APPENDIX D

Hydroelectric Power Potential of the Chattooga River Basin

Electric power loads in the Southeast are doubling every 8 to 10 years. The loads are supplied substantially by power from steam-electric generating plants, but the peak portions are supplied mostly from hydroelectric plants. Both complement each other to furnish the most economical supply available. The potential for future hydroelectric supply, however, in relation to the total load, is diminishing, and it is becoming harder and harder to find good sites for development of the type of power which can be utilized in the peak portions of the load. Based on preliminary studies, potential sites for hydroelectric power in the Chattooga River basin appear feasible for development and warrant additional study. Power from the potential Chattooga River basin projects could supply parts of the peak portions of the future additional power requirements.

Potential Hydroelectric Sites

Several combinations of conventional and pumped-storage hydroelectric projects in the Chattooga River basin could supply 1,800,000 kilowatts. Depending upon additional studies, installed capacity may possibly be increased to as much as 3,000,000 kilowatts. Table 1 shows information for several hydroelectric projects and different development schemes.

The Cashiers project would be a pure pumped-storage installation. The afterbay dam and reservoir of 450 acres would be located on the

TABLE 1
CHATTOOGA RIVER BASIN
Potential Hydroelectric Power Projects

PROJECT NAME	DAM			RESERVOIR				POWER INSTALLATION		
	River	River Mile	Drainage Area Sq Mi	Maximum Power Pool Elev Ft msl	Area Acres	Maximum Critical Drawdown Ft	Power Storage Capacity Ac Ft	Gross Power Head Ft	Installed Capacity Kw	Average Annual Generati Mwh
CASHIERS	Chattooga	46.9 2/	12.4	2880	450	45 3/	16.5M	640	550M 4/	482M
ROGUES FORD	Chattooga	11.3	193.0	1600	5800	25	140M	360	1 MM 5/	876M
SAND BOTTOM alternative for Rogues Ford	Chattooga	17.7	178.0	1640	5800	20	150M	280	1MM 6/	876M
OPOSSUM CREEK with Rogues Ford	Chattooga	4.9	258.0	1240	1000	40	40 M	348	230M 7/	202M
with Sand Bottom	Chattooga	4.9	258.0	1360	3200	10	40 M	468	300M 8/	263M

Footnotes:

1/ Based on 10% annual load factor.

2/ Forebay will be located on Little Whitewater Creek tributary to Whitewater River.

3/ Afterbay drawdown = 45ft, Forebay drawdown = 60ft, Maximum power pool at elevati r 3520 ft.

4/ 550M kw installation based on 15hrs continuous generation if reduced to 8hrs could be increased to about 1MM kw.

5/ 1MM kw installation based on 8 hrs continuous generation.

6/ 1MM kw installation based on 8 hrs continuous generation ultimate could be as much as 2MM kw.

7/ 115M kw pumped storage based on 8hrs continuous generation and 115M kw conventional installation.

8/ 150M kw pumped storage based on 8 hrs continuous generation and 150M kw conventional installation.

Chattooga River and the forebay dam and reservoir of 330 acres on Little Whitewater Creek, a tributary to the Whitewater River in the Keowee River basin. The small forebay reservoir would have an insignificant effect upon the water flows in the Whitewater River. An installed capacity of 550,000 kilowatts is based on 15 hours of continuous generation, and may be increased to about 1,000,000 kilowatts if the time of continuous generation is reduced to eight hours. Selection of the initial amount of installed capacity will depend upon additional economic studies and what can be utilized in the load.

The Rogues Ford or Sand Bottom project would be a pumped-storage installation. The dam sites for these potential projects are fairly near each other and substantially the same stretch of the river would be developed by either project. Construction of Rogues Ford or Sand Bottom, as shown in Table 1, will eliminate the other project as well as the Warwoman project shown in the U. S. Study Commission plan. The installed capacity at Sand Bottom may be increased to as much as 2,000,000 kilowatts, depending upon stream channel limitations, with a drawdown of about 25 feet at the Opossum Creek reservoir.

The maximum critical period drawdown is 25 feet for Rogues Ford and 20 feet for Sand Bottom. Drawdowns during the recreational season for either project during normal periods of operation are, however, expected to range between 5 and 10 feet. The reservoir surface for either project will be about 5,800 acres.

The Opossum Creek project would be a combined pumped-storage and conventional hydroelectric installation. Opossum Creek will provide afterbay storage for either Rogues Ford or Sand Bottom. The small amount

of afterbay storage needed for Opossum Creek will be provided by the existing Tugalo hydroelectric project. The Opossum Creek dam site is located about one mile downstream from the Camp Creek dam site which was included in the U. S. Study Commission plan. The height of the dam proposed for the Opossum Creek project would inundate the Camp Creek dam site and the reservoir area will be 1,000 or 3,200 acres depending upon whether Rogues Ford or Sand Bottom is built.

Economic Evaluations of Projects

Costs and benefits of hydroelectric power only have been considered in this preliminary analysis even though benefits from other water uses would also be realized. Considerable opportunities for recreation, water cooling, and other purposes would be provided but have not been considered in this preliminary analysis.

The investment cost for hydroelectric development in the Chattooga River basin that would provide nearly two million kilowatts of installed capacity is estimated to range from about $316 to $353 million, excluding transmission costs. The investment would vary somewhat depending upon the scheme of development selected.

Even though other benefits would be realized from water storage projects, development of the Chattooga River basin for hydroelectric power only appears feasible. The assumptions used in evaluating the potential projects are as follows:

(1) An interest rate of 4-7/8 percent which is the current rate designated to be used in plan formulation by Federal agencies.

(2) A 100-year period of analysis.

(3) A pumping energy cost of 3.5 mills per kilowatt-hour.

(4) Power values of $19.45 annually per kilowatt of capacity and 2.55 mills per kilowatt-hour of energy.

Based on the above assumptions, the annual equivalent cost would range from about $28.9 to $31.5 million, depending upon the development plan selected, and the annual equivalent benefit from hydroelectric power only would range from about $38.7 to $40.2 million.

Future Need for Electric Power

The large interconnected power regions of the United States are subdivided into power supply areas embracing interconnected and co-ordinated electric facilities. The Southeast Region, Federal Power Commission statistical Region III, encompasses Power Supply Areas 18, and 20 through 24. The power supply areas are usually associated with the following states: 18 with Virginia, 20 with Tennessee, 21 with North Carolina and South Carolina, 22 with Alabama, 23 with Georgia, and 24 with Florida. The Southeast Region has an area of about 355,000 square miles.

The Chattooga River basin lies largely in northeastern Georgia and northwestern South Carolina with the headwaters near Cashiers, North Carolina. The 268-square mile drainage area encompasses portions of Power Supply Areas 20, 21, and 23. Electricity generated at potential projects in the Chattooga River basin would probably be used primarily in Power Supply Areas 21 and 23, however, existing and future interconnecting transmission grids would permit using the energy by displacement throughout the Southeast Region.

The Southeast Region, with a population more than 30 million, had a coincidental peak demand of 38,987 megawatts in 1967. By 1990 the peak demand is expected to be about 210,400 megawatts which is nearly 540 percent of the 1967 demand or an average annual increase of about 7.6 percent. Generating capacity additions of about 193,500 megawatts, including reserve capacity, are contemplated to meet the annual peak load for 1990. Large fossil-fired and nuclear steam-generating plants are included in the projected capacity additions for base load operations, and conventional hydroelectric and pumped-storage installations are usually best suited for peaking purposes. Steam-generating plants and hydroelectric plants complement each other in meeting system demands. Currently in the Southeast about 82 percent of the total capacity is provided at base load plants and 18 percent at peaking plants. By 1990, however, the percentages that will best fit the load requirements may vary from 88 to 90 percent base load capacity and from 10 to 12 percent peaking capacity.

Potential Hydroelectric Projects on Other Rivers

Federal hydroelectric projects currently under construction in Region III will provide 715,000 kilowatts of installed capacity. Five other Federally-authorized projects on which construction has not been initiated but may be completed by 1990 will provide 669,000 kilowatts. Non-Federal hydroelectric facilities currently under construction and those being considered that may be constructed by 1990 would provide another 3,559,000 kilowatts of installed capacity.

Additional Installations Needed by 1990 for Peaking Purposes

Assuming the portion of the load that is adaptable to hydroelectric supply is about 11 percent in 1990, a total of more than 14 million kilowatts of additional capacity will be needed in Region III at peaking capacity installations. Nearly five million kilowatts of installed capacity are currently under construction or are being considered at both Federal and non-Federal hydroelectric projects outside the Chattooga River basin, and in areas where topographic conditions are not favorable for hydroelectric developments a total of about three million kilowatts of additional peaking capacity may be provided by gas turbines. Those capacities added to the nearly two million kilowatts proposed for the Chattooga River basin would still leave a need for over four million kilowatts of installed capacity that is adaptable to supply from hydroelectric developments. This indicates that all of the hydroelectric projects currently being considered and the potential hydroelectric development of the Chattooga River basin could be utilized by 1990.

Discussion and Conclusions

Conventional hydroelectric and pumped-storage developments are becoming increasingly important as sources of peaking capacity. A prerequisite, however, for pumped-storage developments is the availability of energy at low incremental cost for the pumping cycle. Peaking capacity is generally understood to mean that part of a system's generating equipment which is operated intermittently for short periods of time during the hours of highest daily, weekly, or seasonal kilowatt demand. Whether the maximum peak demand of a system lasts for a few minutes or a few hours, generating capacity must be available for supplying the damand at the moment it develops.

Conventional hydroelectric and pumped-storage projects have many favorable characteristics which provide strong incentives for developing potential water power sites. They utilize a renewable resource, they do not have significant thermal effects upon the water resource or contribute to air pollution, and they are very reliable in operation. Because of their ability to start quickly and make rapid changes in power output, they are particularly well adapted for serving peak loads, and for assisting in the supply of spinning reserve. In many cases, development of hydroelectric projects provides associated benefits such as recreation, water for cooling purposes, fish enhancement, flood control, water supply, and low flow augmentation. Load forecasts for electric utility systems in Region III indicate that the coincidental peak demand will increase from 52,960 megawatts in 1970 to 210,400 megawatts in 1990 which represents an increase of about 400 percent. Additional capacity needed by 1990 for peaking purposes is expected to amount to about 14 million kilowatts. Both Federal and non-Federal hydroelectric projects in Region III located outside the Chattooga River basin that are currently being considered would provide only about five million kilowatts of installed capacity. Nearly two million kilowatts of installed capacity, including both conventional hydroelectric and pumped-storage installations in the Chattooga River basin, appear feasible for single purpose development. This latter capacity would help meet the need for future peaking capacity but it represents only a minor part of the total Region III needs by 1990.

The rapidly expanding use of electricity in the Southeast is expected to double every 8 to 10 years. This large growth is a challenge to the

electric utility industry to keep abreast of the demand. The increasing need for additional capacity, particularly peaking capacity installations, and increasing demands for other water use purposes provide impetus for the preparation of long-range river basin plans that will harmonize the water requirements for all uses. Construction of any combination of the hydroelectric projects shown in Table 1 would still leave an 18- to 20-mile stretch of the river that could be considered for other purposes.

APPENDIX E

FEDERAL POWER COMMISSION
REGIONAL OFFICE
730 Peachtree Building
Atlanta, Georgia 30308
March 13, 1970

Mr. T. A. Schlapfer
Regional Forester
Forest Service
U. S. Department of Agriculture
Suite 800, 1720 Peachtree Road, N. E.
Atlanta, Georgia 30309

Dear Mr. Schlapfer:

This refers to the public meeting to be held in Clayton, Georgia, on March 17, 1970, to discuss the Chattooga Wild and Scenic River proposal. The Atlanta Regional Office of the Federal Power Commission has previously submitted a draft report of the hydroelectric potential of the Chattooga River basin which we assume will be made a part of the official recorded documents and fully considered by the study team in preparing the final report for the President and Congress. We believe, however, that it is appropriate to submit an explanatory statement for the forthcoming meeting.

In our draft report submitted December 8, 1969, to the Regional Director, Southeast Regional Office, Bureau of Outdoor Recreation, we briefly described two alternative plans for developing power potential in the Chattooga River basin. Each alternative plan involved three impoundments on the river. It should be noted, however, that the Cashiers project located in the upper reaches of the river could be constructed and operated independently from the other two impoundments in each plan.

The afterbay dam for the Cashiers project would be located about two miles upstream from Norton Mill Creek. The project as proposed would be a pure pumped-storage installation. After initial filling of the afterbay reservoir, releases from the impoundment could be regulated so that they would be nearly equal to the inflows. Therefore, the free flow characteristic of the river would not be necessarily interrupted as reported on page 30 of your Chattooga Wild and Scenic River report except for the inundated area of the reservoir. If the outflows are adjusted to equal the inflows, only about the middle one-third part of Section 1 as shown on page 6 would be affected by the Cashiers project and the scenic value of the Corkscrew Falls located just upstream from Green Creek would not be adversely affected. In fact,

with adequate storage in the Cashiers reservoir the flows downstream may be enhanced. Also, the Silver Slipper Falls, the Chattooga Cliffs, and the most magnificant long-range view and cascades on the river are located upstream from the headwaters of the proposed Cashiers impoundment. It appears that the stretch of the river that makes Section 1 suitable only for a scenic river classification rather than a wild river classification is the part that would be inundated by the afterbay reservoir of the Cashiers pure pumped-storage installation.

We would like to point out again that the rapidly expanding use of electricity in the Southeast is expected to double every eight to 10 years and that pumped-storage projects are expected to play an important role in providing the necessary peaking capacity to keep abreast of the demand for electricity. To classify the entire Chattooga River a wild or scenic river would virtually eliminate future development of the Cashiers project or any other power potential on the Chattooga River, either conventional or pumped storage.

We do not plan to make an oral statement at the March 17 meeting. However, we appreciate the opportunity of expressing our views concerning the power potential on the Chattooga River, the rapidly expanding demand for electricity in the Southeast, and the proposal to classify the Chattooga a wild and scenic river.

Very truly yours,

Robert C. Price

Robert C. Price
Regional Engineer

APPENDIX F

SATURATION LEVEL - RECREATION USE
CHATTOOGA RIVER
(Maximum use based on 12 hr. Days)

		PAOT*
Floating		
Wild	- 38 miles @ 10 craft/Mi & 2 people/craft =	760
Recreation	- 10 miles @ 20 craft/Mi & 2 people/craft =	400
Hiking	- 50 miles of trail @ 8 people/mile =	400
Hunting	- 15,000 acres @ 50 A/hunter =	300
Fishing	- 8 fishermen/mile x 60 miles =	480

COMPUTATION OF ALLOWABLE USE
CHATTOOGA RIVER
(Maximum use based on 12 hr. Days)

Wild 38 miles - (1/2 capacity per day for each use 100 day season)

380 floaters,	152 hikers,	152 fishermen
38,000	15,200	15,200

Wild 3.3 miles - Maximum allowable fishing (100 days)

		26 fishermen
		2,600

Scenic 5.5 miles - Maximum allowable fishing & hiking (100 days)

	44 hikers	44 fishermen
	4,400	4,400

Recreation 10.1 miles - (1/2 capacity per day for each use 100 days)

200 floaters	40 hikers	40 fishermen
20,000	4,000	4,000
78,000	23,600	26,200

Hunting entire area 300 per day @ 60 day Season 18,000 Visitor Day

Primitive Camping PAOT* 134 x 100 day Season 13,400

*People at one time.

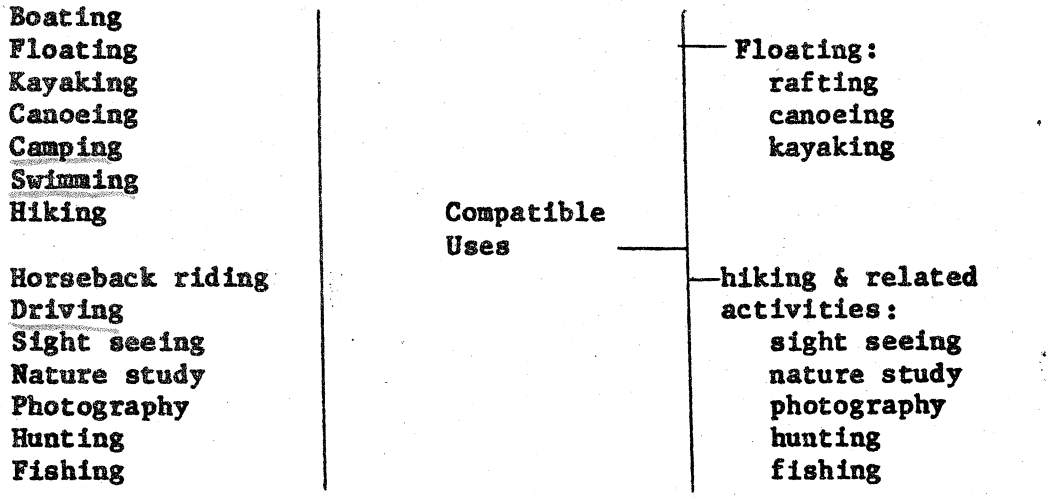
SATURATION LEVEL DETERMINATION

Demand Levels

Before demand levels can be studied, the recreation activities compatible with the wild and scenic environment of the Chattooga River should be established.

Of the twelve possible activities listed below, only seven seem compatible. Camping could be the eighth, but it must be clearly defined as to type and location before it can be considered.

The following diagram is used to illustrate how these activities will be discussed.



Hiking & Related Activities

In hiking, a variety of experiences is offered along the scenic and primitive areas on the Chattooga. There are some very rough, high and treacherous places within the gorge and some less demanding trails along the river banks. Existing hiking trails should be incorporated into a master trail system so that they can be planned and controlled.

Related activities to hiking include nature studies, photography, sight seeing, hunting and fishing. In most cases, the hike is necessary in order to fulfill either one of these activities. Nature study would certainly attract one to the depths of the gorge. Sight seeing and photography can be as extensive as one's ambition will permit. Hunting, on the other hand, will be limited within the boundary of the river because of the nature of the topography. Few hunters will venture into the gorge because the terrain does not afford them very many advantages. Fishing will not have such disadvantages. The wild and rugged environment helps to create a habitat conducive to good trout production. It also limits the number of fishermen.

Floating

Floating activities which include rafting, canoeing, and kayaking are very compatible uses for the river because these activities can capitalize on whitewater and scenic qualities that it possesses. By the nature of the activity, little damage, in comparison to other compatible activities, will be anticipated on the very fragile river banks. The quantity and floating quality of the water will usually determine where these activities are feasible. (See ACA report on Chattooga River.)

Although camping would normally appear to be a compatible use on the Chattooga River, the environment within the river boundary may not be capable of absorbing the impact and alteration that is so often related to this activity. Even the wilderness experience type of camping should not be permitted within the boundary.

There are no discrete ways of preventing hikers and canoers from camping on the river banks. However, there are ways to encourage them to camp beyond the boundary. One of these ways would be to provide drinking water and rough toilets just outside the boundary. The purpose here is to encourage the weary sportsman to camp near these comfort facilities. If these facilities are not provided, the sportsman is more apt to randomly select a campsite for the night that would be a convenient distance to his craft or trail. Since the river side environment is fragile, this would not be the wisest thing for the proponents of a wild and scenic river to let happen. Maintaining the primitive qualities of the river should be the first priority in planning the public use of the river.

The demand level for these activities is not easy to determine. Historical data as well as evidence of the present public interest would be needed in order to develop anything that even resembled a demand level.

Evidence of current interest in recreation activity on the Chattooga has been shown by several outing clubs and the American Canoeing Association. Data pertaining to the private citizen interested in the activities that are compatible with the wild and scenic river is currently not available.

Gathering demand data that would be usable for planning a comprehensive recreation program for the river is a task that is a separate study in itself. Presently, data is not available to speculate on the amount of water and land activities that are or will be in demand on the Chattooga River. In view of the unavailability of demand data, it would be wisest to plan the activities on the river according to the capability of the environment to absorb the proposed compatible uses.

Identifying the recreation resource and the saturation levels of the proposed recreation activities will be the main determinants for recreation planning. Models have been devised to help in identifying saturation levels. These models show the recreation activities on a wild and scenic river in various landscape situations. The landscape situation is described as the physical qualities a landscape possesses i.e., trees, rock and water that permit it to absorb use by man with minimal impact on its total physical quality.

The very dense, heavily foliated landscape away from the river edge, which usually becomes less fragile as the distance from the river increases, had the highest man use absorbing capacity.

Combining the landscape situation with the type of experience desired by the recreationer i.e., the communing with nature or the challenge of nature, sets the stage for saturation levels to be reached not only in recreation uses on the landscape but also the saturation of the experience. At what point in a landscape do the number of users at one time become dominant elements within the landscape and detract from the experience being pursued?

Hiking, for example, is a recreation activity which may be divided into two types of experiences: the wilderness type where the hiker desires an intimate communal relationship with nature and the challenge type usually associated with groups like the outing clubs and Boy Scouts. Both of these experiences have saturation levels, and both are dependent upon the numbers of people involved and the capability of the landscape to supply the atmosphere that evokes the experience.

If, for example, a trail through the dense foliated landscape mentioned earlier, became crowded with people seeking a wilderness experience, and hikers could see hikers from other groups, then that intimate communal feeling would be altered somewhat and possibly lost. What needs to be established then is a reasonable distance between hikers or groups of hikers so that this intimate quality can be maintained.

The challenger, on the other hand, often represented in groups is more concerned with the test of his skill against nature's obstacles than he is with the people around him. Naturally, his saturation level will be higher than his counterpart. A reasonable distance between groups of hikers would also apply to his saturation level. The challenger would not enjoy having to wait to climb a rock precipice or run his canoe through a whitewater rapid.

Distance is the significant factor then in determining the number of recreationers that can be tolerated in a particular experience in a particular activity.

For hiking and related activities the distance between hikers and groups of hikers is dependent upon the type of experience desired. The communal experience with nature can be maintained at 4 people per 1/2 mile. This is assuming that a hiking trail is layed out in predominately dense forest cover. More than 4 people would have a tendency to dominate the trailscape and possibly raise the noise above a desired level. A densely covered hiking trail can screen one group from another as well as absorb their sounds.

In the group experience where the challenge is the objective, the spacing between groups is not as critical. The distance here would be based on reasonable hike completion time.

Considering the terrain and the hike experience for both the communal hiker and the challenger, 8 people per mile should be the maximum figure to facilitate both experiences.

For floating and canoeing, 20 craft per mile in groups from 3-5 allows for congestion free trip with adequate safety. For a wilderness experience, however, the number should be limited to 10 craft.

Directly related to this distance factor is the absorbing capability of the landscape. The closed landscape can absorb more people, shortening the distance between hikers; the open landscape absorbs fewer people, lengthening the distance.

Since it would be extremely difficult to determine what is tolerable in terms of physical use of a landscape, standards must be assumed that rate a cross section of typical landscapes located within the boundary of the Chattooga River. These standards are as follows:

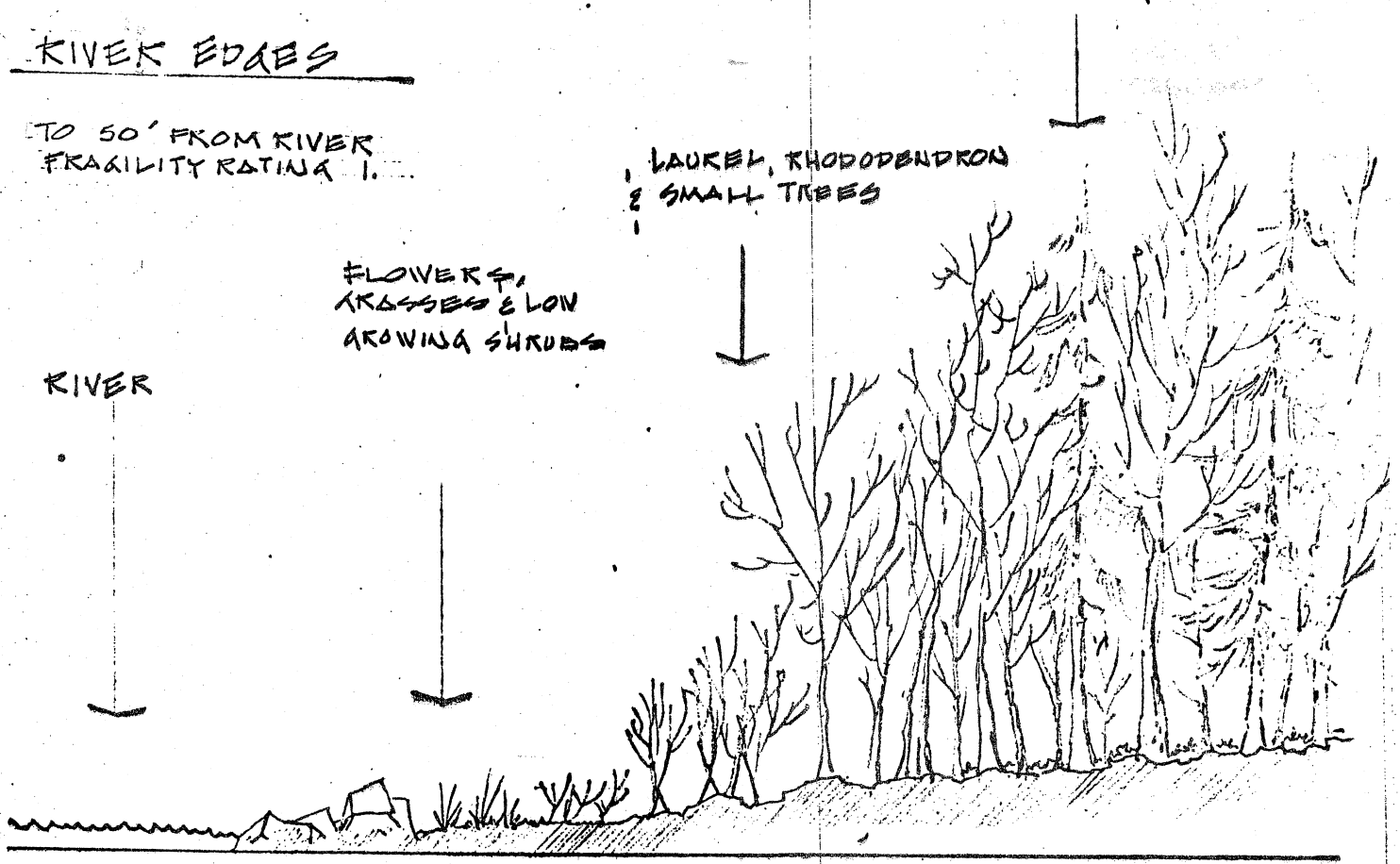
From least tolerable to most tolerable, (ratings 1 - 5)	
River edges to 50 feet from river	1.
Open landscapes from the river edge to within 50 feet of the river	2.
River edges from 50 feet to 200 feet from the river with moderate vegetation	3.
River sides from 50 feet to 200 feet from river with dense vegetation	4.
River sides from 200 feet plus with moderate to dense vegetation	5.

These assumed standards are only to be used as guides in determining landscape capabilities. There will always be exceptions to these standards, and these when recognized should be noted and considered when planning the uses for the river.

If the experience saturation levels are employed in regards to number of people using the river at one time, the landscape should be able to absorb this use with minimal affect. These interpretative saturation levels are valuable in that they are a basis upon which use levels can ultimately be determined. If these interpretative levels are in fact arbitrary, they can be tested in the field and a more realistic figure assumed. An underestimated recreation use capacity permits the planner the flexibility to make the needed adjustments when more accurate demand and saturation data is available.

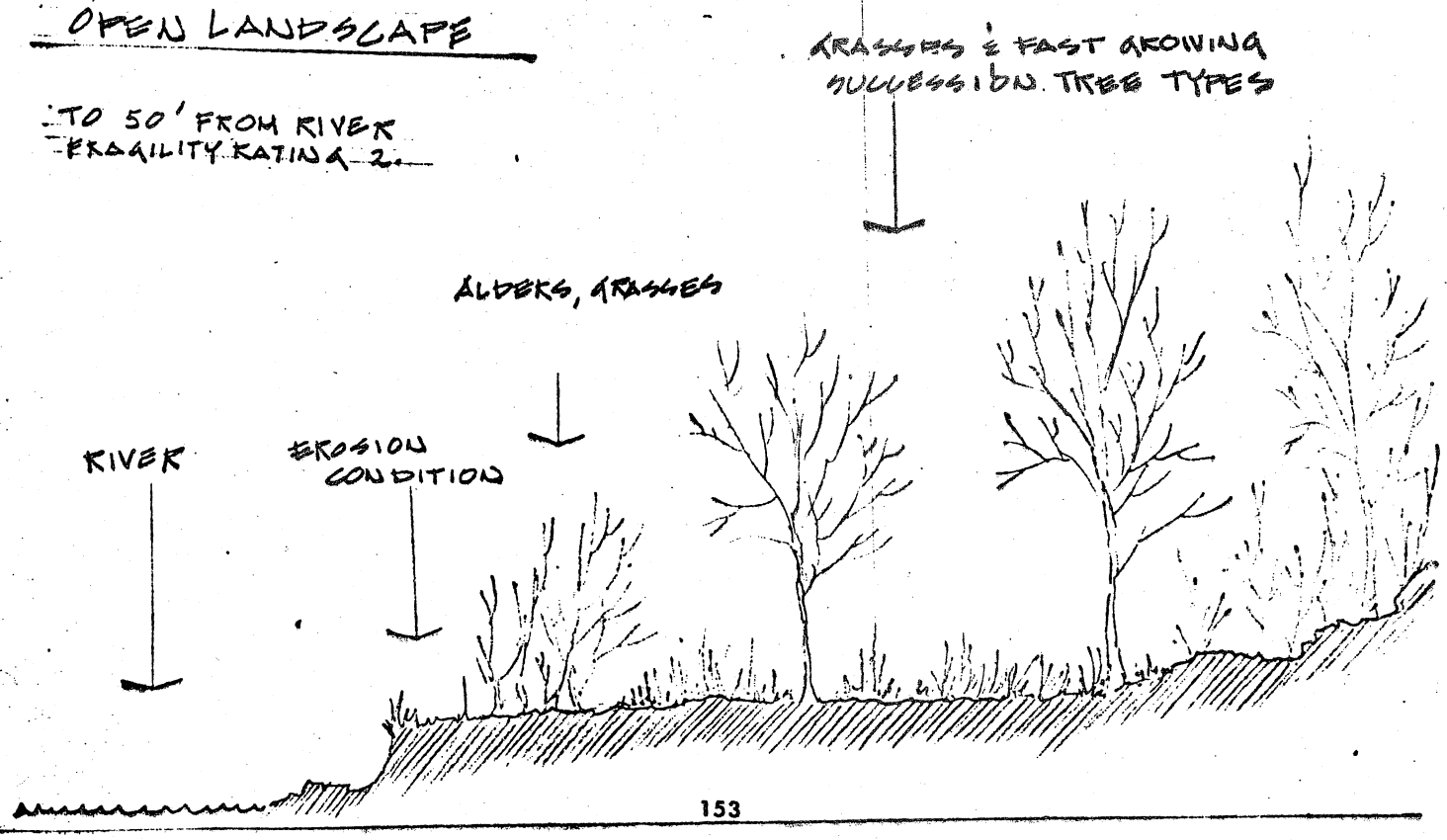
RIVER EDGES

TO 50' FROM RIVER
FRAGILITY RATING 1.



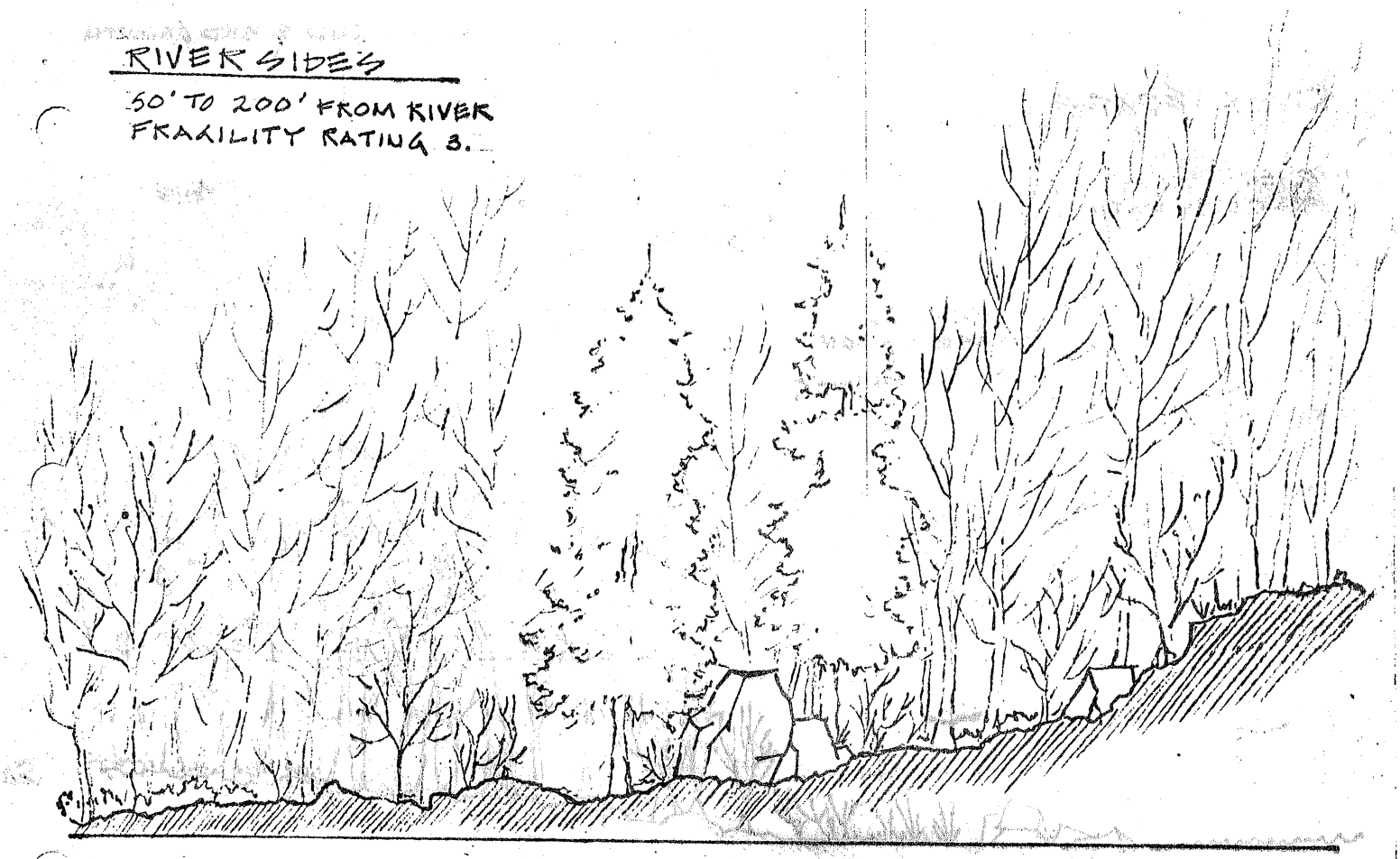
OPEN LANDSCAPE

TO 50' FROM RIVER
FRAGILITY RATING 2.



RIVERSIDES

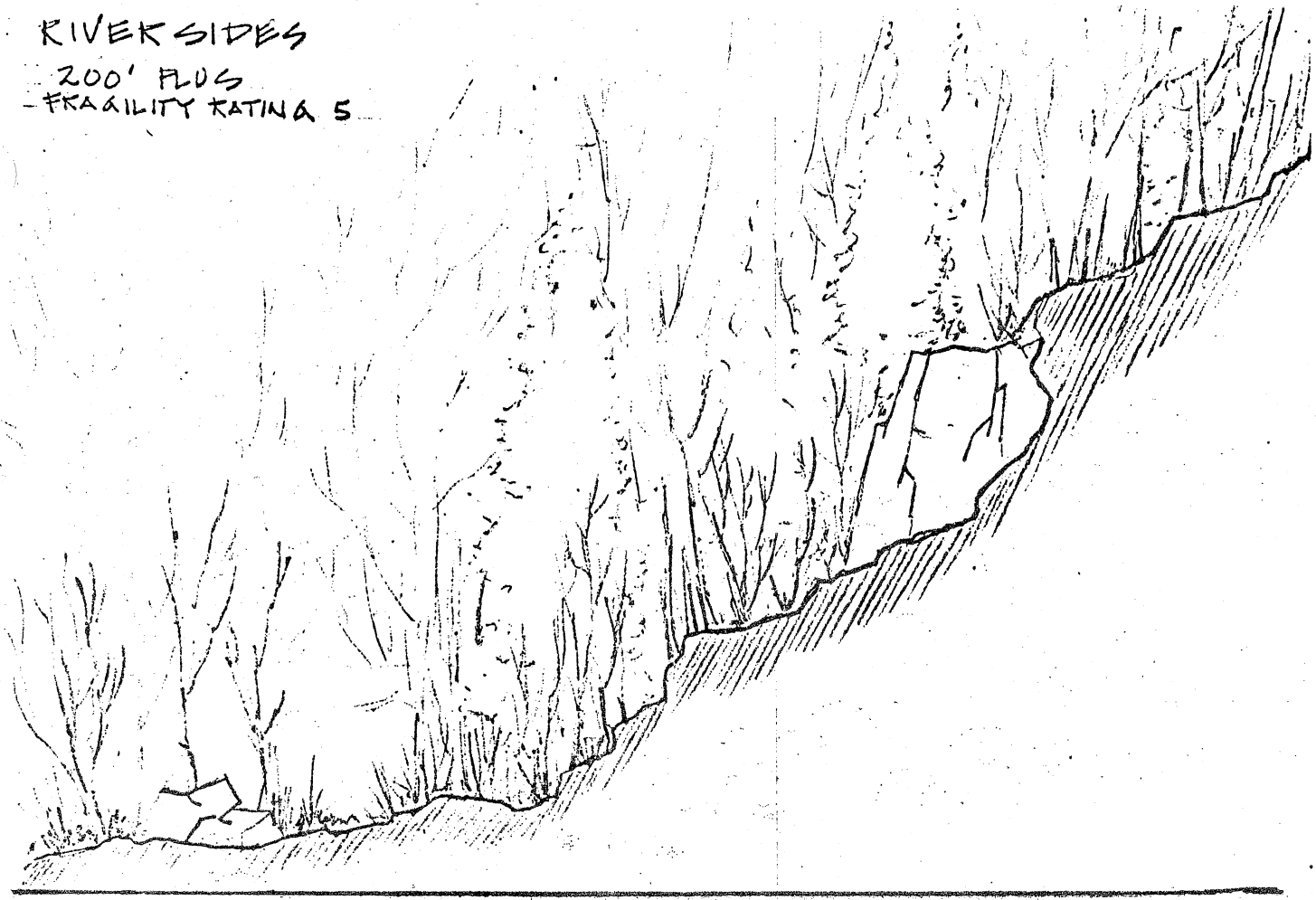
50' TO 200' FROM RIVER
FRAILITY RATING 3.



RIVERSIDES

50' TO 200' FROM RIVER
FRAILITY RATING 4.

RIVERSIDES
200' PLUS
-FRAGILITY RATING 5

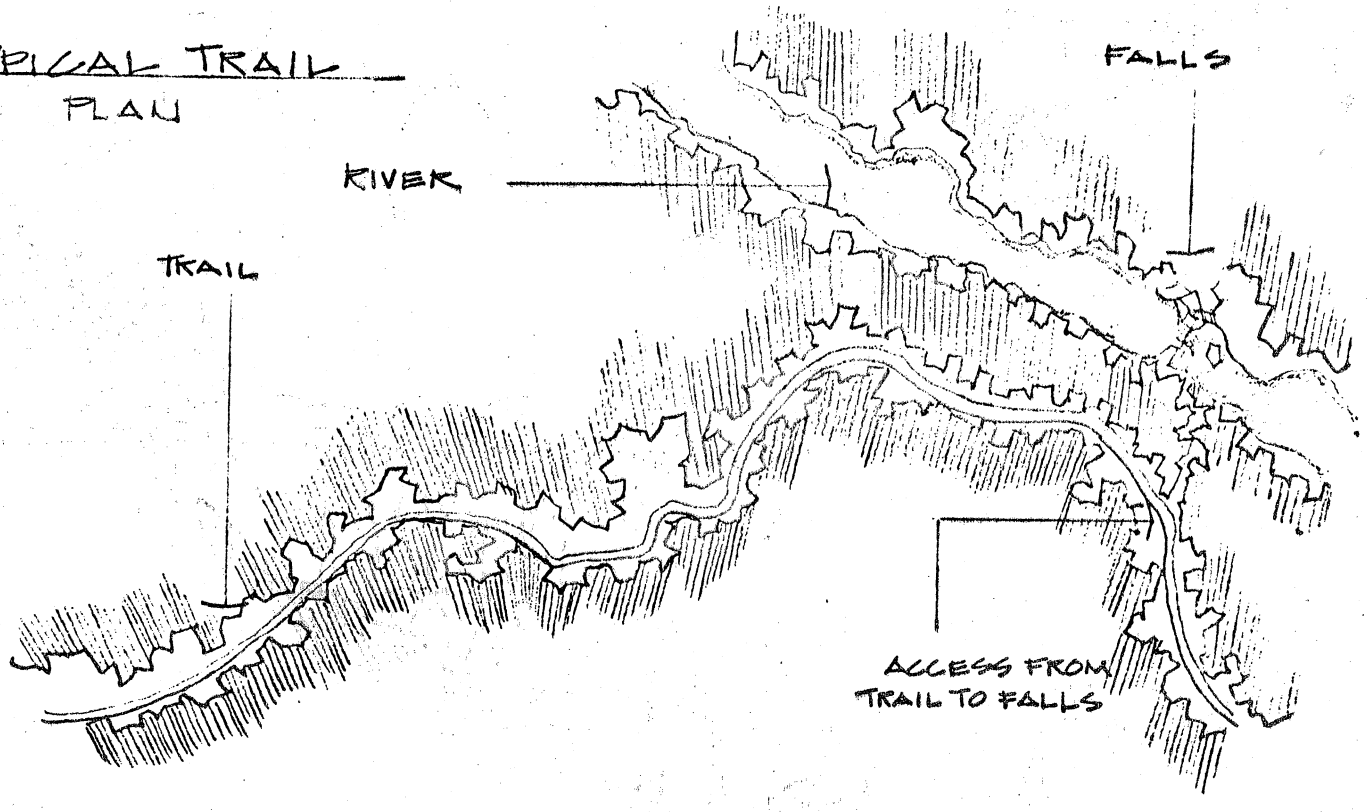


NOTES:

THESE LANDSCAPES ONLY REPRESENT FIVE EXAMPLES OF RIVERSIDE CONDITIONS. THERE ARE INNUMERABLE VARIATIONS ON EACH ONE OF THESE LANDSCAPES. THE PURPOSE OF THESE SKETCHES IS TO SHOW GENERALLY WHAT IS CONTAINED WITHIN THESE FRAGILITY BOUNDARIES

TYPICAL TRAIL

PLAN

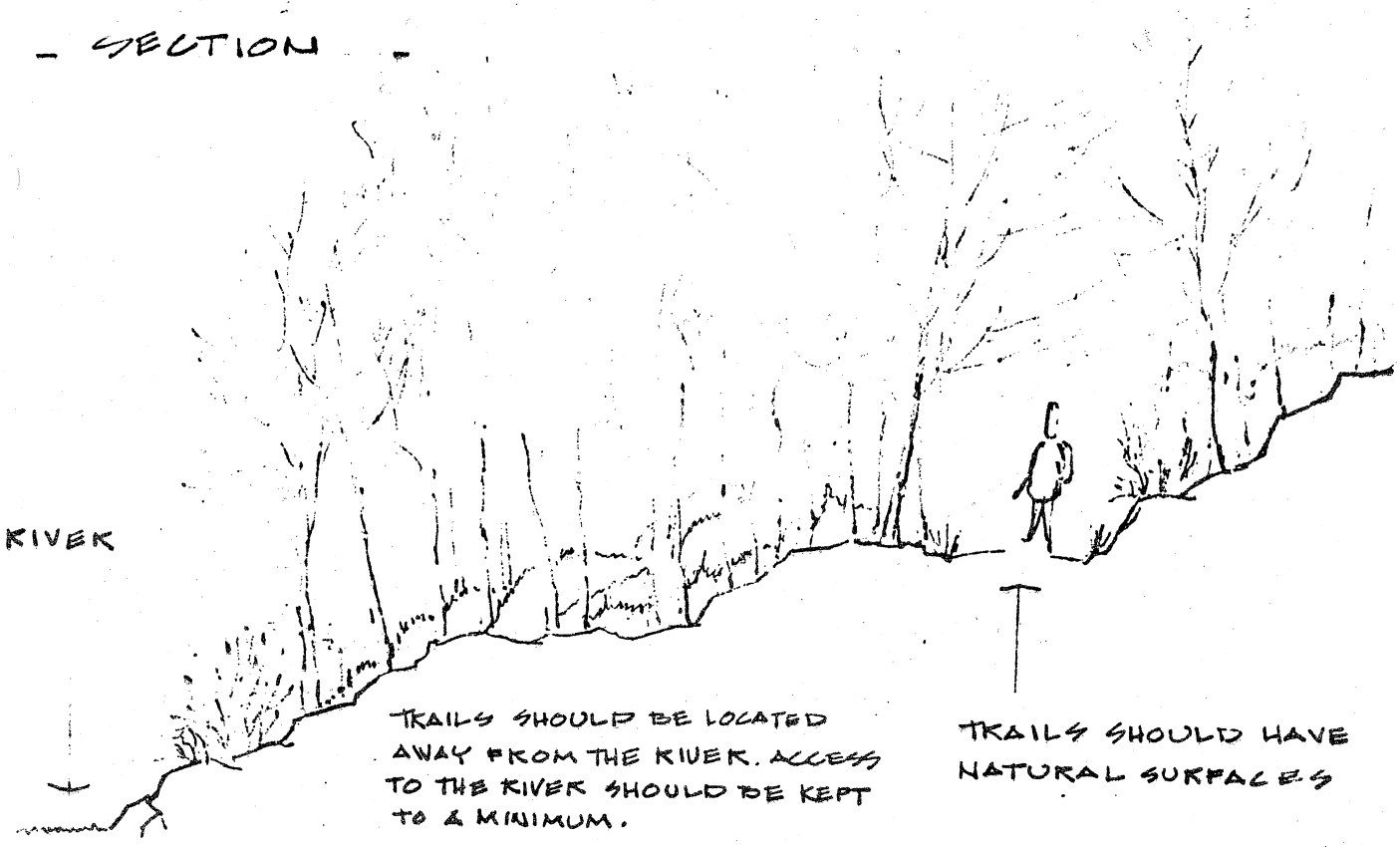


ELEVATION

A DESIGN CONTROL TO PROTECT THE MORE FRAGILE LANDSCAPES

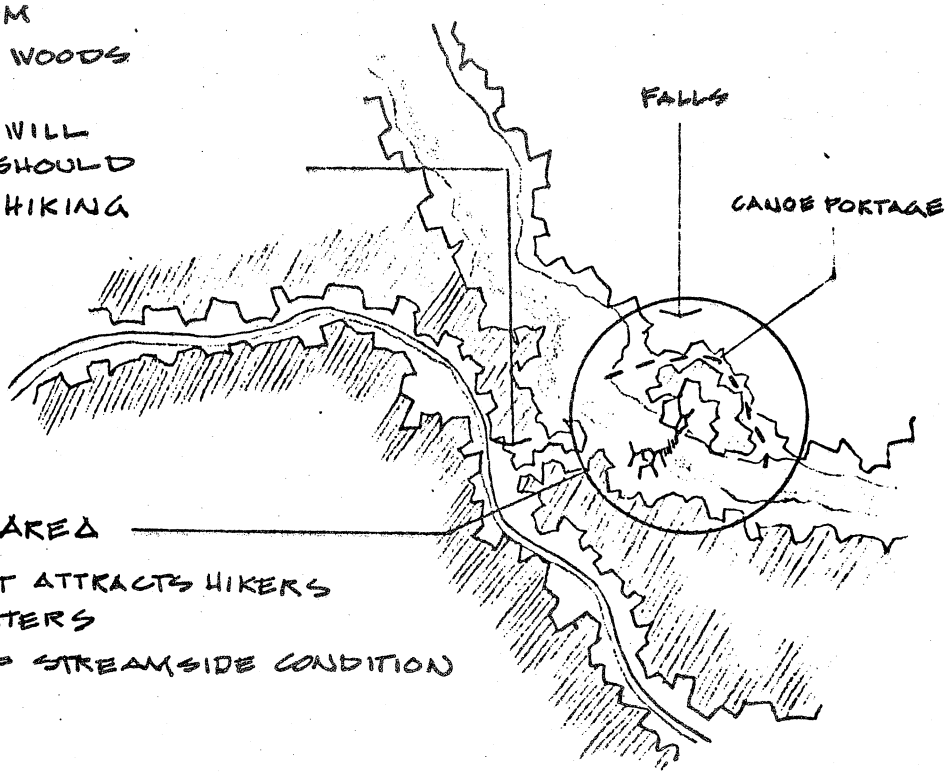
TRAILS WILL PASS THROUGH A VARIETY OF LANDSCAPES. TRAILS THROUGH WILD CLASS AREAS WILL EMPHASIZE RUGGED TOPOGRAPHY. TRAILS THROUGH THE SCENIC AREAS WILL BE LESS DEMANDING

- SECTION -



CONCENTRATION AREAS
NATURAL FEATURES

ACCESS TO FALLS FROM THE TRAIL IS THROUGH WOODS VIA UNMARKED PATH SOUND OF THE WATER WILL DIRECT HIKERS. THIS SHOULD ALSO HEIGHTEN THE HIKING EXPERIENCE

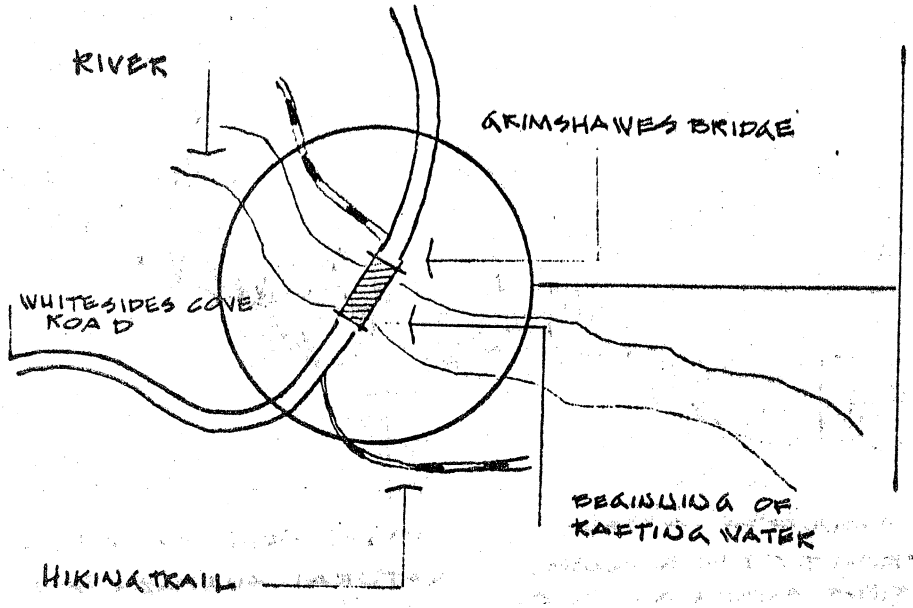


HIGH CONCENTRATION AREA

WATER FEATURE THAT ATTRACTS HIKERS AND DELAYS FLOATERS

DETERIORATION OF STREAMSIDE CONDITION EXPECTED HERE

CONCENTRATION AREAS
ACCESS NODES



HIKERS, RAFTERS AND VEHICLES WILL FREQUENTLY MEET HERE BECAUSE THIS ROAD IS THE ONLY MAJOR ACCESS TO THE RIVER IN THE HEADWATERS AREA

AS AN ACCESS NODE, VEHICLES WILL ONLY BE PERMITTED FOR PICK UP AND DROP OFF OF RECREATIONERS AND THEIR EQUIPMENT