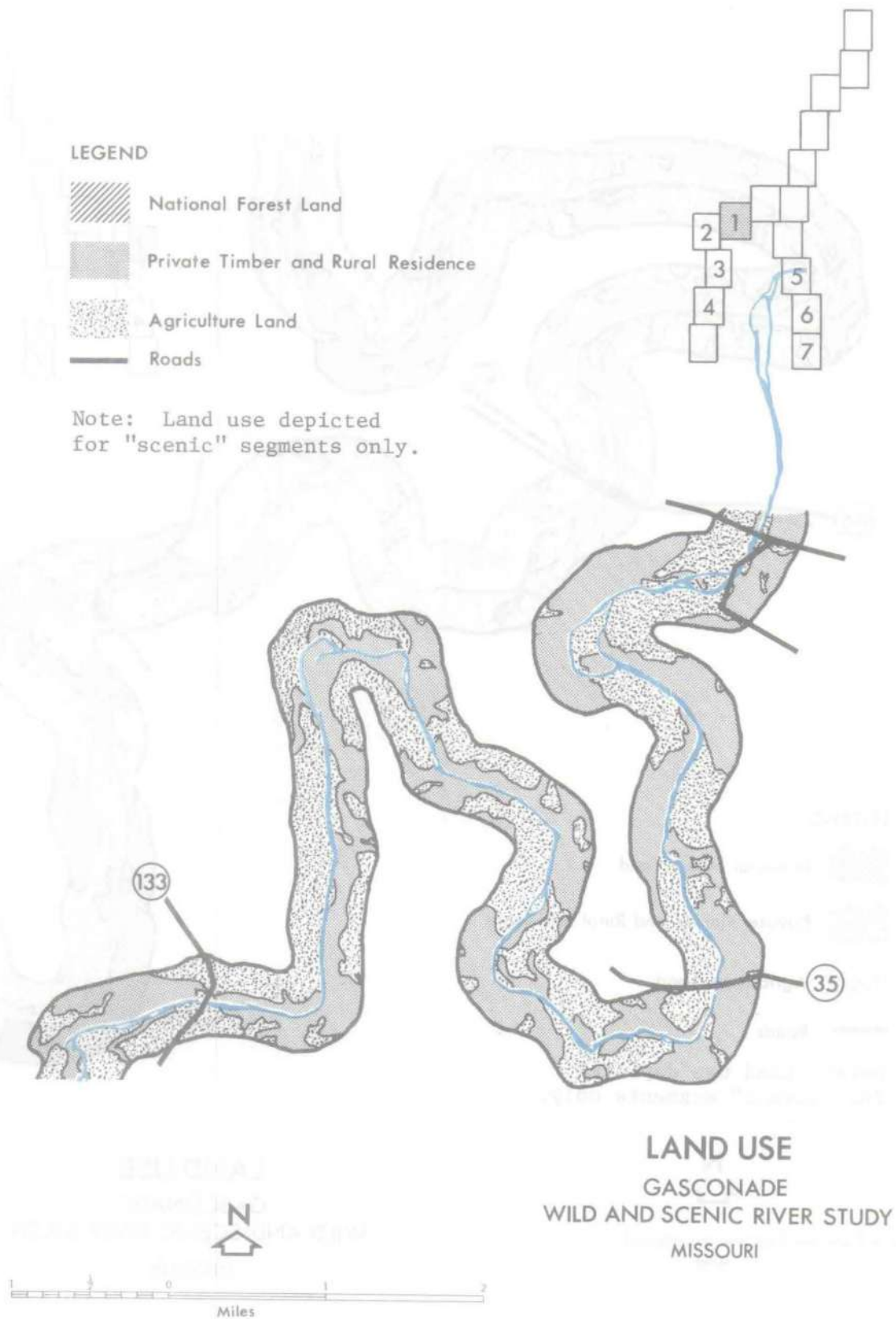
Urban. Town of Jerome.



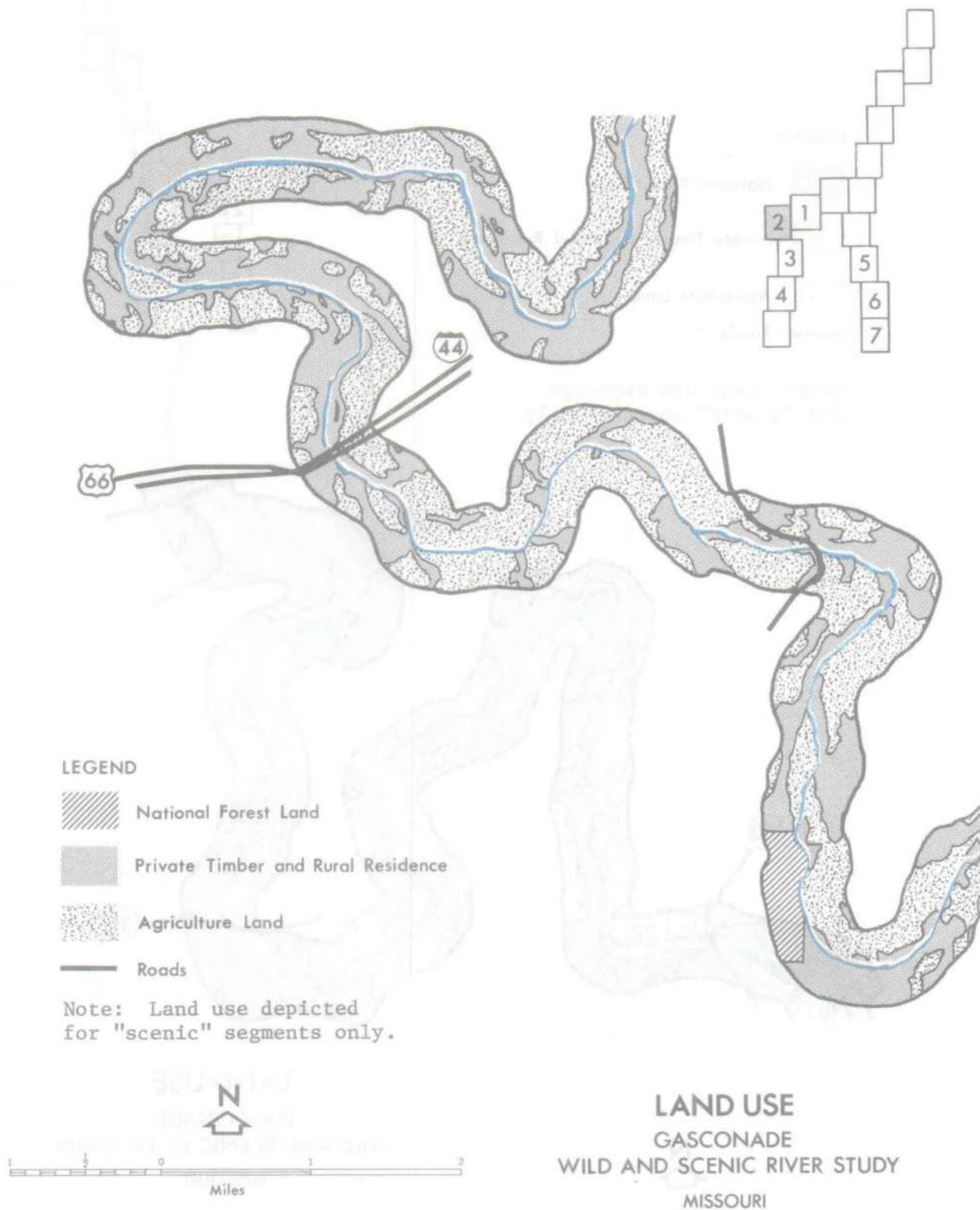
LEGEND

-  National Forest Land
-  Private Timber and Rural Residence
-  Agriculture Land
-  Roads

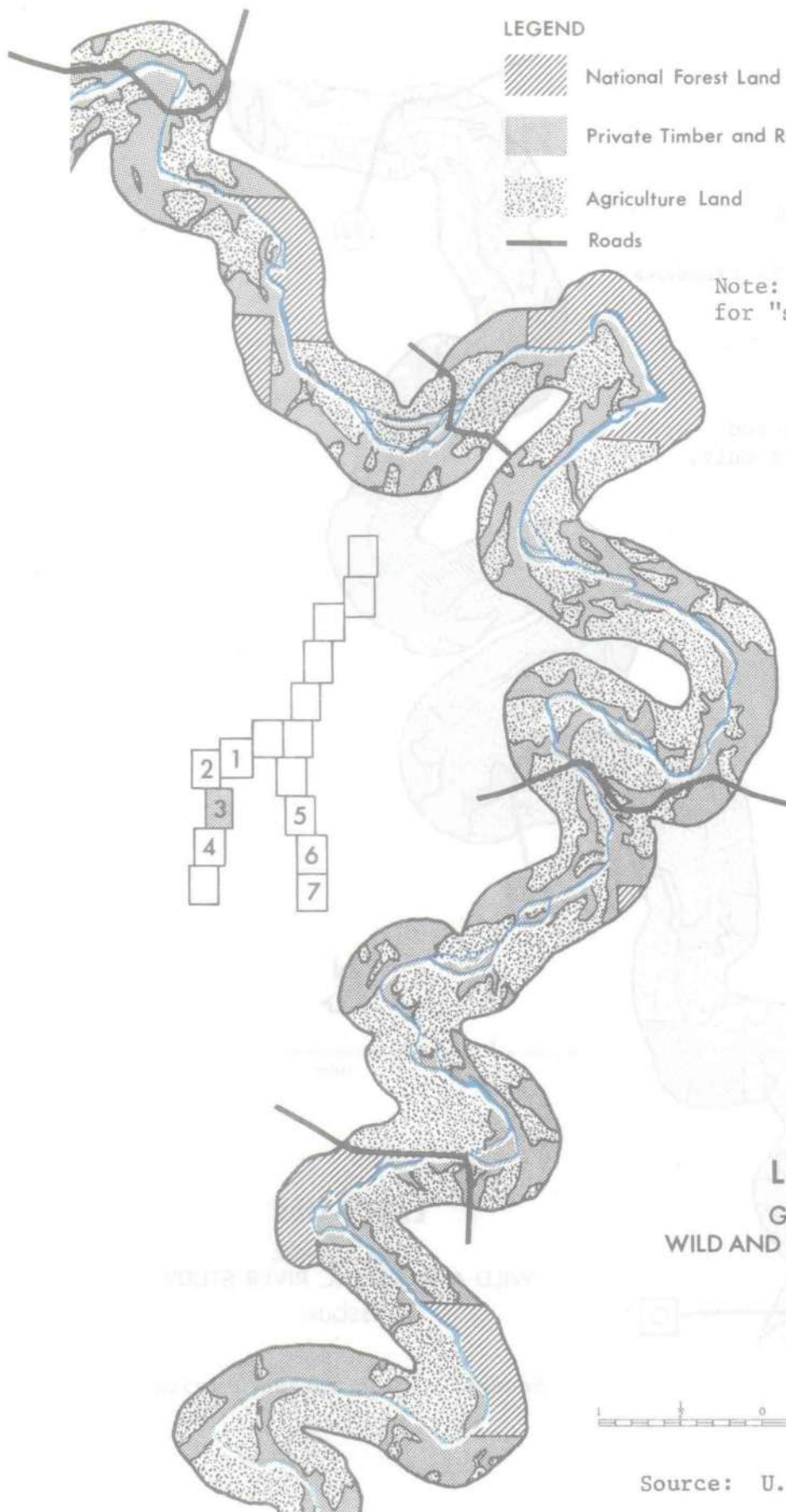
Note: Land use depicted for "scenic" segments only.



Source: U. S. Forest Service



Source: U. S. Forest Service



LEGEND

-  National Forest Land
-  Private Timber and Rural Residence
-  Agriculture Land
-  Roads

Note: Land use depicted
for "scenic" segments only.

LAND USE
GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI

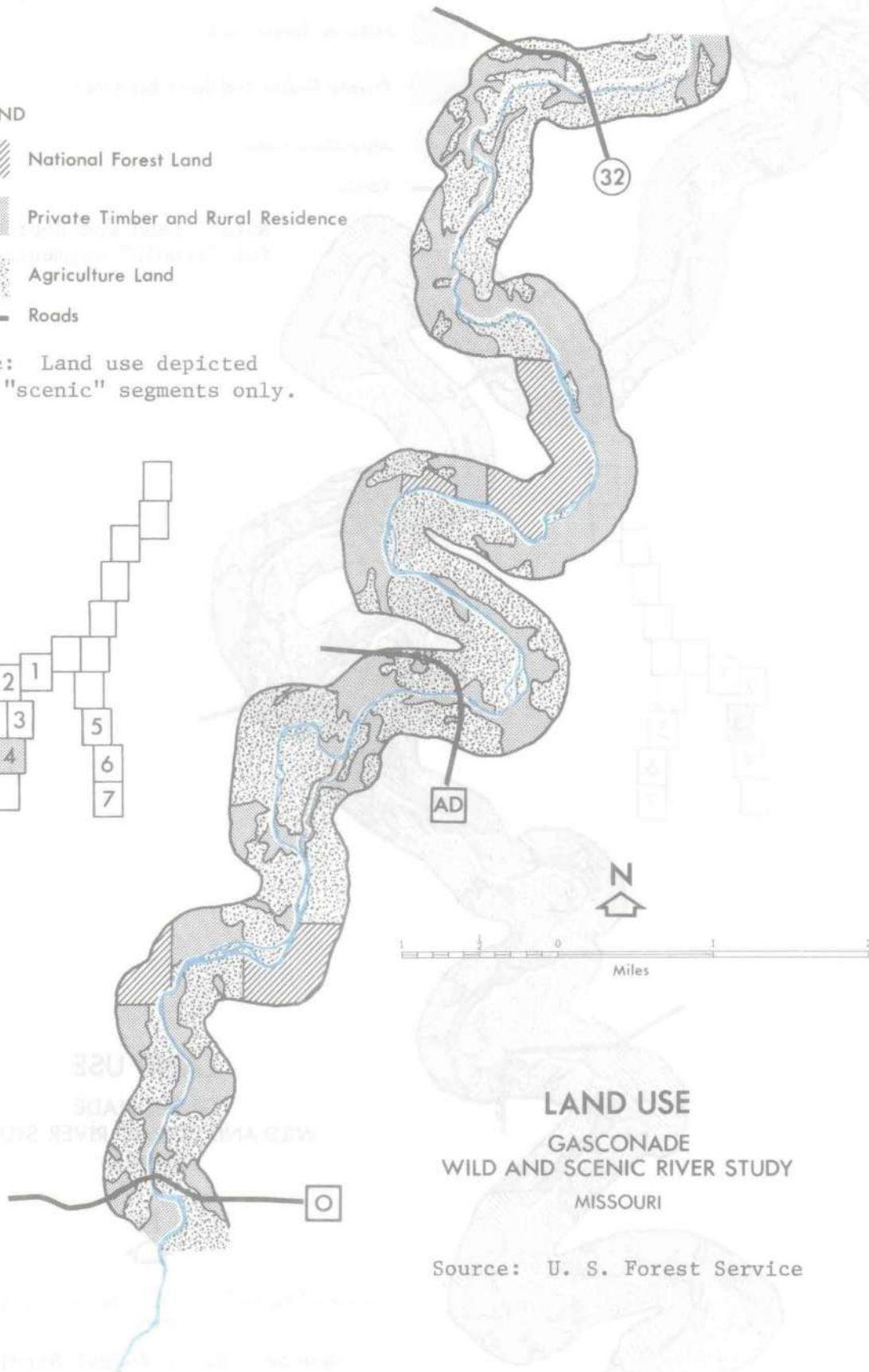
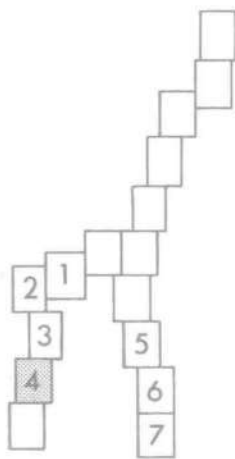


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LEGEND

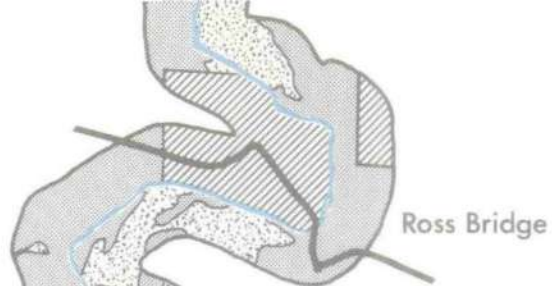
-  National Forest Land
-  Private Timber and Rural Residence
-  Agriculture Land
-  Roads

Note: Land use depicted for "scenic" segments only.



LAND USE GASCONADE WILD AND SCENIC RIVER STUDY MISSOURI

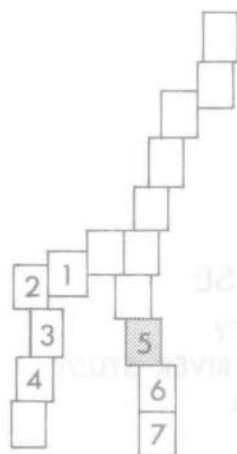
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LEGEND

-  National Forest Land
-  Private Timber and Rural Residence
-  Agriculture Land
-  Roads

Note: Land use depicted for "scenic" segments only.

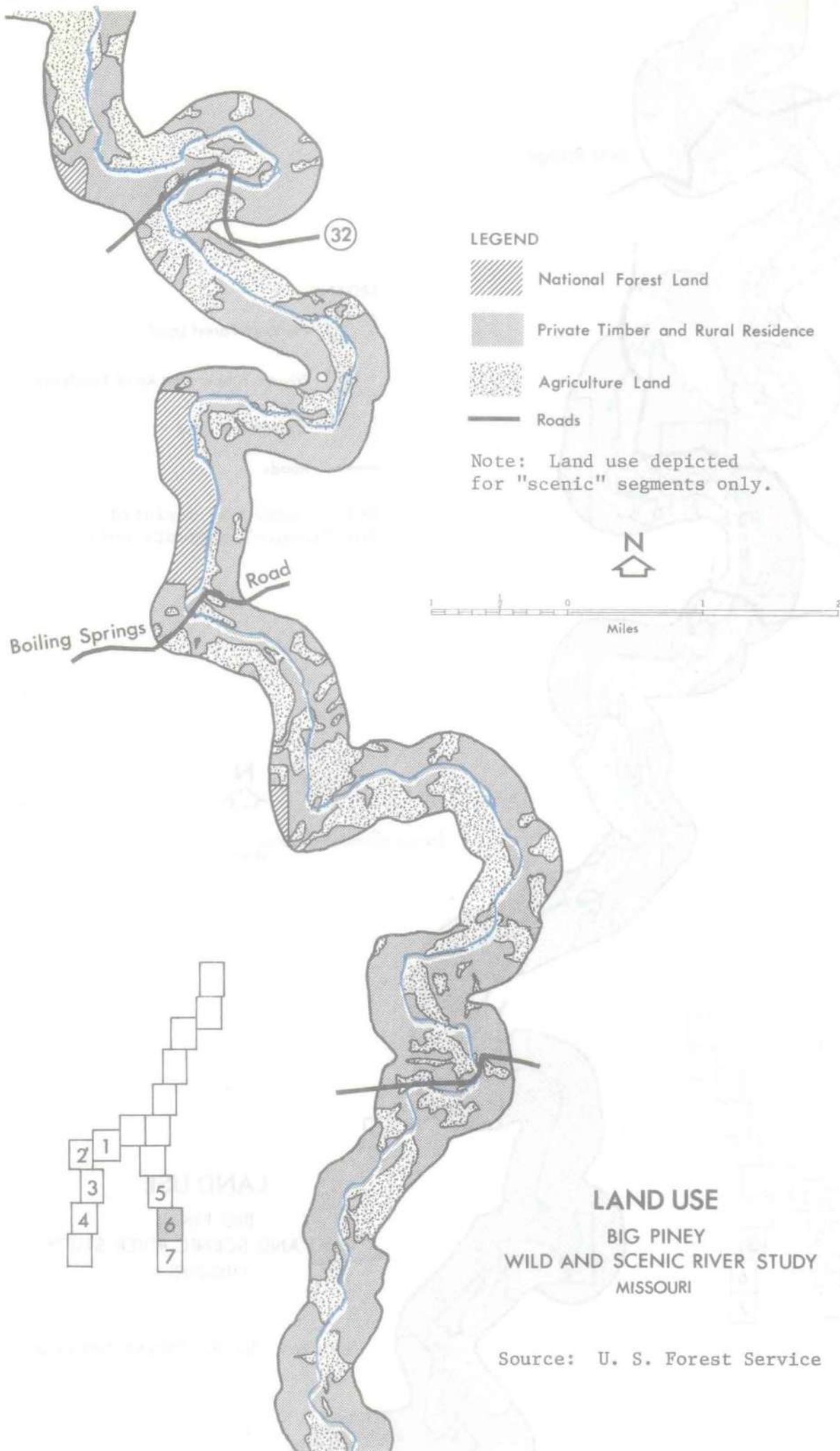


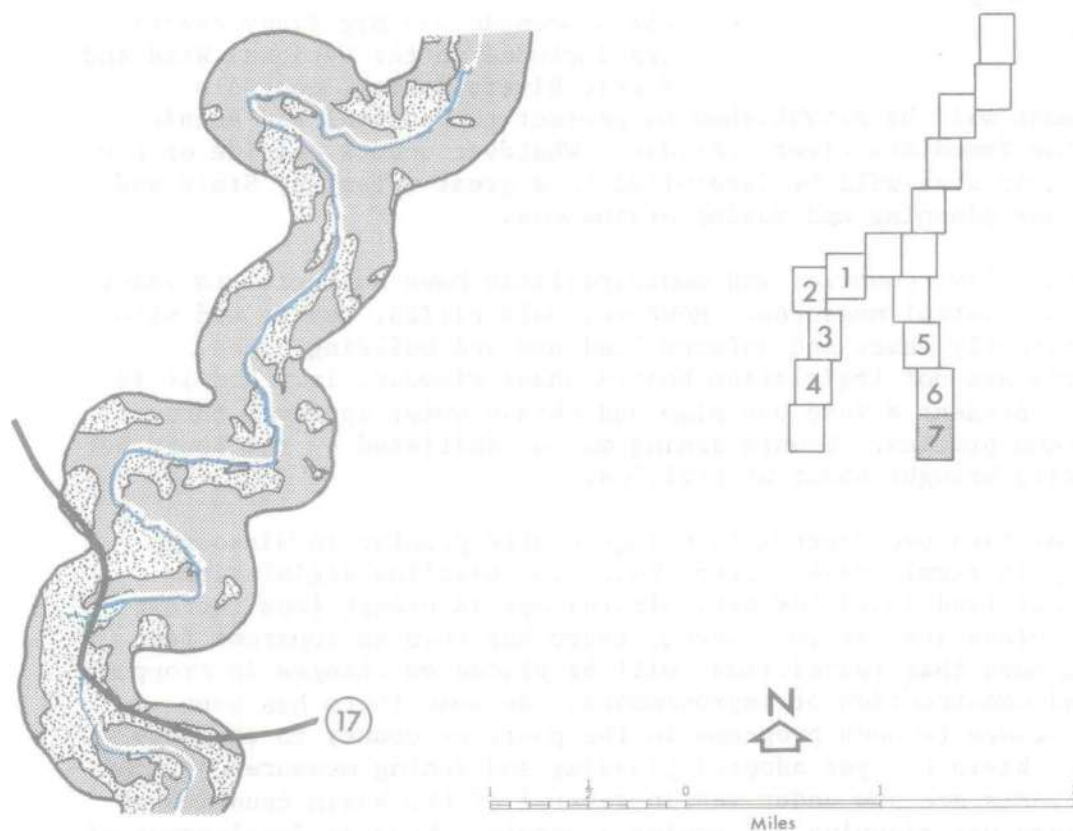
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LAND USE





BIG PINEY
WILD AND SCENIC RIVER STUDY
MISSOURI

Source: U. S. Forest Service





LEGEND

-  National Forest Land
-  Private Timber and Rural Residence
-  Agriculture Land
-  Roads

LAND USE

BIG PINEY
WILD AND SCENIC RIVER STUDY
MISSOURI

Note: Land use depicted
for "scenic" segments only.

Source: U. S. Forest Service

Land Use Planning and Zoning

If the areas classified "scenic" on the Gasconade and Big Piney Rivers are included in the National Wild and Scenic Rivers System, controls

on development will be established to protect the natural and scenic values of the immediate river corridor. Whatever occurs outside of the immediate river area will be determined to a great extent by State and local land use planning and zoning ordinances.

Under Missouri law, counties and municipalities have authority to enact such land use control measures. However, only cities, towns, and villages may directly enact and enforce land use and building codes. County courts are not legislative bodies under Missouri law, and it is necessary to present a land use plan and obtain voter approval through the referendum process. County zoning may be initiated by the court but is customarily brought about by petition.

The theory of land use control is not generally popular in Missouri, particularly in rural areas. Even though the enabling legislation specified that land zoned for agricultural use is exempt from further regulation unless its use is changed, there has been an apparent fear among landowners that restrictions will be placed on changes in cropping patterns and construction of improvements. Because there has been strong resistance to such programs in the past, no county in the Gasconade River basin has yet adopted planning and zoning measures. However, efforts are now under way in several of the basin counties to establish land use planning and zoning controls. Because development of the surrounding area can affect the environmental quality of the river corridor (notably water quality), it is extremely important that proper land use planning and zoning measures be incorporated in these areas. Subdivision regulations can also provide needed controls on residential development.

Water Rights

Missouri water law has two sources--common law which is rules established by the courts in deciding actual controversies and statutory law which is

enacted by the legislature. Although Missouri achieved statehood 150 years ago, there is very little common law or statutory law pertaining to most phases of water use. As observed by the Missouri Supreme Court in 1964:

Missouri is notable for the fact that it has almost no statutory law concerning rights of individual members of the public and of the public generally in public water and watercourses, and such cases as there are based on the common law usually arise from factual situations pertaining to the existence of too much rather than too little water.

In the absence of statutory law delineating water rights and priority of use, the courts have made several determinations relative to public and private ownership and use of surface waters. These determinations were made by applying the riparian doctrine which holds that a person, or group in common, has certain water rights by virtue of owning land which borders the bank of a stream or waterline of a lake. In cases involving private uses, the Missouri courts have followed two approaches in applying the riparian doctrine--that of natural flow and that of reasonable use.

Under the natural flow doctrine, the riparian owner is entitled to the full natural flow of the watercourse on or adjacent to his land, subject only to the decreased flow resulting from "natural uses" by other owners to meet their human wants. Under this theory, a riparian owner may take legal action even if some other user's reduction of stream flow does not interfere with the riparian owner's use of the water. If strictly applied, the "natural flow" theory would strongly restrict most water use and development projects.

Under the reasonable use doctrine, each riparian owner's entitlement to reasonable use of the water in the watercourse is determined by the amount of water available and the uses being made of the water by other riparian owners. This clearly is the doctrine of riparian rights which most courts have adopted and a doctrine which actively encourages use and development of water.

Missouri has never definitely indicated which doctrine of riparian rights is applicable in the State because no decision by the courts has ever required such a determination. Certain language in cases involving obstruction and diversion of water in streams has been couched in "natural flow" terms which has given rise to speculation that the natural flow doctrine either is or would become the law of the State. A recent pronouncement of the Missouri Supreme Court, however, while certainly not a direct holding on the point, indicates that the reasonable use doctrine is in force in Missouri.

The right of a riparian owner in the water of a stream, in jurisdictions wherein the doctrine of riparian rights obtain, include "the right to the flow of the stream in its natural course and in its natural condition in respect of both volume and purity, except as affected by reasonable use by other proprietors."

The Act admitting Missouri to the Union recognizes the Mississippi River, and all navigable waters leading to it, to be common highways and forever free to the citizens of the State and of the United States.

The Missouri Supreme Court has favorably quoted the following:

The test of navigability of a river, as stated by the Supreme Court of the United States, is that those rivers are navigable in law when they are used, or

are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water. Another test is whether, in its ordinary state, a stream or body of water has capacity and suitability for the usual purpose of navigation, ascending or descending, by vessels such as are employed in the ordinary purposes of commerce, whether foreign or inland, and whether steam or sail vessels.

In other cases, the Missouri courts have applied a less rigid test of "navigability" to determine whether the public has an easement of travel in a particular watercourse. As early as 1875 the court recognized the rule that on all rivers not navigable the owner of riparian land is owner of the soil to the thread line of the river "subject to an easement for the public to pass over it with boats, rafts, and rivercraft." Thus, the public right was extended beyond use associated with commercial enterprise.

It has been stressed that it is the capability of use by the public for purposes of commerce, and not the manner and extent of such use, which is crucial in the determination of a stream's navigability.

The foregoing test of navigability is applied in determining whether the bed of the stream is owned by the public or by the adjacent riparian dweller. If the watercourse is navigable under this test, the bed is the property of the public; if not, it is the property of the riparian dweller. Only the largest watercourses have been found to be navigable waters under this definition.

The leading case on this point is *Elder v. Delcour*, decided by the Missouri Supreme Court in 1954. The case established the fact that under the circumstances peculiar to the situation, the Meramec River could be used by the public for any mode of travel, including wading, even though the stream was not navigable in the commercial sense, and the bed was in the ownership of the adjoining landowner. The decision further recognized a public right to reasonable use of the banks and exposed bed of the stream for purposes of portage, picnicking, and repairing equipment. Fishing from the bank, however, was considered trespass on riparian property. The court also recognized liability on the part of the public user for any damage of riparian property.

The 1954 case has established a precedent in Missouri by recognizing an extended right of the public to use waterways for various purposes. It also clearly established the fact that ownership of the water proper is with the State. It is assumed that these trends will continue to be reflected as Missouri water law is developed.

Non-recreational Uses of the Gasconade and Big Piney Rivers

Consumptive water use of the Gasconade River and its tributaries is negligible in comparison to total volumes of flow. There are no municipalities which use any of the streams within

the basin as a source of water supply. Fort Leonard Wood uses the Big Piney River to supplement its supply, but the primary source is from groundwater. With the exception of gravel washing operations, there are no industries known to be using streamflow as a source of water supply. The only agricultural water use identified is for livestock watering. Two fish farming operations located along the Gasconade River utilize some stream flow, but most of the water is returned to the stream.

The Communities of Cabool, Houston, and Licking discharge treated sewage effluent into the Big Piney or its tributaries. Some industrial effluent from Cabool enters the Big Piney. Treated effluent from Fort Leonard Wood is also discharged into a creek tributary of the Big Piney a short distance from the river. Because of adverse effects on water quality caused by these discharges, the Missouri Clean Water Commission ordered that all sewage discharges into the Big Piney and its tributaries be eliminated by December 31, 1973. Compliance with this order has been delayed due to financial difficulties.

Stream corridors of the Gasconade and Big Piney Rivers are primarily used for grazing, field crops, and timber production. Generally, homes and summer cottages are not grouped together along either river in great numbers. However, there tends to be clusters of homes, cottages, and other development near highway crossings and communities along the river. A sizeable low-density housing project is in the early stages of development along the lower reaches of the Big Piney near the confluence of Spring Creek.

The most significant difference between the Gasconade and Big Piney Rivers is the corridor of the Big Piney within Fort Leonard Wood Military Reservation which is used for various types of military training, including the construction of pontoon bridges.

Recreational Uses of the Gasconade and Big Piney Rivers

The Gasconade and Big Piney Rivers offer recreation opportunities as many and varied as the scenic landscape through which they flow.

Although marked scenic routes have not been established within the area, driving for pleasure and sight-seeing along the scenic river valleys are popular recreation activities.

In general, recreation pressure on both rivers can presently be characterized as light to moderate, with the heaviest use occurring on holidays or weekends during the normal recreation season, from May to September. Weekday use during this period is light. As would be expected, floating

and fishing are the most popular activities along both rivers, thus concentrating recreation use at access sites and near road and bridge crossings.

GASCONADE RIVER

Existing and Proposed Recreation Facilities--Most of the public and private recreation facilities located along the Gasconade River are concentrated from Riddle Bridge downstream to the river mouth. The primary public use areas in this river stretch are nine small access sites established by the Missouri Conservation Department. Very few public recreation facilities are located in the upper portions of the river from its headwaters to Riddle Bridge. Four Forest Service, two State, and two private recreation facilities provide public access on this 114-mile stretch.

A major goal of Missouri's Department of Conservation is to assure public access to fishable streams and public lakes. Whenever possible, the Department has established access sites along the river at intervals needed for leisurely one-day float trips, usually eight to 10 miles on most Ozark streams. The 10 access sites which have been developed throughout the Gasconade River range from two to 16 acres in size and offer from 250 to 1,300 feet of river frontage for public use, with boat ramp, parking, and sanitary facilities available at all sites.

Five private areas along the Gasconade provide a variety of recreation facilities and service, including boat ramps, picnic and camping areas, as well as cabin and boat rental, while two private lodges provide recreation facilities for members only. Public and private recreation areas along the Gasconade River are described in Table 21 and their location illustrated on page 173.

Recreation Use, Opportunities, and Limiting Factors--The Gasconade River provides a fine base for a number of recreation activities. To properly discuss the recreational characteristics of the river, it is necessary to divide the river into three separate segments--upper, middle, and lower. As a result of their contrasting physical and man-made characteristics, recreational activities on these three river segments are distinctively different.

Upper River--From the Gasconade River's headwaters to County Highway 0 near Competition, the river may be characterized as a small, shallow, yet relatively undisturbed rural stream. Floating and fishing opportunities here are severely restricted by shallow water areas, especially during mid-summer low water periods. Fishing activities which do occur are limited to stream wading or bank fishing.

From County Highway 0 to the I-44 Interstate Highway, sufficient water flows provide excellent canoeing and fishing opportunities. Float fishing, which originated in the Missouri Ozarks at the turn of the

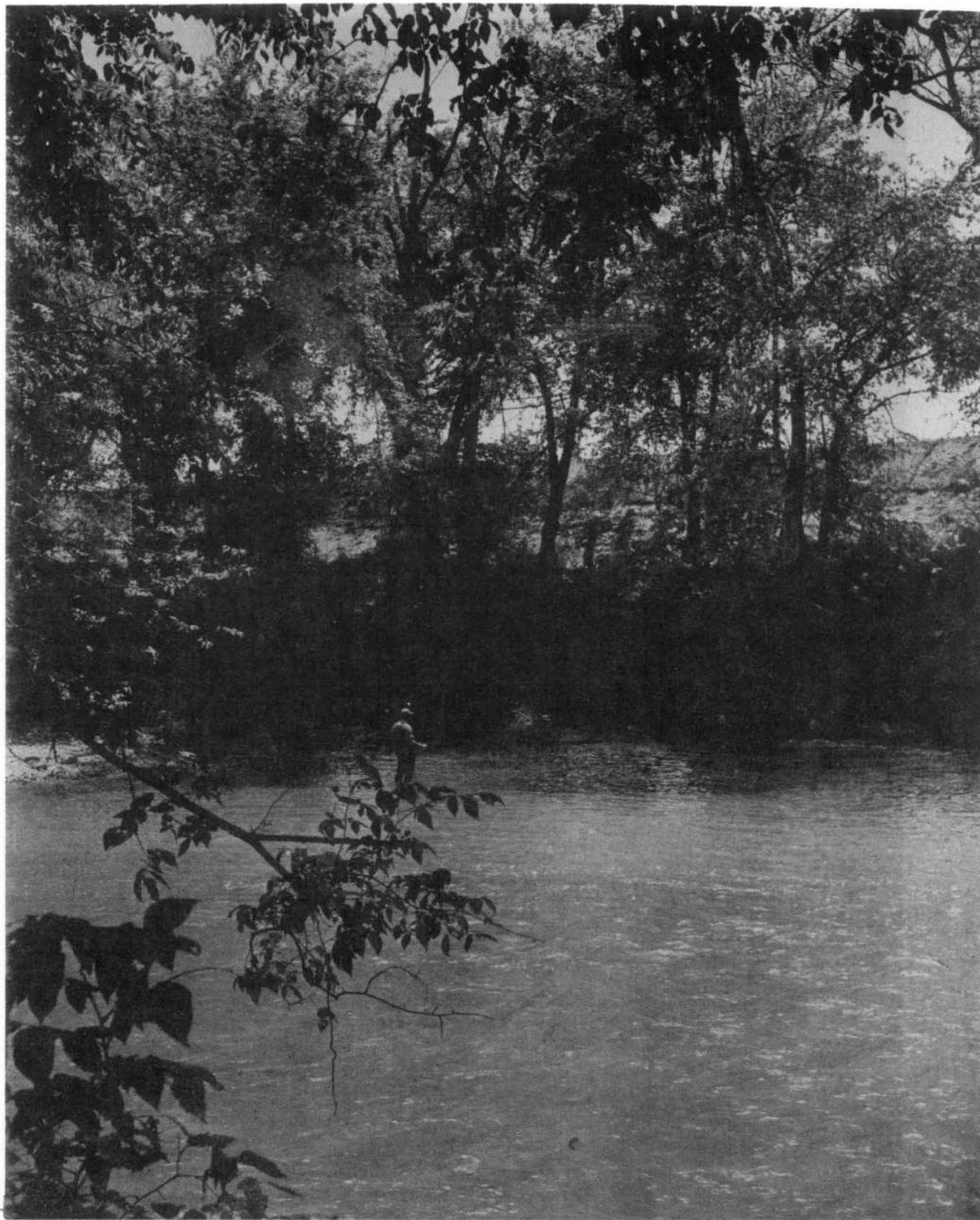


TABLE 21

PUBLIC AND PRIVATE RECREATION AREAS
ALONG THE GASCONADE RIVER

Map Site No.	Name	Agency	River Mile Location	Acres of Land	River Frontage (Feet)	Activities and Services
1.	Mayfield Spring	U. S. Forest Service	220	80	300	F, B
2	Brown Tract	U. S. Forest Service	214	80	300	F, B
3	Dales Float Service	Private	207	--	---	F, B, F, Br, Cr
4	McDaniel Tract	U. S. Forest Service	192	80	2,500	F, B
5	Wright Tract	U. S. Forest Service	189	80	2,000	F, B
6	Hazelgreen	Missouri Department of Conservation	177	2	580	F, B
7	Eden Resort	Private	177	--	---	F, B, C, P, Br, Cr
8	Riddle Bridge	Missouri Department of Conservation	121	9	1,000	F, B
9	R. Hefflin	Private	101	--	---	Br
10	B & S Boat Dock	Private	101	--	---	Br
11	Jerome	Missouri Department of Conservation	99	9.8	575	F, B
12	Sugartree Lodge	Private (Members only)	96	--	---	F, B, Indoor Rec. Activities
13	Nagogami Lodge	Private (Members only)	96	--	---	F, B
14	Bell Chute	Missouri Department of Conservation	85	6.0	500	F, B
15	James Resort	Private (Members only)	80	--	---	C, B, Br, Cr
16	Paydown	Missouri Department of Conservation	65	4.6	250	F, B
17	Rollins Ferry	Missouri Department of Conservation	49	16	1,000	F, B
18	Pointers Creek	Missouri Department of Conservation	41	8.7	1,300	F, B
19	Helds Island	Missouri Department of Conservation	16	9.6	665	F, B
20	Fredericksburg Ferry	Missouri Department of Conservation	8	5.1	900	F, B
21	Gasconade Park	Missouri Department of Conservation	1	2.2	500	F, B

*Activities Code

B - Boating	Cr - Cabin Rental
Br - Boat Rental	F - Fishing
C - Camping	P - Picnicking

U. S. Forest Service

BIG PINEY

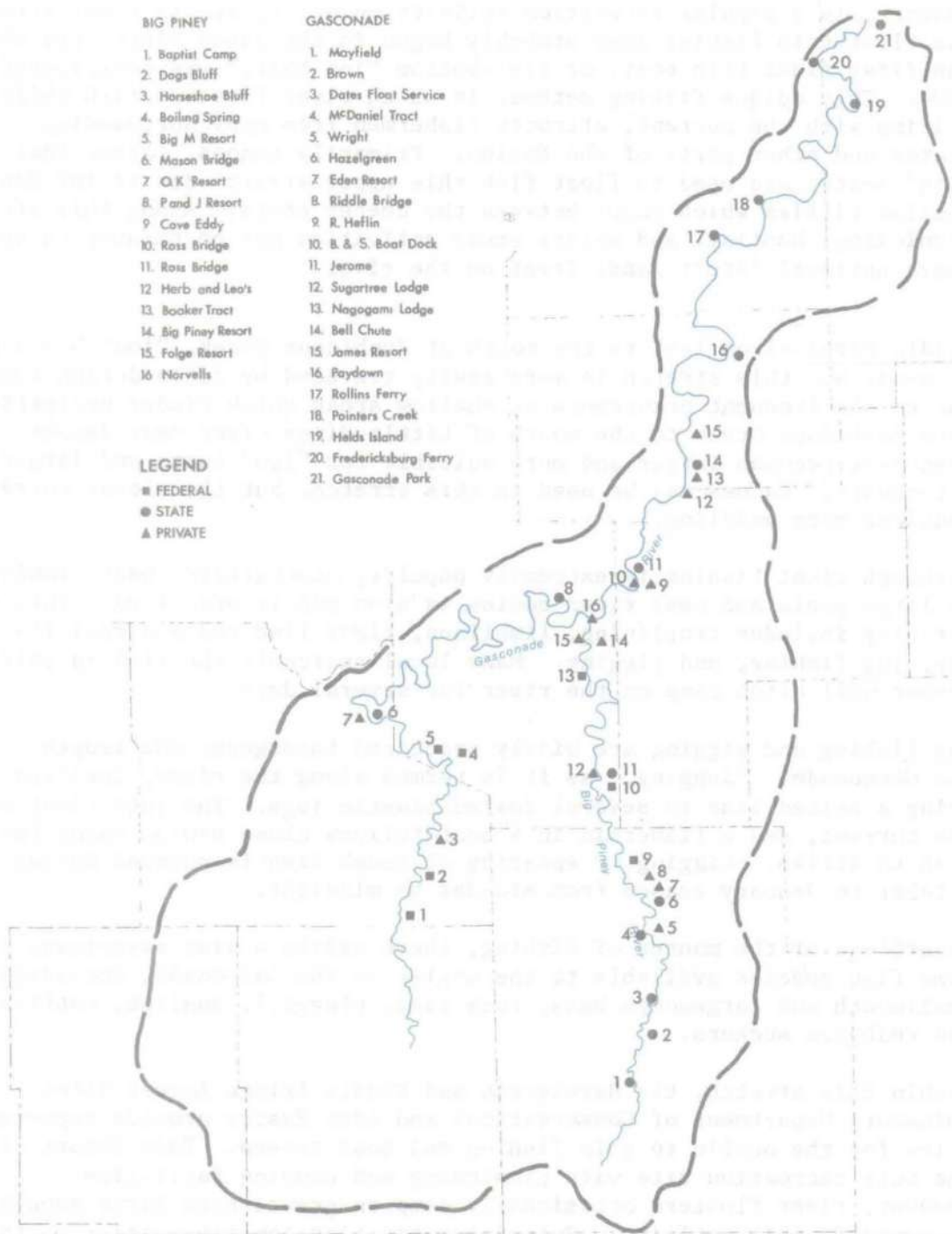
1. Baptist Camp
2. Dogs Bluff
3. Horseshoe Bluff
4. Boiling Spring
5. Big M Resort
6. Mason Bridge
7. O.K. Resort
8. Pand J Resort
9. Cove Eddy
10. Ross Bridge
11. Ross Bridge
12. Herb and Leo's
13. Booker Tract
14. Big Piney Resort
15. Folge Resort
16. Norvells

GASCONADE

1. Mayfield
2. Brown
3. Dates Float Service
4. McDaniel Tract
5. Wright
6. Hazelgreen
7. Eden Resort
8. Riddle Bridge
9. R. Heflin
10. B. & S. Boat Dock
11. Jerome
12. Sugartree Lodge
13. Nagogami Lodge
14. Bell Chute
15. James Resort
16. Paydown
17. Rollins Ferry
18. Pointers Creek
19. Helds Island
20. Fredericksburg Ferry
21. Gasconade Park

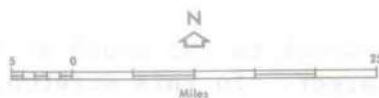
LEGEND

- FEDERAL
- STATE
- ▲ PRIVATE



EXISTING RECREATION FACILITIES

GASCONADE
WILD AND SCENIC RIVER STUDY
MISSOURI



century, is a popular recreation activity on all floatable river stretches. The Float-trip fishing idea probably began in the James River area where the first float trip boat, or flat-bottom "jon boat," was constructed in 1904. This unique fishing method, in which river floaters fish while drifting with the current, attracts fishermen from many surrounding States and other parts of the Nation. Primarily canoes, rather than "jon" boats, are used to float fish this upper stretch due to the many shallow riffles which occur between the deeper pools. Along this stretch picnicking, hunting, and nature study activities may be pursued on areas where national forest lands front on the river.

Middle River--From I-44 to the mouth of Roubidoux Creek, "jon" boats may be used, but this stretch is more easily traveled by canoe during summer due to the frequent occurrence of shallow areas which hinder navigation. From Roubidoux Creek to the mouth of Little Piney Creek near Jerome, the Gasconade becomes larger and more suitable for "jon" boats and larger motorboats. Canoes may be used in this stretch, but the slower current requires more paddling.

Although float fishing is extremely popular, concentrated bait fishing in large pools and near river eddies is also widely practiced. This activity includes trotlining, limblines, tight line rod and reel fishing, jug fishing, and gigging. Many local residents who fish in this manner will often camp on the river for several days.

Jug fishing and gigging are widely practiced throughout the length of the Gasconade. "Jugging," as it is termed along the river, involves tying a baited line to several sealed plastic jugs. The jugs float with the current, and a fisherman in a boat follows close behind ready for a fish to strike. Gigging or spearing of rough fish is pursued during the October to January season from mid-day to midnight.

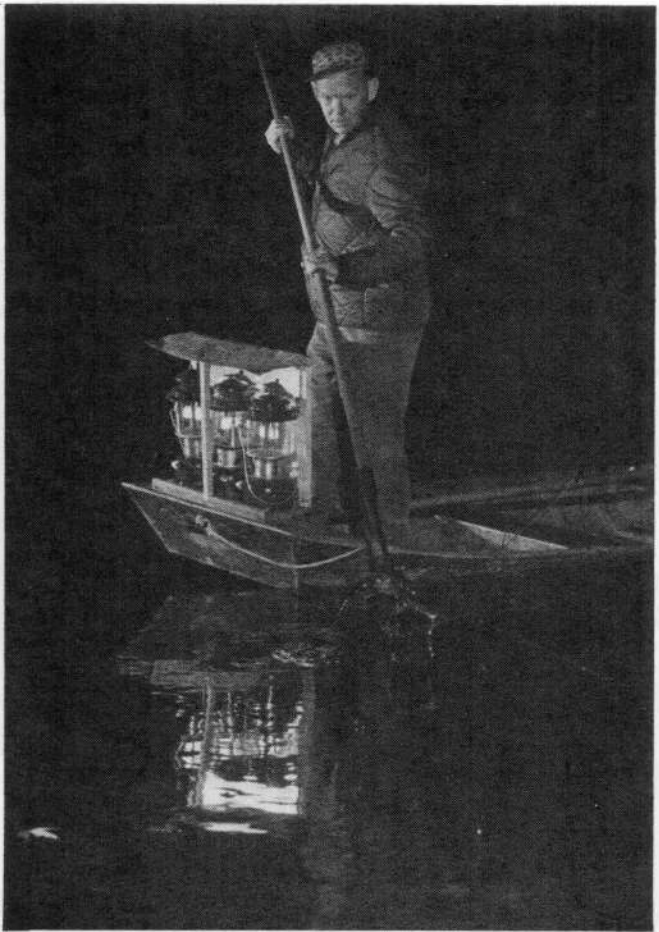
Regardless of the manner of fishing, there exists a wide assortment of game fish species available to the angler in the Gasconade, including smallmouth and largemouth bass, rock bass, bluegill, sunfish, catfish, and redhorse suckers.

Within this stretch, the Hazelgreen and Riddle Bridge Access Sites (Missouri Department of Conservation) and Eden Resort provide opportunities for the public to gain fishing and boat access. Eden Resort is the only recreation site with picnicking and camping facilities. However, river floaters occasionally camp on gravel bars large enough to accommodate this activity. Swimming activities sometimes occur in the deep river pools, especially in areas with gradual sloping banks and river bars.

Lower River--From the mouth of Little Piney Creek to the mouth of the Gasconade, the river becomes increasingly larger. In this stretch, boats with large outboard motors may be used throughout the year. Water-skiing occasionally occurs in the wider portions of the river, and fishing is very popular throughout.



Swimming



Canoeing

Gigging

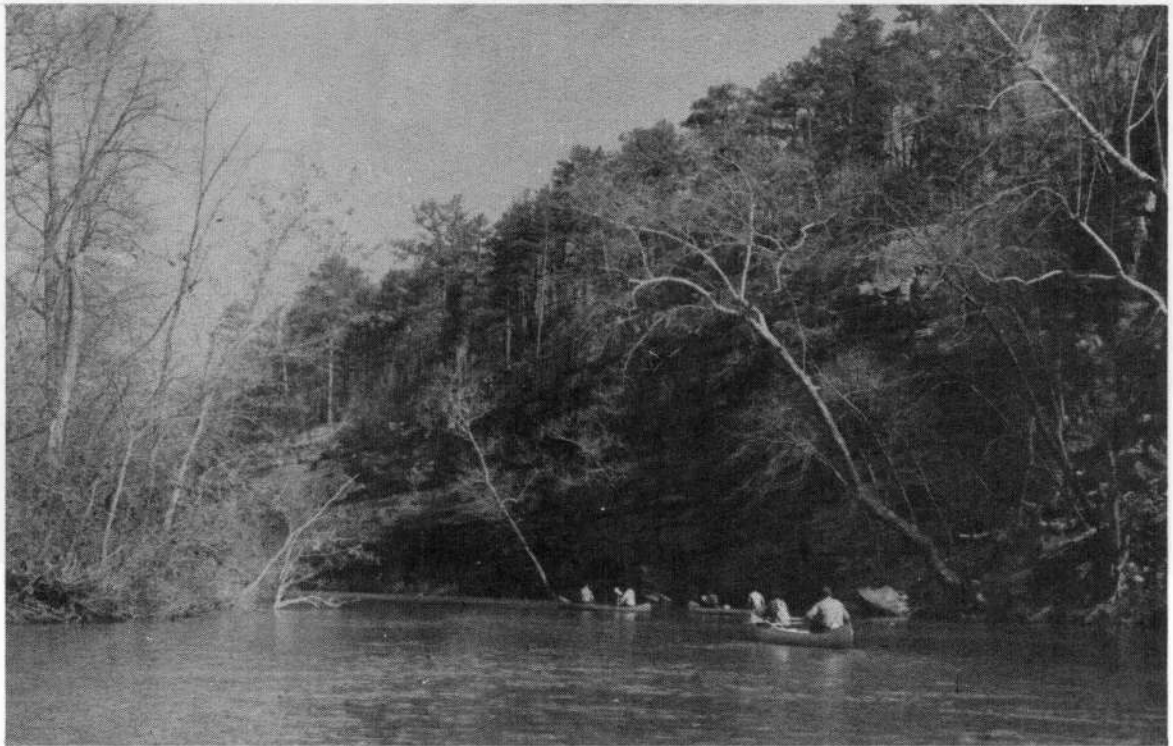


TABLE 22

PUBLIC AND PRIVATE RECREATION AREAS
ALONG THE BIG PINEY RIVER

Map Site No.	Name	Agency	River Mile Location	Acres of Land	River Frontage (Feet)	Activities and Services
1	Baptist Camp	Missouri Dept. of Conservation	86	5	1,000	F, B
2	Dogs Bluff	Missouri Dept. of Conservation	77	3.3	550	F, B
3	Horseshoe Bend	Missouri Dept. of Conservation	72	6.65	600	Presently Undeveloped
4	Boiling Spring	Missouri Dept. of Conservation	61	9.4	2,000	F, B
5	Big M Resort	Private	61	--	--	F, P, C, Br, Cr
6	Mason Bridge	Missouri Dept. of Conservation	55	7.2	400	F, B
7	O. K. Resort	Private	55	--	--	F, B, C, P, Br, Cr
8	P and J Resort	Private	55	--	--	F, B, C, P, Br
9	Cave Eddy	U.S. Forest Serv.	46	22	2,500	F, B, P
10	Ross Bridge	Missouri Dept. of Conservation	31	4.5	600	F, B
11	Ross Bridge	U.S. Forest Serv.	31	15	300	F, B
12	Herb and Lea's	Private	31	--	--	F, B, Br, Cr
13	Booker Tract	U.S. Forest Serv.	8	40	300	F, B
14	Big Piney Resort	Private	4	--	--	F, B, Br, Cr
15	Falge Safari	Private	3	--	--	F, B, C, P, Br Swimming pool outdoor programs
16	Norvell's	Private	0	--	--	F, B

*Activities Code

B - Boating	Cr - Cabin Rental
Br - Boat Rental	F - Fishing
C - Camping	P - Picnicking

Source: U. S. Forest Service

Public boating and fishing access to the river is provided by eight Missouri Department of Conservation Access Sites, Beginning with the Jerome Access Site (See Table 21). Three private facilities--Heflin's, B & S Boat Dock, and the James Resort--provide picnic and camping opportunities and boat rental services.

BIG PINEY RIVER

Existing and Proposed Recreation Facilities--Although numerous public and private recreation facilities exist along the Big Piney River, the river access sites established by the Missouri Conservation Department are the primary public use areas.

Also receiving a substantial amount of use are several Forest Service recreation facilities near the stream. The recently developed 22-acre Cave Eddy Recreation Area, with one-half of river frontage and picnicking, camping, boating, and fishing access facilities, received 1,700 visitor days of use in 1972. Two other undeveloped Forest Service sites furnish road access for fishing and boating activities on the river. In 1971, the Ross Bridge site had an estimated use of 1,400 visitor days. The other area, Booker Tract, located downstream and immediately north of Fort Leonard Wood, accounted for an estimated 1,500 visitor days of use in 1971.

Within Fort Leonard Wood, the Happy Hollow Beach Area provides base personnel with facilities for picnicking and swimming, with the base golf course located nearby. The nearby Stone Mill Spring Area also offers picnic facilities and a very attractive spring with a flow of 10,000,000 gallons a day.

A recently initiated base program provides opportunities for post personnel to float the Big Piney River. The program is sponsored by the Base Sportsman's Center which rents boats and also provides the necessary transportation.

During the 1974-75 period, the Fort plans to develop the Wildcat Shoal Camping Area to be located on the east bank of the river midway between Stone Mill Spring and Happy Hollow Beach. The area's 40 campsites will furnish 20 trailer or tent sites with tables, grills, and water outlets. Another 20 sites will provide water, sewer, and electrical hook-ups. Shower, sanitary, and washer-dryer facilities will be offered in a central building. A scenic overlook to be developed nearby will offer parking facilities, tables, cooking grills, and a picnic shelter.

The Missouri Conservation Department's first river access site in the State was acquired in 1957 through the donation of Ross Bridge Access on the Big Piney River. Since then, five other river access sites have been established along the Big Piney. Except for the Horseshoe Bend site, all areas provide parking, boat launching, fishing access, and sanitary facilities. The recently acquired Horseshoe Bend site is

undeveloped, but has excellent development potential. The access sites range from three to 10 acres in size and offer from 400 to 2,000 feet of river frontage for public use.

Seven private recreation facilities located along the Big Piney offer a wide array of recreation facilities, such as boat and cabin rental, camping, and picnicking. Some areas offer more highly developed recreation facilities than others, such as the Falge Safari with a swimming pool and an outdoor recreation program. The map on page 173 and Table 22 on page 176 describe the location of the private and public recreation areas along the Big Piney and the facilities available at each.

Recreation Use, Opportunities, and Limiting Factors--The many recreation opportunities provided by the Big Piney River are best described by dividing the river into three separate segments--upper, middle, and lower. Each segment has its own distinctive physical and man-made characteristics which either limit or enhance recreation opportunities and use.

Upper River--From the Town of Cabool to the Dogs Bluff Access Site, the river is a small, shallow stream with low water flow during the recreation season which limits floating and fishing opportunities. Due to the shallow waters, fishing is primarily accomplished by either wading the deeper pools or by fishing from a bank. The small size of the river limits the fish population and, in turn, the amount of fishing pressure this stretch can endure.

Effluent discharge into the Big Piney and its tributaries from the Communities of Licking, Houston, and Cabool, as well as industrial discharges, have adversely affected the water quality and thus the quality of recreation experience available in this segment. Large stretches of stream have been reported thick with slime and algae in this area as a result of the discharges. All parties were ordered by the Missouri Clean Water Commission to cease all effluent discharge into the stream or its tributaries by December 31, 1973. Compliance has been delayed.

A recent toxic chemical spill in the Big Piney provided still another example of how pollution can limit recreation opportunities--in this instance, sport fishing. The spill, which occurred in November 1972, several miles downstream from Cabool, resulted in a massive kill of nearly 150,000 fish and seven to eight miles of the Big Piney River being declared biologically "dead."

Although this portion of the river does not provide significant recreation opportunities, its potential impact on water quality for recreation purposes downstream is extremely important.

Middle River--Between Dog's Bluff access site and the southern boundary of Fort Leonard Wood, the Big Piney reveals why it is rated one of the best fishing streams in the State. A number of sport fish species are available, including smallmouth and largemouth bass, rock bass, sunfish, bluegill, and redhorse suckers.

Every year since 1963, a creel census study has been conducted by the Conservation Department from March 15 to November 30 between Dogs Bluff and Ross Bridge access sites--44 miles of river, covering 700 surface acres. The results presented in Table 23 on page 180 verify the intensive fishing pressure on this area, which in 1971 amounted to an estimated 49.4 hours of fishing on each surface acre. Since 1963, the number of nonfloating fishing trips has substantially decreased, while the number of float fishing trips has rapidly increased and is now the most popular method for fishing the Big Piney.

The Big Piney River is considered marginal for floating during extremely low water conditions in the stretch from the Baptist Camp Access Site to a short distance below the Dogs Bluff Access Site. Below Dogs Bluff, the Big Piney is considered suitable for year-round floating. Here several stretches with fast riffles and sharp turns result in a challenge and an enjoyable trip for the amateur canoeist.

A number of gravel bars in this segment are large enough for use as camping or picnicking sites. For those who prefer more facility conveniences, seven public and four private recreation areas are available from Dogs Bluff to Ross Bridge (see Table 22 for description of the areas and recreation opportunities provided).

Lower River--Portions of the river segment from Ross Bridge to the mouth of Big Piney offer good fishing and, in most instances, floating opportunities similar to the middle river segment.

Inside Fort Leonard Wood, Stone Mill Spring provides an excellent trout fishery as a result of the Conservation Department's annual stocking program. Anglers are also afforded the opportunity to hook bass, bluegill, and channel catfish.

Throughout this segment, sufficient water flows exist for river floating. Two dams constructed on the river within Fort Leonard Wood can present problems for the river floater. Encountered first is a low concrete rubble dam constructed for the base's water plant intake. During high water this dam may be floated, but during low or normal water flows the adjacent steep riverbanks prohibit portaging and require that boats be walked through the dam.

Further downstream, a portage is required around a second dam which backs up water for training military personnel in pontoon bridge construction. Training sessions of this type occur only occasionally, but their occurrence can cause river travelers to be delayed.

Most day-use recreation facilities on Fort Leonard Wood, including the picnic and swimming areas and the base golf course, are primarily for the use of military and civilian base personnel.

One public (Forest Service) and three private recreation areas on this stretch provide fishing, boating, picnicking, camping, and swimming opportunities.

TABLE 23

CREEL CENSUS SUMMARY 1963-1971

	1963	1964	1965	1966	1967	1968	1969	1970	1971
Number of fishermen interviewed	2,234	2,111	1,828	2,074	1,818	1,584	1,835	1,746	1,756
Trips, Total	5,330	5,103	4,295	4,831	4,660	4,014	6,527	5,444	6,191
Nonfloat	3,001	2,057	1,761	1,318	1,427	987	1,228	1,562	1,332
Commercial float	812	1,073	680	894	999	907	1,498	1,171	1,375
Private float	1,517	1,973	1,854	2,619	2,234	2,120	3,801	2,711	3,464
Man hours, estimated total	31,165	29,881	23,710	28,572	25,737	24,201	29,610	30,187	34,584
Nonfloat	13,553	8,202	6,438	5,260	5,253	4,145	4,223	5,874	5,016
Commercial float	6,163	7,807	5,655	6,430	7,511	6,459	7,769	7,243	9,120
Private float	11,449	13,872	11,617	16,882	12,973	13,597	17,618	17,070	20,448
Catch rate, fish per hour, combined	0.60	0.51	0.60	0.59	0.55	0.60	0.50	0.59	0.49
Nonfloat	0.77	0.67	0.71	0.76	0.79	0.84	0.76	0.81	0.97
Commercial float	0.47	0.31	0.48	0.44	0.40	0.42	0.34	0.35	0.24
Private float	0.52	0.53	0.59	0.59	0.54	0.62	0.51	0.61	0.60
Fishing pressure, hours per acre	44.5	42.3	33.9	40.8	36.8	34.6	42.3	43.1	49.4

¹Based on 700 river surface acres from Dogs Bluff to Ross Bridge access sites (44.0 river miles)

Source: Missouri Department of Conservation.

Fort Leonard Wood's discharge of three to four million gallons of treated waste water a day into Dry Creek which empties into the Big Piney is detrimental to the recreational quality of the river. The discharges have aggravated the problem of excessive nutrients in the Big Piney and Gasconade Rivers causing aquatic vegetation to flourish and form a thick green carpet on the surface of the rivers. Under these conditions, fishing and boating opportunities become extremely limited, and the river's scenic quality is severely impaired. Plans are being developed by Fort Leonard Wood authorities to correct this situation.

Future Recreation Use and Limiting Factors on the Gasconade and Big Piney Rivers--According to the Missouri State Outdoor Recreation Plan, by 1985 the State's population is expected to increase by 19 percent, but demands for outdoor recreation are expected to increase at rates nearly twice that of the population.

In addition, as overcrowding at recreational developments in adjacent, better known basins occurs, increased demands will be made on the recreation resources of the Gasconade and Big Piney Rivers. Thus, even without designating the Gasconade and Big Piney as components of the National Wild and Scenic Rivers System, pressures for increased recreational use of these rivers are expected. Publicity associated with inclusion of the rivers in the National System could increase the demand to use the rivers beyond the normal projected increase. Whether or not this increased use would eventually impair the present high quality recreation experience provided by the rivers depends on future efforts to limit and control use. Development and management guidelines for rivers within the National System are designed to provide necessary user control.

Shoreline development and, to a lesser extent, water quality are now the most serious limiting factors affecting recreational use. Along the middle and lower portions of the Gasconade and the lower portion of the Big Piney excessive amounts of streamside home, cottage, and other shoreline developments, some in poor condition, often destroy the visual portion of a river user's recreation experience. Municipal, domestic, and other sewage effluent discharges have produced exorbitant algae growth on the upper Big Piney and excessive aquatic plant production on the lower Big Piney and middle portion of the Gasconade during summer months. Algae growth reduces the recreational experience, and fishing, boating, and other activities are physically restricted by the aquatic plant growth.

The present amount of shoreline development and water quality problems indicates both factors could affect river values in the future unless corrective measures and controls are soon established.

Low water flows limit water-oriented recreation only in the upper reaches of both rivers and do not seriously limit recreation opportunities in other river areas. Similarly, the few commercial sand and

gravel dredging operations which now exist do not presently affect river recreation opportunities.

In the past, vandalism and littering have occurred at some of the public river access sites located near major highways. This type of problem is common to many recreation areas which are within a convenient driving distance of major transportation routes.

X. APPENDIXES

APPENDIX A

Population of SMSA's Within a 250-Mile Radius

	<u>1970¹</u>	<u>2020²</u>
St. Louis, Mo. & Ill.	2,363,017	3,020,200
St. Joseph, Missouri	86,915	81,900
Kansas City, Mo. & Kans.	1,253,916	2,092,000
Springfield, Mo.	152,929	255,200
Springfield, Ill.	161,335	308,700
Decatur, Ill.	125,010	231,100
Champaign-Urbana, Ill.	163,281	237,900
Bloomington-Normal, Ill.	104,389	165,600
Peoria, Ill.	341,979	484,000
Davenport-Rock Island, Moline	362,638	416,200
Terre Haute, Ind.	175,143	214,300
Topeka, Kan.	155,322	247,400
Wichita, Kan.	389,352	383,000
Fort Smith, Ark. & Olk.	160,421	236,300
Des Moines, Iowa	286,101	451,100
Cedar Rapids, Iowa	163,213	229,100
Tulsa, Okl.	476,945	671,600
Memphis, Tenn.	770,120	1,283,000
Lincoln, Neb.	167,972	248,700
Omaha, Neb-Ia.	540,142	803,000
Little Rock, Ark.	323,296	604,900
Evansville, Ind.-Ky.	232,775	366,200

¹1970 Census, Bureau of the Census

²OBERS Projections, Series E, April 1974, U. S. Water Resources Council.

APPENDIX B

FAUNA*

AMPHIBIANS

<u>Common Name</u>	<u>Scientific Name</u>
American toad	<u>Bufo americanus americanus</u>
Blanchard's cricket frog	<u>Acris crepitans blanchardi</u>
Bronze frog	<u>Rana clamitans clamitans</u>
Bullfrog	<u>Rana catesbeiana</u>
Cave salamander	<u>Eurycea lucifuga</u>
Central newt	<u>Diemictylus viridescens</u>
	<u>louisianensis</u>
Dark-sided salamander	<u>Eurycea longicauda melanopleura</u>
Dwarf american toad	<u>Bufo americanus charlesmithi</u>
Eastern gray treefrog	<u>Hyla versicolor versicolor</u>
Eastern spadefoot	<u>Scaphiopus holbrooki</u>
Eastern tiger salamander	<u>Ambystoma tigrinum tigrinum</u>
Four-toed salamander	<u>Hemidactylium scutatum</u>
Fowlers toad	<u>Bufo woodhousei fowleri</u>
Great plains narrow-mouthed toad	<u>Gastrophryne olivacea olivacea</u>
Green frog	<u>Rana clamitans melanota</u>
Grotto salamander	<u>Typhlotriton spelaeus</u>
Hellbender	<u>Cryptobranchus alleganiensis</u>
	<u>allenganiensis</u>
Long tailed salamander	<u>Eurycea longicauda longicauda</u>
Marbled salamander	<u>Ambystoma opacum</u>
Mud puppy	<u>Necturus maculosus maculosus</u>
Northern crayfish frog	<u>Rana areolata circulos</u>
Northern leopard frog	<u>Rana pipiens pipiens</u>
Northern spring peeper	<u>Hyla crucifer crucifer</u>
Ozark blind salamander	<u>Typhlotriton spelaeus</u>
Pickerel frog	<u>Rana palustris</u>
Plains spadefoot	<u>Scaphiopus bombifrons</u>
Red-backed salamander	<u>Plethodon cinereus cinereus</u>
Ringed salamander	<u>Ambystoma annulatum</u>
Slimy salamander	<u>Plethodon glutinosus glutinosus</u>
Small-mouthed salamander	<u>Ambystoma texanum</u>
Southern leopard frog	<u>Rana pipiens sphenocephala</u>
Spotted salamander	<u>Ambystoma maculatum</u>
Western chorus frog	<u>Pseudacris triseriata triseriata</u>
Western lesser siren	<u>Siren intermedia nettingi</u>
Wood frog	<u>Rana sylvatica</u>

*From Appendix E, Meremac Park Environmental Statement, U.S. Army Corps of Engineers. Most of the fauna in the Meremac River basin also inhabit the Gasconade River basin.

REPTILES

<u>Common Name</u>	<u>Scientific Name</u>
Alligator snapping turtle	<u>Macrolemys temmincki</u>
Black rat snake	<u>Elaphe obsoleta obsoleta</u>
Broad-headed skink	<u>Eumeces laticeps</u>
Bull snake	<u>Pituophis melanoleucus sayi</u>
Common snapping turtle	<u>Chelydra serpentina serpentina</u>
Diamond-backed water snake	<u>Natrix rhombifera rhombifera</u>
Eastern coachwhip	<u>Masticophis flagellum flagellum</u>
Eastern colloared lizard	<u>Crotaphytus collaris collaris</u>
Eastern garter snake	<u>Thamnophis sirtalis sirtalis</u>
Eastern hognose snake	<u>Heterodon platyrhinos</u>
Eastern yellow-bellied racer	<u>Coluber constrictor flaviventris</u>
Five-lined skink	<u>Eumeces fasciatus</u>
Grahams water snake	<u>Natrix grahami</u>
Great plains rat snake	<u>Elaphe guttata emoryi</u>
Ground skink	<u>Lygosoma laterale</u>
Map turtle	<u>Gratemys geographica</u>
Midland brown snake	<u>Storeria dykayi wrightorum</u>
Mississippi map turtle	<u>Gratemys kohni</u>
Northern copperhead	<u>Agkistrodon contortrix mokeson</u>
Northern fence lizard	<u>Sceloporus undulatus hyacinthinus</u>
Northern flat-headed snake	<u>Tantilla gracilis hallowelli</u>
Northern lined snake	<u>Tropidoclonion lineatum lineatum</u>
Northern red-bellied snake	<u>Storeria occipitomaculata</u>
	<u>occipitomaculata</u>
Northern water snake	<u>Natrix sipedon sipedon</u>
Ornate box turtle	<u>Terrapene ornata ornata</u>
Quachita map turtle	<u>Gratemys pseudogeographica</u>
	<u>ouachitensis</u>
Prairie king snake	<u>Lampropeltis calligaster calligaster</u>
Prairie ringneck snake	<u>Diadophis punctatus arnyi</u>
Red-eared turtle	<u>Pseudemys scripta elegans</u>
Red milk snake	<u>Lampropeltis doliaata sypila</u>
Rough earth snake	<u>Haldea striatula</u>
Rough green snake	<u>Opheodrys aestivus</u>
Scarlet Snake	<u>Cemophora coccinea</u>
Six-lined racerunner	<u>Cnemidophorus sexlineatus</u>
Smooth soft-shelled turtle	<u>Trionyx mutica mutica</u>
Southern coal skink	<u>Eumeces anthracinus pluvialis</u>
Speckled king snake	<u>Lampropeltis getulus holbrookii</u>
Stinkpot	<u>Sternothaerus odoratus</u>
Texas brown snake	<u>Storeria dekayi texana</u>
Three-toed box turtle	<u>Terrapene carolina triunguis</u>
Timber rattlesnake	<u>Crotalus horridus horridus</u>
Western pigmy rattlesnake	<u>Sistrurus miliarius streckeri</u>
Western painted turtle	<u>Chrysemys picta belli</u>
Western ribbon snake	<u>Thamnophis sauritus proximus</u>
Western slender glass lizard	<u>Ophisaurus attenuatus attenuatus</u>
Western spiney soft-shelled turtle	<u>Trionyx spinifer hartwegi</u>
Western earth snake	<u>Haldea valeriae elegans</u>
Western worm snake	<u>Carphophis amoenus vermis</u>

MAMMALS

<u>Common Name</u>	<u>Scientific Name</u>
Badger	<u>Taxidea taxus</u>
Beaver	<u>Castor canadensis</u>
Big brown bat	<u>Eptesicus fuscus</u>
Black bear	<u>Ursus americanus</u>
Black rat	<u>Rattus rattus</u>
Bobcat	<u>Lynx rufus</u>
Common cotton rat	<u>Sigmodon hispidus</u>
Cottontail rabbit	<u>Sylvilagus floridanus</u>
Coyote	<u>Canis latrans</u>
Eastern chipmunk	<u>Tamias striatus</u>
Eastern cottontail rabbit	<u>Sylvilagus floridanus</u>
Eastern fox squirrel	<u>Sciurus niger</u>
Eastern gray squirrel	<u>Sciurus carolinensis</u>
Eastern big-eared bat	<u>Corynorhinus macrotis</u>
Eastern lump-nosed bat	<u>Corynorhinus macrotis</u>
Eastern mole	<u>Scalopus aquaticus</u>
Eastern pipistrelle	<u>Pipistrellus subflavus</u>
Eastern wood rat	<u>Neotoma floridana</u>
Evening bat	<u>Nycticeius humeralis</u>
Franklins ground squirrel	<u>Citellus franklinii</u>
Fulvous harvest mouse	<u>Reithrodontomys fulvescens</u>
Golden mouse	<u>Peromyscus nuttalli</u>
Gray bat	<u>Myotis trisescens</u>
Gray fox	<u>Urocyon cinereoargenteus</u>
Groundhog	<u>Marmota monax</u>
Hoary bat	<u>Lasiurus cinereus</u>
House mouse	<u>Mus musculus</u>
Indiana bat	<u>Myotis sodalis</u>
Keens bat	<u>Myotis keenii</u>
Least bat	<u>Myotis subulatus</u>
Least shrew	<u>Cryptotis parva</u>
Little brown bat	<u>Myotis lucifugus</u>
Long-Tailed weasel	<u>Mustela frenata</u>
Meadow jumping mouse	<u>Zapus hudsonius</u>
Mink	<u>Mustela vison</u>
Mountain lion	<u>Felis concolor</u>
Muskrat	<u>Ondatra zibethicus</u>
Norway rat	<u>Rattus norvegicus</u>
Opossum	<u>Didelphis marsupialis</u>
Pine Vole	<u>Microtus pinetorum</u>
Plains pocket gopher	<u>Geomys bursarius</u>
Prairie Vole	<u>Microtus ochrogaster</u>
Prairie white-footed mouse	<u>Peromyscus maniculatus</u>
Raccoon	<u>Procyon lotor</u>
Red bat	<u>Lasiurus borealis</u>
Red fox	<u>Vulpes fulva</u>
Red wolf	<u>Canis niger</u>
River otter	<u>Lutra canadensis</u>

Common NameScientific Name

Short-tailed shrew
Silver-haired bat
Small-footed myotis
Southern flying squirrel
Southern lemming mouse
Spotted skunk
Striped skunk
Thirteen-lined ground squirrel
Western harvest mouse
Western lump-nosed bat
White-tailed deer
Woodland white-footed mouse
Woodchuck

Blarina brevicauda
Lasionycteris noctivagans
Myotis subulatus
Glaucomys volans
Synaptomys cooperi
Spilogale putorius
Mephitis mephitis
Citellus tridecemlineatus
Reithrodontomys megalotis
Corynorhinus rafinesquii
Odocoileus virginianus
Peromyscus leucopus
Marmota monax

BIRDS

<u>Common Name</u>	<u>Scientific Name</u>
Acadian flycatcher	<u>Empidonax virescens</u>
American avocet	<u>Recurvirostra americana</u>
American bittern	<u>Botaurus lentiginosus</u>
American coot	<u>Fulica americana</u>
American golden plover	<u>Pluvialis dominica</u>
American goldfinch	<u>Spinus tristis</u>
American redstart	<u>Setophaga ruticilla</u>
American widgeon	<u>Mareca americana</u>
American woodcock	<u>Philohela minor</u>
Bachman's sparrow	<u>Aimophila aestivalis</u>
Baird's sandpiper	<u>Erolia bairdii</u>
Bald eagle	<u>Haliaeetus leucocephalus</u>
Baltimore oriole	<u>Icterus galbula</u>
Bank swallow	<u>Riparia riparia</u>
Barn owl	<u>Tyto alba</u>
Barred owl	<u>Strix varia</u>
Barn swallow	<u>Hirundo rustica</u>
Bay-breasted warbler	<u>Dendroica castanea</u>
Bell's vireo	<u>Vireo belli</u>
Belted kingfisher	<u>Megasceryle alcyon</u>
Bewicks wren	<u>Thryomanes bewickii</u>
Bobolink	<u>Dolichonyx oryzivorus</u>
Bobwhite quail	<u>Colinus virginianus</u>
Bohemian waxwing	<u>Bombycilla garrulus</u>
Bonaparte's gull	<u>Larus philadelphia</u>
Brewer's blackbird	<u>Euphagus cyanocephalus</u>
Broad-winged hawk	<u>Buteo platypterus</u>
Brown creeper	<u>Certhia familiaris</u>
Brown-headed cowbird	<u>Molothrus ater</u>
Brown thrasher	<u>Toxostoma refum</u>
Buff breasted sandpiper	<u>Tryngites subruficollis</u>
Bufflehead	<u>Bucephala albeola</u>
Black and white warbler	<u>Mniotilta varia</u>
Black-bellied plover	<u>Squatarola squatarola</u>
Black-billed cockoo	<u>Coccyzus erythrophthalmus</u>
Blackburnian warbler	<u>Dendroica fusca</u>
Black-crowned night heron	<u>Nycticorax nycticorax</u>
Black duck	<u>Anas rubripes</u>
Black-legged kittiwake	<u>Rissa tridactyla</u>
Black-necked stilt	<u>Himantopus mexicanus</u>
Blackpoll warbler	<u>Dendroica striata</u>
Black rail	<u>Laterallus jamaicensis</u>
Black tern	<u>Chlidonias niger</u>
Black-throated blue warbler	<u>Dendroica coerulescens</u>
Black-throated green warbler	<u>Dendroica virens</u>
Blue jay	<u>Cyanocitta cristata</u>
Blue-gray gnatcatcher	<u>Polioptila caerulea</u>

<u>Common Name</u>	<u>Scientific Name</u>
Blue goose	<u>Chen caerulescens</u>
Blue grosbeak	<u>Guiraca caerulea</u>
Blue-winged teal	<u>Anas discors</u>
Blue-winged warbler	<u>Vermivora pinus</u>
Canada goose	<u>Branta canadensis</u>
Canada warbler	<u>Wilsonia canadensis</u>
Canvasback	<u>Aythya valisineria</u>
Cape May warbler	<u>Dendroica tigrina</u>
Cardinal	<u>Richmondia cardinalis</u>
Carolina chickadee	<u>Parus carolinensis</u>
Carolina wren	<u>Thryothorus ludovicianus</u>
Caspian tern	<u>Hydroprogne caspia</u>
Catbird	<u>Dumetella carolinensis</u>
Cattle egret	<u>Bubulcus ibis</u>
Cedar waxwing	<u>Bombycilla cedrorum</u>
Cerulean warbler	<u>Dendroica cerulea</u>
Chestnut-sided warbler	<u>Dendroica pensylvanica</u>
Chimney swift	<u>Chaetura pelagica</u>
Chipping sparrow	<u>Spizella passerina</u>
Chuck-will's-widow	<u>Caprimulgus carolinensis</u>
Cinnamon teal	<u>Anas cyanoptera</u>
Clay-colored sparrow	<u>Spizella pallida</u>
Cliff swallow	<u>Petrochelidon pyrrhonota</u>
Common crow	<u>Corvus brachyrhynchos</u>
Common crackle	<u>Quiscalus quiscula</u>
Common egret	<u>Casmerodius albus</u>
Common gallinule	<u>Gallinula chloropus</u>
Common goldeneye	<u>Bucephala clangula</u>
Common loon	<u>Gavia immer</u>
Common merganser	<u>Mergus merganser</u>
Common nighthawk	<u>Chordeiles minor</u>
Common redpoll	<u>Acanthis flammea</u>
Common scoter	<u>Oidemia nigra</u>
Common snipe	<u>Caspeula gallinago</u>
Common tern	<u>Sterna hirundo</u>
Connecticut warbler	<u>Oporornis agilis</u>
Coopers hawk	<u>Accipiter cooperii</u>
Dickcissel	<u>Spiza americana</u>
Double-crested cormorant	<u>Phalacrocorax auritus</u>
Downy woodpecker	<u>Dendrocopos pubescens</u>
Dunlin	<u>Erolia alpina</u>
Eared grebe	<u>Podiceps caspicus</u>
Eastern Bluebird	<u>Sialia sialis</u>
Eastern kingbird	<u>Tyrannus tyrannus</u>
Eastern meadowlark	<u>Sturnella magna</u>
Eastern phoebe	<u>Sayornis phoebe</u>
Eastern wood pewee	<u>Contopus virens</u>
European tree sparrow	<u>Passer montanus</u>
Evening grosbeak	<u>Hesperiphona vespertina</u>

<u>Common Name</u>	<u>Scientific Name</u>
Field sparrow	<u>Spizella pusilla</u>
Forster's tern	<u>Sterna forsteri</u>
Fox sparrow	<u>Passerella iliaca</u>
Franklin's gull	<u>Larus pipixcan</u>
Gadwall	<u>Anas strepera</u>
Glaucous gull	<u>Larus hyperboreus</u>
Glossy ibis	<u>Plegadis falcinellus</u>
Golden-crowned kinglet	<u>Regulus satrapa</u>
Golden eagle	<u>Aquila chrysaetos</u>
Golden-winged warbler	<u>Vermivora chrysoptera</u>
Goshawk	<u>Accipiter gentilis</u>
Grasshopper sparrow	<u>Ammodramus savannarum</u>
Gray-cheeked thrush	<u>Hylocichla minima</u>
Great blue heron	<u>Ardea herodias</u>
Great crested flycatcher	<u>Myiarchus crinitus</u>
Greater yellowlegs	<u>Totanus melanoleucus</u>
Greater scaup	<u>Aythya marila</u>
Great horned owl	<u>Bubo virginianus</u>
Green heron	<u>Butorides virescens</u>
Green-winged teal	<u>Anas carolinensis</u>
Hairy woodpecker	<u>Dendrocopos villosus</u>
Harlan's hawk	<u>Buteo harlani</u>
Harris' sparrow	<u>Zonotrichia querula</u>
Henslow's sparrow	<u>Passerherbulus henslowii</u>
Hermit thrush	<u>Hylocichla guttata</u>
Herring gull	<u>Larus argentatus</u>
Hooded merganser	<u>Lophodytes cucullatus</u>
Horned grebe	<u>Podiceps auritus</u>
Horned lark	<u>Eremophila alpestris</u>
House sparrow	<u>Passer domesticus</u>
House wren	<u>Troglodytes aedon</u>
Hudsonian godwit	<u>Limosa hoemastica</u>
Iceland gull	<u>Larus glavacoides</u>
Indigo bunting	<u>Passerina cyanea</u>
Kentucky warbler	<u>Oporornis formosus</u>
Killdeer	<u>Charadrius vociferus</u>
King rail	<u>Rallus elegans</u>
Knot	<u>Calidris canutus</u>
Lapland longspur	<u>Calcarius lapponicus</u>
Larksparrow	<u>Chondestes grammacus</u>
Least bittern	<u>Ixobrychus exilis</u>
Least flycatcher	<u>Empidonax minimus</u>
Least sandpiper	<u>Erolia minutilla</u>
Least tern	<u>Sterna albifrons</u>
Le Conte's sparrow	<u>Passerherbulus caudacutus</u>
Lesser yellowlegs	<u>Totanus flavipes</u>

<u>Common Name</u>	<u>Scientific Name</u>
Lessor scaup	<u>Aythya affinis</u>
Lincoln's sparrow	<u>Melospiza lincolni</u>
Little blue heron	<u>Florida caerulea</u>
Loggerhead shrike	<u>Lanius ludovicianus</u>
Long-eared owl	<u>Asio otus</u>
Long-billed dowitcher	<u>Limnodromus scolopaceus</u>
Long-billed marsh wren	<u>Telmatodytes palustris</u>
Louisiana waterthrush	<u>Seiurus motacilla</u>
Magnolia warbler	<u>Dendroica magnolia</u>
Mallard	<u>Anas platyrhynchos</u>
Marbled godwit	<u>Limosa fedoa</u>
Marsh hawk	<u>Circus cyaneus</u>
Mockingbird	<u>Mimus polyglottos</u>
Mourning dove	<u>Zenaidura macroura</u>
Mourning warbler	<u>Oporornis philadelphia</u>
Myrtle warbler	<u>Dendroica coronata</u>
Nashville warbler	<u>Vermivora ruficapilla</u>
Northern phalarope	<u>Lobipes lobatus</u>
Northern waterthrush	<u>Seiurus noveboracensis</u>
Oldsquaw	<u>Clangula hyemalis</u>
Olive-sided flycatcher	<u>Nuttallornis borealis</u>
Orange-crowned warbler	<u>Vermivora celata</u>
Orchard oriole	<u>Icterus spurius</u>
Oregon junco	<u>Junco oreganus</u>
Osprey	<u>Pandion haliaetus</u>
Ovenbird	<u>Seiurus aurocapillus</u>
Palm warbler	<u>Dendroica palmarum</u>
Parula warbler	<u>Parula americana</u>
Pectoral sandpiper	<u>Erolia melanotos</u>
Peregrine falcon	<u>Falco peregrinus</u>
Philadelphia vireo	<u>Vireo philadelphicus</u>
Pied-billed grebe	<u>Podilymbus podiceps</u>
Pigeon hawk	<u>Falco columbarius</u>
Pileated woodpecker	<u>Dryocopus pileatus</u>
Pine siskin	<u>Spinus pinus</u>
Pine warbler	<u>Dendroica pinus</u>
Pintail	<u>Anas acuta</u>
Piping plover	<u>Charadrius melodus</u>
Prairie falcon	<u>Falco mexicanus</u>
Prairie warbler	<u>Dendroica discolor</u>
Prothonotary warbler	<u>Protonotaria citrea</u>
Purple finch	<u>Carpodacus purpureus</u>
Purple martin	<u>Porgne subis</u>
Red-bellied woodpecker	<u>Centurus carolinus</u>
Red-breasted merganser	<u>Mergus serrator</u>
Red-breasted nuthatch	<u>Sitta canadensis</u>
Red crossbill	<u>Loxia curvirostra</u>
Red-eyed vireo	<u>Vireo olivaceus</u>

<u>Common Name</u>	<u>Scientific Name</u>
Tennessee warbler	<u>Vermivora peregrina</u>
Traill's flycatcher	<u>Empidonax traillii</u>
Tree sparrow	<u>Spizella arborea</u>
Tree swallow	<u>Tridoprocne bicolor</u>
Tufted titmouse	<u>Parus bicolor</u>
Turkey	<u>Meleagris gallopavo</u>
Turkey vulture	<u>Cathartes aura</u>
Upland plover	<u>Bartramia longicauda</u>
Veery	<u>Hylocichla fuscescens</u>
Vesper sparrow	<u>Poocetes gramineus</u>
Virginia rail	<u>Rallus limicola</u>
Warbling vireo	<u>Vireo gilvus</u>
Water pipit	<u>Anthus spinoletta</u>
Western grebe	<u>Aechmophorous occidentalis</u>
Western sandpiper	<u>Ereunetes mauri</u>
Whip-poor-will	<u>Caprimulgus vociferus</u>
Whistling swan	<u>Olor columbianus</u>
White-breasted nuthatch	<u>Sitta carolinensis</u>
White-crowned sparrow	<u>Zonotrichia leucophrys</u>
White-eyed vireo	<u>Vireo griseus</u>
White-fronted goose	<u>Anser albifrons</u>
White ibis	<u>Eudocimus alba</u>
White pelican	<u>Pelecanus erythrorhynchos</u>
White-rumped sandpiper	<u>Erolia fuscicollis</u>
White-throated sparrow	<u>Zonotrichia albicollis</u>
White-winged crossbill	<u>Loxia leucoptera</u>
White-winged scoter	<u>Melanitta deglandi</u>
Wild turkey	<u>Meleagris gallopavo</u>
Willet	<u>Catoptrophorus semipalmatus</u>
Wilson's phalarope	<u>Steganopus tricolor</u>
Wilson's warbler	<u>Wilsonia pusilla</u>
Winter wren	<u>Troglodytes troglodytes</u>
Wood ibis	<u>Mycteria americana</u>
Wood duck	<u>Aix sponsa</u>
Wood thrush	<u>Hylocichla mustelina</u>
Worm-eating warbler	<u>Helmitheros vermivorus</u>
Yellow-bellied flycatcher	<u>Empidonax flaviventris</u>
Yellow-bellied sapsucker	<u>Sphyrapicus varius</u>
Yellow-bellied cuckoo	<u>Coccyzus americanus</u>
Yellow-breasted chat	<u>Icteria virens</u>
Yellow-crowned night heron	<u>Nyctanassa violacea</u>
Yellow rail	<u>Coturnicops noveboracensis</u>
Yellow-shafted flicker	<u>Colaptes auratus</u>
Yellow-throated vireo	<u>Vireo flavifrons</u>
Yellow-throated warbler	<u>Dendroica dominica</u>
Yellowthroat	<u>Geothlypis trichas</u>
Yellow warbler	<u>Dendroica petechia</u>

Common NameScientific Name

Redhead	<u>Aythya americana</u>
Red-headed woodpecker	<u>Melanerpes erythrocephalus</u>
Red-necked grebe	<u>Podiceps grisegena</u>
Red-shafted flicker	<u>Colaptes cafer</u>
Red-shouldered hawk	<u>Buteo lineatus</u>
Red-tailed hawk	<u>Buteo jamaicensis</u>
Redwinged blackbird	<u>Agelaius phoeniceus</u>
Ring-billed gull	<u>Larus delawarensis</u>
Ring-necked duck	<u>Aythya collaris</u>
Robin	<u>Turdus migratorius</u>
Rock dove	<u>Columba livia</u>
Rose-breasted grosbeak	<u>Phenicurus ludovicianus</u>
Rough-legged hawk	<u>Buteo lagopus</u>
Rough-winged swallow	<u>Stelgidopteryx ruficollis</u>
Ruby-crowned kinglet	<u>Regulus calendula</u>
Ruby-throated hummingbird	<u>Archilochus colubris</u>
Ruddy duck	<u>Oxyura jamaicensis</u>
Ruddy turnstone	<u>Arenaria interpres</u>
Rufous-sided towhee	<u>Pipilo erythrophthalmus</u>
Rusty blackbird	<u>Euphagus carolinus</u>
Sanderling	<u>Crocethia alba</u>
Sandhill crane	<u>Grus canadensis</u>
Savannah sparrow	<u>Passerculus sandwichensis</u>
Saw-whet owl	<u>Aegolius acadicus</u>
Scarlet tanager	<u>Piranga olivacea</u>
Screech owl	<u>Otus asio</u>
Semipalmated plover	<u>Charadrius semipalmatus</u>
Semipalmated sandpiper	<u>Ereunetes pusillus</u>
Sharp-shinned hawk	<u>Accipiter striatus</u>
Sharp-tailed sparrow	<u>Ammodramus caudacuta</u>
Short-billed dowitcher	<u>Limnodromus griseus</u>
Short-billed marsh wren	<u>Cistothorus platensis</u>
Short-eared owl	<u>Asio flammeus</u>
Shoveler	<u>Spatula clypeata</u>
Slate-colored junco	<u>Junco hyemalis</u>
Smith's longspur	<u>Calcarius pictus</u>
Snowy egret	<u>Leucophoyx thula</u>
Snow goose	<u>Chen hyperborea</u>
Snowy owl	<u>Nyctea scandiaca</u>
Solitary sandpiper	<u>Tringa solitaria</u>
Solitary vireo	<u>Vireo solitarius</u>
Song sparrow	<u>Melospiza melodia</u>
Sora	<u>Porzana carolina</u>
Sparrow hawk	<u>Falco sparverius</u>
Spotted sandpiper	<u>Actitis macularia</u>
Sprague's pipit	<u>Anthus spragueii</u>
Starling	<u>Sturnus vulgaris</u>
Stilt sandpiper	<u>Micropalama himantopus</u>
Summer tanager	<u>Piranga rubra</u>
Swainson's hawk	<u>Buteo swainsoni</u>
Swainson's thrush	<u>Hylocichla ustulata</u>
Swamp sparrow	<u>Melospiza georgiana</u>

GASCONADE BASIN FISHES

Source: Missouri Department of
Conservation

<u>Common Name</u>	<u>Scientific Name</u>
Alabama shad	<u>Alosa alabamiae</u> (Jordan and Evermann)
American eel	<u>Anguilla rostrata</u> (Lesueur)
Banded darter	<u>Etheostoma zonale</u> (Cope)
Banded sculpin	<u>Cottus carolinae</u> (Gill)
Bigeye shiner	<u>Notropis boops</u> (Gilbert)
Bibmouth buffalo	<u>Ictiobus cyprinellus</u> (Valenciennes)
Black bullhead	<u>Ictalurus melas</u> (Rafinesque)
Black buffalo	<u>Ictiobus niger</u> (Rafinesque)
Black crappie	<u>Pomoxis nigromaculatus</u> (Lesueur)
Black redhorse	<u>Moxostoma duquesnei</u> (Lesueur)
Blacknose shiner	<u>Notropis heterolepis</u> (Eigenmann and Eigenmann)
Blackspotted topminnow	<u>Fundulus olivaceus</u> (Storer)
Bleeding shiner	<u>Notropis zonatus</u> (Putnam)
Bluegill	<u>Lepomis macrochirus</u> (Rafinesque)
Bluestripe darter	<u>Percina cymatotaenia</u> (Gilbert and Meek)
Bluntnose minnow	<u>Pimephales notatus</u> (Rafinesque)
Brook silverside	<u>Labidesthes sicculus sicculus</u> (Cope)
Carp	<u>Cyprinus carpio</u> (Linnaeus)
Central stoneroller	<u>Campostoma anomalum pullum</u> (Agassiz)
Channel catfish	<u>Ictalurus punctatus</u> (Rafinesque)
Chestnut lamprey	<u>Ichthyomyzon castaneus</u> (Girard)
Creek chub	<u>Semotilus atromaculatus</u> (Mitchell)
Crystal darter	<u>Ammocrypta asprella</u> (Jordan)
Emerald shiner	<u>Notropis atherinoides</u> (Rafinesque)
Fantail darter	<u>Etheostoma flabellare</u> (Rafinesque)
Fathead minnow	<u>Pimephales promelas</u> (Rafinesque)
Flathead catfish	<u>Pylodictis olivaris</u> (Rafinesque)
Freshwater drum	<u>Aplodinotus grunniens</u> (Rafinesque)
Ghost shiner	<u>Notropis buechanani</u> (Meek)
Gilt darter	<u>Percina evides</u> (Jordan and Gilbert)
Gizzard shad	<u>Dorosoma cepedianum</u> (Lesueur)
Golden redhorse	<u>Moxostoma erythrurum</u> (Rafinesque)
Golden shiner	<u>Notemigonus crysoleucas</u> (Mitchill)
Goldeye	<u>Hiodon alosoides</u> (Rafinesque)
Gravel chub	<u>Hybopsis x-punctata</u> (Hubbs and Crowe)
Green sunfish	<u>Lepomis cyanellus</u> (Rafinesque)
Greenside darter	<u>Etheostoma blennioides</u> (Rafinesque)
Hornyhead chub	<u>Nocomis biguttata</u> (Kirtland)
Johnny darter	<u>Etheostoma nigrum</u> (Rafinesque)
Largemouth bass	<u>Micropterus salmoides salmoides</u> (Lacepede)
Largescale stoneroller	<u>Campostoma oligolepis</u> (Hubbs and Greene)
Least darter	<u>Etheostoma microperca</u> (Jordan and Gilbert)
Logperch	<u>Percina caprodes</u> (Rafinesque)
Longear sunfish	<u>Lepomis megalotis megalotis</u> (Rafinesque)
Longnose gar	<u>Lepisosteus osseus</u> (Linnaeus)

Common NameScientific Name

Mimic shiner	<u>Notropis volucellus</u> (Cope)
Missouri saddled darter	<u>Etheostoma tetrazonum</u> (Hubbs and Black)
Mooneye	<u>Hiodon tergisus</u> (Rafinesque)
Mottled sculpin	<u>Cottus bairdi bairdi</u> (Girard)
Northern brook lamprey	<u>Ichthyomyzon fossor</u> (Reighard and Cummins)
Northern hog sucker	<u>Hypentelium nigricans</u> (Lesueur)
Northern redhorse	<u>Moxostoma macrolepidotum</u> (Lesueur)
Northern studfish	<u>Fundulus catenatus</u> (Storer)
Orangethroat darter	<u>Etheostoma spectabile</u> (Agassiz)
Orangespotted sunfish	<u>Lepomis humilis</u> (Girard)
Ozark minnow	<u>Dionda nubila</u> (Forbes)
Plains minnow	<u>Hybognathus placitus</u> (Girard)
Plains topminnow	<u>Fundulus sciadicus</u> (Cope)
Pugnose minnow	<u>Opsopoeodus emiliae</u> (Hay)
Quillback	<u>Carpiodes cyprinus</u> (Lesueur)
Rainbow darter	<u>Etheostoma caeruleum</u> (Storer)
Rainbow trout	<u>Salmo gairdneri</u> (Richardson)
Red shiner	<u>Notropis lutrensis</u> (Baird and Girard)
Redfin shiner	<u>Notropis umbratilis</u> (Girard)
River carpsucker	<u>Carpiodes carpio carpio</u> (Rafinesque)
River redhorse	<u>Moxostoma carinatum</u> (Cope)
Rock bass	<u>Ambloplites rupestris</u> (Rafinesque)
Rosyface shiner	<u>Notropis rubellus</u> (Agassiz)
Sand shiner	<u>Notropis stramineus</u> (Cope)
Sauger	<u>Stizostedion canadense</u> (Smith)
Shortnose gar	<u>Lepisosteus platostomus</u> (Rafinesque)
Silver chub	<u>Hybopsis storeriana</u> (Kirtland)
Silver redhorse	<u>Moxostoma anisurum</u> (Rafinesque)
Silverband shiner	<u>Notropis shumardi</u> (Girard)
Slender madtom	<u>Noturus exilis</u> (Nelson)
Slenderhead darter	<u>Percina phoxocephala</u> (Nelson)
Smallmouth bass	<u>Micropterus dolomieu</u> (Lacepede)
Smallmouth buffalo	<u>Ictiobus bubalus</u> (Rafinesque)
Southern brook lamprey	<u>Ichthyomyzon gagei</u> (Hubbs and Trautman)
Southern redbelly dace	<u>Phoxinus erythrogaster</u> (Rafinesque)
Spotfin shiner	<u>Notropis spilopterus</u> (Cope)
Stippled darter	<u>Etheostoma punctulatum</u> (Agassiz)
Stonecat	<u>Noturus flavus</u> (Rafinesque)
Striped shiner	<u>Notropis chrysocephalus chrysocephalus</u> (Rafinesque)
Suckermouth minnow	<u>Phenacobius mirabilis</u> (Girard)
Walleye	<u>Stizostedion vitreum vitreum</u> (Mitchell)
Wedgespot shiner	<u>Notropis greeniei</u> (Hubbs and Ortenburger)
Western silvery minnow	<u>Hybognathus argyritis</u> (Girard)
White crappie	<u>Pomoxis annularis</u> (Rafinesque)
White sucker	<u>Catostomus commersoni</u> (Lacepede)
Yellow bullhead	<u>Ictalurus natalis</u> (Lesueur)

APPENDIX C

Partial List of Plant Species Occupying Floodplain of the Gasconade Watershed

1. Ward's Willow - Sycamore Associates

(A) Tree Species

Ward's Willow (Salix caroliniana)
Black Willow (Salix nigra)
Sandbar Willow (Salix interior)
Sycamore (Platanus occidentalis)

(B) Herbaceous Species

Common Arrowhead (Sagittaris latifolia)
Canada Wild Rye (Elymus canadensis, F. Glacifolius)
Bent Grass (Agrostis perennans)
Wood Reed Grass (Cinna arundinacea)
White Grass (Leersia virginica)
Panic Grass (Panicum cladestinum)
Chairmakers Rush (Scripus americana)
Gray Clearweed (Pilea pumila)
Sand Grape (Vita rupestris)
Common Violet (Viola papilionacea)
Blue Phlox (Phlox divaricata)
Trumpet Creeper (Campsis radicans)
Wild Petunia (Ruellia Stuepens)
Water Willow (Dianthera americana)
Smooth Buttonweed (Spermacoce glabra)
Buck Brush (Symphoricarpos orbiculatis)
Goldenrod (Solidaga gigantea leiophylla)

2. Green Ash - Silver Maple Associates

(A) Tree Species

Sandbar Willow (Salix interior)
Ward's Willow (Salix caroliniana)
Black Willow (Salix nigra)
River Birch (Betula nigra)
Sycamore (Platanus occidentalis)
Silver Maple (Acer saccharinum)
Green Ash (Fraxinus pensylvanica laceolata)
Buttonbush (Cephalanthus occidentalis)

(B) Herbacious Species

Wood Reed Grass (Cinna arundinacea)
White Grass (leersia virginica)
Chairmaker's Rush (Scirpus americanus)
Day Flower (Commelina virginica)
Bristly Greenbriar (Smilax temnoides hispida)
False Nettle (Boehmeria cylindrica)
Gray Clearweed (Pilea pumila)
Virginia Knotweed (Polygonum virginianum)
Bloodleaf (Iresine rhizomatosa)
Three-Seeded Mercury (Acalypha rhomboidea)
Poison Ivy (Rhus radicans)
Spotted Touch-me-not (Impatiens capensis)
Winter Grape (Vitus vulpina)
Rose Mallow (Habiscus lasiocarpus)
Common Violet (Viola papilionacea)
Tooth-cup (Rotala ramosior)
Mad-dog skullcap (Scutellaria lateriflora)
Monkey flower (Mimulus alatus)
Wild Petunia (Ruellia strepens)
Cardinal flower (Lobelia cardinalis)
Ironweed (Vernonia altissima)
Blue Mist Flower (Eupatorium coelestinum)
Goldenrod (Solidago gigantea leiophylla)
White Woodland Aster (Aster lateriflorus)
Wild Goldenglow (Rudbeckia laciniata)

3. American Elm - Green Ash Associates

(A) Tree Species

Black Willow (Salix nigra)
River birch (Betula nigra)
Bur Oak (Quercus macrocarpa)
Shumard Oak (Quercus shumardii)
American Elm (Ulmus americana)
Pawpaw (Asimina triloba)
Sycamore (Platanus occidentalis)
Silver Maple (Acer saccharinum)
Boxelder (Acer negundo)
Bladdernut (Straphylea trifolia)
Green Ash (Fraxinus pensylvanica lanceolata)
Buttonbush (Cephalanthus Occidentalis)

(B) Herbacious Species

Fragile Fern (Cystopteris fragilis protrusa)
Fowl Meadow Grass (Glyceria striata)
Spike Grass (Uniola latifolia)

Yam (Dioscorea villosa)
 Wild Giner (Asarum canadensis)
 Wood Nettle (Laportea canadensis)
 Bloodleaf (Iresine rhizomatosa)
 Pokeweed (Phytolacca americana)
 May Apple (Podophyllum peltatum)
 Moonseed (Menispermum canadense)
 Cupseed (Calycocarpum lyoni)
 Bloodroot (Sanquinaria canadensis)
 Virginia Knotweed (Polygonum virginianum)
 White Avens (Geum canadense)
 Hog Peanut (Amphicarpa bracteata)
 Poison Ivy (Rhus radicans)
 Pale Touch-Me-Not (Impatiens pallida)
 Yellow Violet (Viola pensylvanica leicarpa)
 Pale Violet (Viola striata)
 Enchanter's Nightshade (Circaea quadrisulcata canadensis)
 Honewort (Cryptotaenia canadensis)
 Blue Phlox (Phlox divaricata laphamii)
 Woolen Breeches (Hydrophyllum appendiculatum)
 White Vervain (Verbena urticifolia)
 Skullcap (Scutellaria ovata)
 Wood Mint (Blephilia hirsuta)
 Beefsteak Plant (Perilla frutescens)
 Sweet-Scented Bedstraw (Galium triflorum)
 Green-stemmed Joe-Pye Weed (Eupatorium purpureum)
 White Snakeroot (Eupatorium rugosum)
 Leaf-cup (Polymnia canadensis)
 White Crown-beard (Verbesina virginica)

4. Sugar Maple-Bitternut Hickory Associates

(A) Tree species

Black Walnut (Juglans cinerea)
 Butternut (Juglans cinerea)
 Bitternut Hickory (Carya cordiformis)
 Hazelnut (Corylus americana)
 American Hornbeam (Carpinus caroliniana)
 River Birch (Betula nigra)
 Hophornbeam (Ostrya virginiana)
 White Oak (Quercus alba)
 Shingle Oak (Quercus imbricaria)
 Shumard Oak (Quercus shumardii)
 Bur Oak (Quercus macrocarpa)
 Northern Red Oak (Quercus rubra)
 Winged Elm (Ulmus alata)
 Hackberry (Celtis occidentalis)
 American Elm (Ulmus americana)
 Red Mulberry (Morus rubra)

Pawpaw (Asimina triloba)
 Spicebush (Benzoin aestivale)
 Sycamore (Platanus occidentalis)
 Black Cherry (Prunus serotina)
 Honeylocust (Gleditsia triacanthos)
 Redbud (Cercis canadensis)
 Fragrant Sumac (Rhus aromatica)
 Bladdernut (Staphylea trifolia)
 Sugar Maple (Acer saccharum)
 Silver Maple (Acer saccharinum)
 Buckeye (Aesculus discolor)
 American Basswood (Tilia americana)
 Flowering Dogwood (Cornus florida)
 Black Gum (Nyssa sylvatica)
 Green Ash (Fraxinus pennsylvanica lanceolata)
 Black Haw (Viburnum rufidulum)
 Elderberry (Sambucus canadensis)

(B) Herbaceous Species

Fragile Fern (Cystopteris fragilis protrusa)
 Greenbriar (Smilax hispida)
 Yam (Dioscorea villosa)
 Wood Nettle (Laportea canadensis)
 Gray Clearweed (Pilea pumila)
 Wild Ginger (Asarum canadensis)
 Pokeweed (Phytolacca americana)
 Small-Flowered Crowfoot (Ranunculus abortivus)
 Moonseed (Menispermum canadensis)
 Bloodroot (Sanguinaria canadensis)
 White Avens (Geum canadense)
 Hog Peanut (Amphicarpa bracteata)
 Poison Ivy (Rhus radicans)
 Smooth Yellow Violet (Viola eriocarpa)
 Pale Violet (Viola striata)
 Passion-flower (Passiflora lutrea glabriflora)
 Pale Touch-Me-Not (Impatiens pallida)
 Blue Phlox (Phlox divaricata laphamii)
 Beggar's Lice (Lappula echinata)
 Wood Mint (Blephilia hirsuta)
 Beefsteak Plant (Perilla frutescens)
 Sweet-scented Bedstraw (Galium triflorum)
 Buckbrush (Symphoricarpos orbiculatus)
 Bar Cucumber (Sicyos angulatus)
 Green-stemmed Joe-Pye Weed (Eupatorium purpureum)
 White Snakeroot (Eupatorium rugosum)
 Virginia Creeper (Parthenocissus quinquefolia)
 White Crown-beard (Verbesina virginica)
 Yellow Ironweed (Verbesina alternifolia)

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Remainder of photos