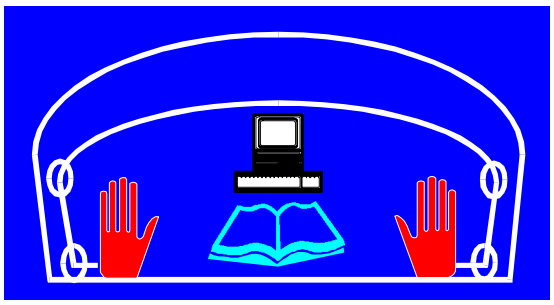

Summary - Heritage Rivers Of The Northwest Territories - A System Planning Study

Type of Study: Analysis/review

Author: Canada - Parks Canada

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SUMMARY

HERITAGE RIVERS OF THE NORTHWEST TERRITORIES
A SYSTEM PLANNING STUDY

1984

Parks Canada,
Department of the Environment.

Department of Indian Affairs and Northern Development.

Division of Tourism and Parks,
Department of Economic Development and Tourism,
Government of the Northwest Territories.

HERITAGE RIVERS OF THE NORTHWEST TERRITORIES

A SYSTEM PLANNING STUDY

ABSTRACT

This study formulates and describes themes which reflect the natural history, the human history and the recreational potential of rivers in the Northwest Territories. Accordingly, rivers are evaluated to determine their merit either for inclusion in a Territorial system of protected rivers or for nomination to the Canadian Heritage Rivers System. The study also assessed the suitability of the rivers for management by determining the extent to which it is desirable and feasible to protect them.

Of 41 rivers examined, three from three distinct physiographic regions were selected: the South Nahanni River from the Cordillera, the Mackenzie River from the Interior Plains, and the Thelon River from the Shield.

This paper is an abridged version of an original four-volume report prepared by tourist, park and recreation consultant W.M. Baker of Scarborough, Ontario. It also includes some additional background information. The study was commissioned by Parks Canada, the Department of Indian Affairs and Northern Development, and the Department of Economic Development and Tourism of the Government of the Northwest Territories.

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INTRODUCTION

The objectives of the Canadian Heritage Rivers System (CHRS) are to give national recognition to the important rivers of Canada and to ensure their future management such that:

- the natural heritage which they represent is conserved and interpreted;
- the human heritage which they represent is conserved and interpreted; and,
- the opportunities they possess for recreation and heritage appreciation are realized by residents of and visitors to Canada.

Further information on the objectives, principles and procedures of the CHRS is available from Parks Canada (Ottawa, Ontario, KIA 1G2) or Tourism and Parks (Government of the Northwest Territories, Box 1320, Yellowknife, Northwest Territories, XIA 2L9).

Within the framework of these objectives for the CHRS, the Heritage Rivers of the Northwest Territories study was undertaken. Its purpose was to formulate and implement a systematic method to identify those rivers in the NWT which merit either inclusion in a territorial system of protected rivers or nomination to the CHRS. The work was divided into four parts.

Phase I, Formulation of Thematic Framework, determined and described three heritage value categories which reflect the major characteristics of the natural history, human history and recreational potential of the rivers of the Northwest Territories.

Phase II, Heritage Values for Forty-one Selected Rivers, assessed the rivers according to the thematic framework developed in phase I.

Phase III, Assessment of River Suitability -- Management Considerations, evaluated the rivers for management considerations which are important in terms of the extent to which it is desirable and feasible to protect them.

Phase IV, River Selection, combined the results of phases II and III of the study to assign a priority to rivers for consideration for nomination to the CHRS or another heritage river system.

PHASE I: FORMULATION OF THEMATIC FRAMEWORK

Basic Requirements of the Assessment System

To develop the thematic framework, the following criteria were established (among others detailed in the report).

The thematic framework must be:

- comprehensive, encompassing all major natural, historical and recreational features and relationships;
- flexible, applicable both to the rivers of the NWT and to those of the rest of Canada;
- relatively stable, but with some capacity for updating to accommodate new information;
- composed of mutually exclusive and unambiguous classes; empirically founded on features and relationships which are observable and amenable to rating or assignable to mathematical classes;
- replicable;
- operationably feasible, requiring only currently available central sources of information and oral evidence of knowledgeable people to implement; and,
- expressed in concise, moderately technical terminology.

Major Components of the Assessment System

The assessment system consists of three major components with distinctly different functions relative to the decision-making process for the inclusion of a river in the Territorial or the CHRS.

The objective of the 'heritage values component' is to identify and to assess the quality of the historical, natural and recreational resources of a river. It is the positive, inherent resource capability input to the decision-making processes associated with the nomination and inclusion of a river into the system.

In the 'suitability estimation component', major management considerations, other than heritage values, that affect the decision-making process for the inclusion or nomination of a river are identified and assessed. The economic costs of forgoing or constraining possible uses, such as hydroelectric power development and navigation or of maintaining water quality, would be included. Costs associated with damaging effects upon ecological values resulting from increased usage generated by designation as a heritage river also enter into suitability assessment. Economic benefits such as tourist expenditure impacts are a legitimate consideration under this component.

In the 'feasibility estimation component', the results of the heritage values and the suitability estimation components are combined to provide a feasibility/practicality type of assessment for rivers relative to their inclusion or nomination. Where the costs of the management aspects are extremely heavy, or outweigh the heritage values that represent benefits, inclusion or nomination would appear not to be feasible.

It is useful to clarify the nature of the output of the feasibility estimation component relative to the decision-making process. While it provides a meaningful measure of significance for individual rivers and also a basis for comparison between rivers, its derivation is essentially an estimation process and therefore it should not be regarded as an automatic indicator for decision-making. The element of judgement that is the hallmark of administrative decision-making where complex interrelated interests, concerns, values and issues are involved will remain.

Operational Definition of a River and a River Environment

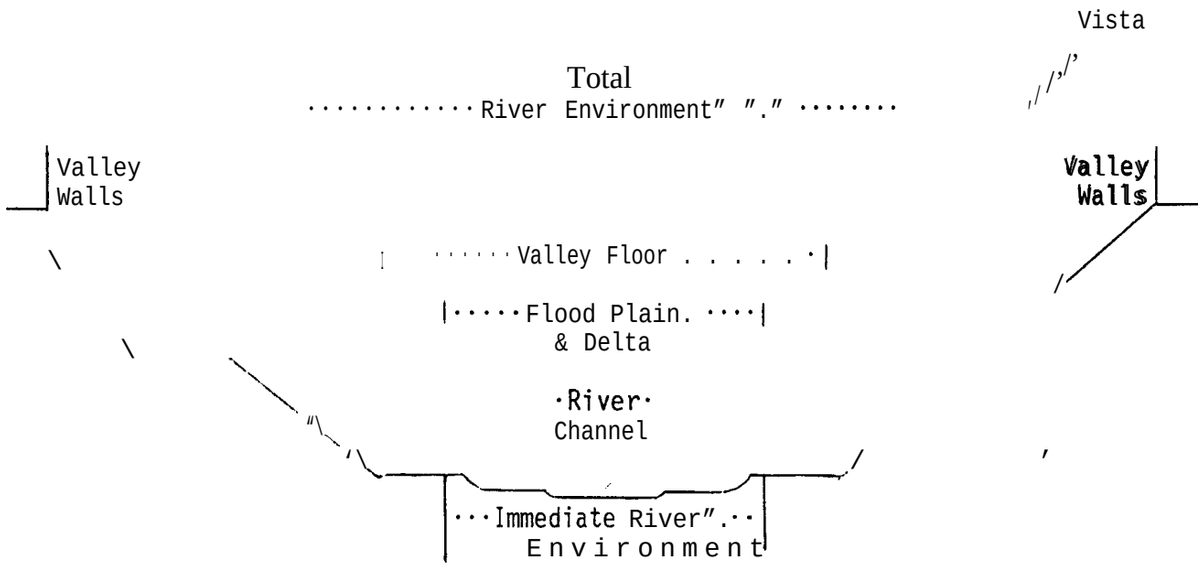
In this assessment system, the geographic extent of the features and relationships associated with a river are defined in terms of total river environment.

Only the main course or a major tributary of a river is eligible. For example, the TheIon River would qualify, as would its major tributary the Kazan River entering Aberdeen Lake. Similarly the Mackenzie River and its major tributaries such as the Liard and the Arctic Red Rivers are within scope.

Generally, the river or the segment under consideration should be 200 miles or more in length. In special circumstances such as the Slave River or the Thomsen River on Banks Island this requirement may be relaxed.

Values within the total river environment will be assessed including the river channel, which is the spinal cord of the environment, the valley floor, including plain and delta formation, and the valley walls to the crest, which are the normal limit of the visual horizon from the flood plain and include the lookout or vista points. Views of distant formations, such as mountains, will be considered to contribute to the aesthetic qualities of that part of the river from which they may be seen. However, they will not be considered to be within the physical dimensions of the river environment.

DIAGRAMMATIC REPRESENTATION OF A RIVER ENVIRONMENT



Heritage Value Categories

The multiplicity of theme features and relationships having significance in the evaluation of the quality or potential of the rivers of the Northwest Territories for inclusion in a territorial system of protected rivers and their possible nomination to the Canadian Heritage River System can be grouped under one of three heritage value categories:

- natural physical and biological,
- historical/cultural, and
- recreation/tourism.

The categories relate the system directly and meaningfully to major divisions of interest, values, goals and functions of the Territorial and Federal governments concerning heritage rivers. The natural physical and biological, and the historical/cultural value categories identify and assess the importance of phenomena requiring preservation and interpretation. The recreation/tourism value category is tied directly to the capture of social and economic values associated with the natural and historical/cultural river heritage through recreation and tourist activity, consistent with preservation goals.

The divisions also expose significant differences in the nature of the evaluative system. In the case of the natural physical and biological heritage value category, the focus is upon the identification and quality assessment of inherent physical and biological features and relationships within the context of dynamic self-organized and self-sustaining river environments. Attention centres on the selection and rating of a variety of somewhat disconnected features of valley morphology and hydrological regime, together with river dependent fish and game populations, ecological habitats and sensitive areas.

The sciences of hydrography and hydrology lack a comprehensive and 'integrated generic or nominal classification, together with a nation-wide mapping thereof. For this field there is nothing in Canada akin to the classification and mapping efforts of geology, physiography, climate and vegetation upon which a true natural river environmental classification could be based. To a large extent the evaluative process for physical river features, therefore, is forced into the identification and assessment of a number of isolated or theoretically unconnected features and relationships stressed in the hydrological literature and river physiographic studies. There is, therefore, an important element of selective subjectivity and a noticeable degree of detachment in the themes presented.

In the case of the historical/cultural value category the assessment procedure possesses a degree of theoretical cohesion and integration based upon the solid foundation of thematic studies and systems development completed for Parks Canada in recent years. Dene, Inuit and Metis cultural values associated with rivers, however, remain undetermined, a serious limitation in the Northwest Territories as noted subsequently.

The recreation/tourism heritage value category carries the assessment system firmly into the realm of analytical natural resource use capability or quality classification. Natural and historical/cultural resource phenomena, patterns and relationships are evaluated in terms of requirements of selected recreation and tourism activities or experiences.

Finally, the value categories are directly related to differences in the primary focus of interest and priority emphasis in river values and requirements for designation under the Canadian Heritage River System in different parts of the nation. In the densely populated sections of southern Canada, tourism and recreation factors probably will receive major emphasis by virtue of their social and economic demands and the virtual absence of large natural river environments.

In the Northwest Territories natural values can be expected to receive major emphasis in decision-making processes.

Thematics and Theme Weighings

Under each of the heritage value categories, river evaluation proceeds within a framework of theme groupings, themes and sub-themes defined on the basis of distinct natural, historical/cultural and recreation/tourism topical features, associations, relationships and activities. This provides a detailed framework for the value recording process.

Weighting of theme evaluation and summation will not be considered until phase II of the study when an adequate perspective and basis of empirical evidence develops for an appreciation of real dimensions of the situation. Conclusions reached solely on the basis of theoretical considerations could be misleading and perhaps totally erroneous.

Integrity Guideline Requirements

In addition to the values revealed in the assessment of the natural, historical/cultural and recreation/tourism analysis, a river or river segment under consideration for nomination must meet what has been termed 'integrity guidelines'. These integrity guidelines are: stability, ecological viability or self-sustainment, and water quality.

'Stability' demands that no major natural or man-made transforming process, impact or catastrophe which could destroy the basic values identified appear imminent.

'Ecological viability or self-sustainment' demands that a river designated be of a size and quality sufficient to ensure the continued existence and functioning of the natural biotic and abiotic features and processes upon which its value is based. This is not a function of size alone, but rather of size in relation to the ecological viability of the determinant features and processes.

'Water quality', which in many situations bears a relationship to ecological viability, must be of a sufficiently high standard to sustain the life forms present and not unduly impair recreation/tourism values.

Thematic Development of the Natural Physical and Biological Heritage Value Category

While it is recognized that the natural river environment is a dynamic, integrated and self-organized system of abiotic and biotic phenomena, pragmatic considerations virtually demand the adoption of a systematic approach to evaluation. Three distinct theme groupings within the natural physical and biological heritage value category are recognized: physical, botanical and zoological.

In principle, a river can qualify for inclusion in the Territorial or the Canadian Heritage River System on the basis of the strength of its resources under any of the three heritage value categories. In the Northwest Territories, however, the values of the natural physical and biological heritage category are the most central and critical in the total evaluation process and hence receive attention initially. For many rivers in the Territories, the historical/cultural and the recreation/tourism categories are only weakly represented, particularly the former.

Table I lists the themes, sub-themes, etc. of the three theme groups of the natural physical and biological heritage value category.

TABLE I

NATURAL PHYSICAL AND BIOLOGICAL HERITAGE VALUE CATEGORY

PHYSICAL THEMES GROUP

1. Hydrology
   - Flow Pattern
     - river length
     - glacial meltwater component
     - mean annual volume discharge
     - periodicity of discharge
     - velocity
   - Flooding
   - Lake Balance
   - Water Quality
     - water temperature
     - chemical composition
     - hardness
     - suspended sediments
     - bacterial and chemical pollution

2. Morphology
   - Permafrost Relationships
   - Channel Morphology
     - channel gradient
     - channel pattern
     - depositional forms
   - Valley Morphology
     - valley walls
     - terraces
     - deltas and fans
     - flood plains and associated landforms

BOTANICAL THEMES GROUP

1. Vegetation/Forest Region
   - Tundra
     - arctic rock desert or fell field
     - arctic stoney lichen heath
     - arctic dwarf shrubs, sedges, lichen heath
     - arctic mature sedges, grasses and shrubs
     - alpine sedges, grasses and shrubs
   - Transition
     - tundra/open woodland
     - open subarctic woodland
     - alpine forest/tundra
     - lower Mackenzie River
   - Boreal Forest
     - upper Mackenzie/Liard
     - Hay River

2. Rare/Exotic Plant Communities

ZOOLOGICAL THEMES GROUP

1. Fish
2. Mammals
3. Birds

Thematic Development of the Historical/Cultural Heritage Value Category

Three distinct theme groupings are recognized: Prehistory, Indigenous History and Culture (which, because of time and cost constraints, is not dealt with effectively in the study), and History (the period of written record since the first European contact).

The focus of the evaluation is quite distinct being centred on the significance of the resources of the rivers as a representative or unique sample of the features, patterns or relationships for the theme with which they are associated within the geographic limits of the Northwest Territories and Canada. In effect, it is the significance of the resources relative to the understanding of the historical and cultural patterns of the Territories and Canada that is crucial.

Table II lists the themes, sub-themes, etc. of the three theme groups of the historical/cultural heritage value category.

TABLE II

HISTORICAL/CULTURAL HERITAGE VALUE CATEGORY

HISTORICAL/CULTURAL THEMES GROUP

1. **Prehistory**
   - Arctic Small Tool Tradition
   - Shield Archaic Tradition
   - Northern Piano Tradition
   - Piano Culture

2. Indigenous History and Culture

3. **History**
   - Exploration
     - geographical exploration
     - resource development exploration
   - Fur Trade
     - water transportation

Thematic Development of the Recreation/Tourism Heritage Value Category

From the standpoint of individual leisure time pursuits such as swimming, angling or river landscape touring, there is no basic difference between recreation and tourism insofar as the determinant parameters and criteria for the evaluation of a quality experience are concerned. The significant difference is related to the level of quality required to give satisfaction to a local resident recreationist who incurs little time and monetary cost of access and, in many cases, has no alternative opportunities, and the tourist who must incur substantial cost and often has the luxury of alternative destination area choices. The greater the expense to the tourist and the wider the range of choice, the higher the quality of the resource must be to attract and sustain tourism.

There is a marked difference in the type of benefits involved. Recreation centres upon social benefits measured in days of recreation activity, opportunity or participation. Tourism is focused upon economic values including income, investment and employment opportunities and tax revenue generated. In effect, it is in management considerations that this distinction assumes its greatest importance.

Four theme groupings are recognized: Recreational Canoeing, Kayaking, Boating and Rafting, River Corridor Touring, Specific Outdoor Activity, and Community Interest and Infrastructure. The theme groupings, etc., are shown in Table III.

TABLE III

RECREATION/TOURISM HERITAGE VALUE CATEGORY

RECREATION TOURISM THEMES GROUP

1. Recreational Canoeing, Kayaking, Boating and Rafting
   - Recreational Canoeing, Kayaking, Boating and Rafting

2. River Corridor Touring
   - Highway Touring
   - Commercial River Touring

3. Specific Outdoor Activity
   - Angling District Quality
   - Sports Lodges and Camps

4. Community Interest and Infrastructure
   - Population Scale
   - Tourist Facilities
   - Access
   - Ethnicity

PHASE II: HERITAGE VALUES FOR FORTY-ONE SELECTED RIVERS

Calculation of Points and Indexing

In phase II of the study, the consultant assessed rivers of the NWT according to the thematic framework developed in phase I. The Division of Tourism and Parks, of the GNWT, provided the consultant with a list of 41 rivers for evaluation. On the basis of various sources of documentary evidence and discussions with knowledgeable people in federal and territorial government agencies in Yellowknife and Ottawa, the consultant determined heritage values.

Tables IV, V and VI summarize the results of the consultant's detailed evaluations. For consistency, and to facilitate interpretation, all values are adjusted to a range of zero to ten.

TABLE IV

INDEXED POINTS OF THE NATURAL PHYSICAL AND BIOLOGICAL HERITAGE VALUE CATEGORY

Name	HYDROLOGY	MORPHOLOGY THEMES	BOTANICAL THEMES	ZOOLOGICAL THEMES	SUMMARY
MOUNTAINS & UPLANDS					
a) Cordilleran					
Arctic Red	10	10	10	8	9
Keele	7	8	10	9	9
Liard	10	4	3	8	6
Mountain	7	7	10	7	8
Peel	7	10	3	8	6
Redstone	8	8	7	9	8
South Nahanni	10	9	10	10	10
b) Arctic Islands Uplands					
Dewar (Baffin Is.)	10	7	3	3	5
Dodge	4	7	3	1	3
Hantzsch	6	10	3	3	5
Isortoq	10	9	3	3	5
Kuujjua	10	7	7	3	6
McKeand	10	8	3	1	4
No name (Devon Is.)	10	7	3	3	5
INTERIOR PLAINS					
Anderson	7	9	10	10	9
Great Bear	10	6	7	8	8
Hay	8	9	3	7	6
Horn	6	6	7	6	6
Hornaday	6	9	3	7	6
Horton	6	10	7	7	7
Mackenzie	10	10	10	10	10
Slave	10	10	3	10	8
Willowlake	6	6	7	7	7
SHIELD					
Back	10	8	3	7	6
Burnside	6	9	3	7	6
Coppermine	10	10	7	6	8
Dubawnt	10	8	3	10	6
Ellice	4	6	3	10	6
Hayes	4	6	7	4	6
Kazan	10	7	10	7	8
Lockart	10	9	10	7	9
Maguse	7	9	10	8	9
Quoich	6	7	3	4	5
Snare	7	6	3	6	6
Talston	8	10	7	8	9
Thelon	10	6	7	9	8
Thlewiaza	8	9	10	7	8
Yellowknife	6	7	3	7	6
ARCTIC ISLANDS LOWLANDS					
Bernard	10	10	7	2	6
	10	9	3		
	10	9	7		

TABLE V

INDEXED POINTS OF THE HISTORICAL/CULTURAL HERITAGE VALUE CATEGORY

Name	PREHISTORY	INDIGENOUS HISTORY & CULTURE	HISTORY	SUMMARY
MOUNTAINS & UPLANDS				
a) Cordilleran				
Arctic Red	1	6	0	3
Keele	1	4	1	3
Liard	3	4	2	4
Mountain	1	4	0	2
Peel	1	4	0	3
Redstone	1	4	0	2
South Nahanni	1	4	0	2
b) Arctic Islands Uplands				
Dewar (Baffin Is.)	1	4	0	2
Dodge	7	2	0	4
Hantzsch	2	4	0	3
Isortoq	2	4	0	3
Kuujjua	1	4	0	2
McKeand	2	4	0	3
No name (Devon Is.)	2	2	0	2
INTERIOR PLAINS				
Anderson	1	8	0	4
Great Bear	3	4	2	4
Hay	1	4	1	3
Horn	1	4	0	2
Hornaday	1	4	0	2
Horton	1	8	0	4
Mackenzie	3	10	10	10
Slave	1	4	3	3
Willowlake	1	6	0	3
SHIELD				
Back	1	4	1	3
Burnside	1	4	1	3
Coppermine	4	8	3	6
Dubawnt	3	4	1	3
Ellice	2	6	0	3
Hayes	1	4	0	2
Kazan	2	8	0	4
Lockart	4	6	2	5
Maguse	3	4	0	3
Quoich	2	4	0	3
Snare	2	4	1	3
Talston	1	4	0	2
TheIon	10	8	2	9
Thlewiaza	3	8	0	5
Yellowknife	2	4	0	3
ARCTIC ISLANDS LOWLANDS				
Bernard	1	2	0	1
Gifford	2	4	0	3
Thomsen	3	2	0	2

TABLE VI

INDEXED POINTS OF THE RECREATION/TOURISM HERITAGE VALUE CATEGORY

Name	RECREATIONAL CANOEING, KAYAKING, BOATING & RAFTING	RIVER CORRIDOR TOURING	SPECIFIC OUTDOOR ACTIVITY	COMMUNITY INTEREST & INFRASTRUCTURE	SUMMARY
MOUNTAINS & UPLANDS					
a) Cordilleran					
Arctic Red	5	1	3	2	5
Keele	8	0	3		5
Liard	[illegible]	7	3	5	6
Mountain	8	0	3		5
Peel	3	4	3	5	5
Redstone	9	0	3		6
South Nahanni	10	0	3	2	7
b) Arctic Islands Uplands					
Dewar (Baffin Is.)	2	0	2	0	2
Dodge	0	0	1	0	0
Hantzsch	0	0	2	0	1
Isortoq	0	0	2	0	1
Kuujjua	2	0	2	0	2
McKeand	0	0	2	0	1
No name (Devon Is.)	0	0	1	0	0
INTERIOR PLAINS					
Anderson	6	0	3	0	4
Great Bear	2	1	3	8	5
Hay	1	3	6	8	5
Horn	0	0	3	0	1
Hornaday	4	0	5	3	5
Horton	4	0	4	0	3
Mackenzie	6	10	4	9	10
Slave	1	3	6	7	5
Willowlake	1	0	4	0	2
SHIELD					
Back	10	0	7	0	8
Burnside	5	0	7	2	5
Coppermine	10	0	5	5	9
Dubawnt	9	0	9	0	8
Ellice	4	0	5	0	4
Hayes	4	0	2	0	3
Kazan	9	0	8	0	7
Lockart	3	0	6	0	3
Maguse	4	0	5	5	5
Quoich	4	0	2	0	3
Snare	6	0	6	0	5
Talston	7	0	10	0	7
Thelon	10	0	8	5	9
Thlewiaza	9	0	8	0	7
Yellowknife	6	0	8	10	9
ARCTIC ISLANDS LOWLANDS					
Bernard	0	0	1	0	0
Gifford	0	0	1	0	0
Thomsen	2	0	1	0	1

Selection of Rivers for Further Study

A river may be eligible for inclusion in the Canadian or Territorial heritage river systems by virtue of its natural, historical/cultural or recreation/tourism values considered individually. In the case of the 41 rivers of the Northwest Territories under consideration, evaluation by point scores and ranks indicates that the natural values should be the major determinant with the recreation/tourism and historical/cultural values representing important secondary factors. In effect, the latter categories are not sufficiently strong, with the exception of the Mackenzie River, to justify the inclusion of a river in a heritage system.

Considerable choice is available in approach and method to select rivers for further study. Each yields a different result in terms of the comparative strength of the rivers and hence those considered eligible for further consideration. Equally important, some rivers (Mackenzie, Coppermine, Thelon) were always at the forefront regardless of the approach and method adopted.

Two broad approaches were employed in this study to provide that comparative perspective considered necessary in a subjective evaluative process of this type. These can be summarized as follows:

Approach A_1: Involved the totalling of point scores for each category, the indexing of the results and the ranking of the rivers scoring above the mean value.

Approach A_2: Involved the selection of rivers with index point scores above the mean for a particular category and elimination of those below the mean score. Point scores obtained by the selected rivers under other categories are added and the totals obtained then are indexed. Rivers above the mean then are ranked. Three variations were employed including:

- $A_{2.1}$ - Initial selection on basis of index point scores obtained under the natural heritage value category.
- $A_{2.2}$ - Initial. selection on basis of index point scores obtained under the historical/cultural heritage value category.
- $A_{2.3}$ - Initial selection on basis of index point scores obtained under the recreation/tourism heritage value category.

On the basis of the point scores and rankings a selection of rivers eligible for further consideration was determined as follows:

Step 1 - The results of the elimination approach beginning with the natural heritage value category ($A2_{-1}$) were accepted as most suitable. This provided ten rivers with point scores ranging from 5 to 10. Those with lower point scores were eliminated.

Step 2 - The process was relaxed to permit the inclusion of the Thomsen and the Kuujjua Rivers as representatives of the Arctic Islands lowlands and uplands. Otherwise, these areas would not have been represented further in the study.

The results of steps 1 and 2 are shown in Table VII.

TABLE VII

FINAL SELECTION OF RIVERS WITH THE BEST HERITAGE VALUES

River	Setting	Point Score
Mackenzie	Interior Plains	10
TheIon	Shield	9
Coppermine	Shield	8
Thlewiaza	Shield	7
South Nahanni	Cordilleran	6
Arctic Red	Cordilleran	6
Keele	Cordilleran	6
Anderson	Interior Plains	6
Kazan	Shield	6
Lockhart	Shield	6
Maguse	Shield	6
Thomsen	Arctic Islands Lowlands	4
Kuujjua	Arctic Islands Highlands	3

PHASE III: ASSESSMENT OF RIVER SUITABILITY -- MANAGEMENT CONSIDERATIONS

Selection of Parameters and Evaluation

In phase III, the consultant evaluated the 41 rivers for management considerations which are important in terms of the extent to which it is desirable and feasible to protect them.

Thirteen individual subjects or topics (termed 'parameters by the consultant) related to management considerations were identified. Those parameters with essentially negative or restrictive impact were handled as a group. Eleven fell in this group, nine of which could be assessed quantitatively. Those two remaining parameters with essentially positive impact, that is those that enhanced the qualities of a river for inclusion in a heritage rivers program from a management standpoint, were treated separately.

In recognition of the magnitude of the impact of the different parameters, weights were assigned on a tripartite scale: high of 3x, moderate of 2x, and low of lx. To some degree, the weighings were determined by the nature and strength of the information base available for the assessment of the parameter in addition to general theoretical aspects and past experiences.

The consultant cautioned that the results obtained in the study are highly subjective in nature. While a point score system was employed and mechanically sound indexing and weighing procedures were followed, these must not be permitted to mask limitations in the intensity and objectivity of the work implicit in the underlying foundation sources of information. Gaps in readily accessible information frequently dictated the subjects and topics associated with management considerations that could be assessed in this study. Moreover, some highly subjective decisions having very important implications were made in the assignment of the numerical measures of advantages and constraints.

The parameters and their assigned weights are shown in Table VIII.

The resultsof the consultant's evaluations and calculations for phase III are shown in Table IX.

TABLE VIII

PARAMETERS OF MANAGEMENT CONSIDERATION AND ASSIGNED WEIGHTS

	Parameter	Negative Weight	Positive Weight
1.	Hydroelectric power development and potential	3	
2.	Mining exploration and production	3	
3.	Commercial and domestic forestry potentials and harvesting	3	
4.	Gas and oil exploration	3	
5.	Gas and oil pipeline routeways	2	
6.	Highway planning and construction as an intrusive factor	2	
7.	Native land claims	2	
8.	Commercial and domestic fishing	1	
9.	Jurisdictional patterns	1	
10.	Trapping	*	
11.	Industrial/domestic water extraction and pollution	*	
12.	Parklands, wildlife and natural history preserves/reserves		3
13.	Highway and major road access as a management advantage		1

* Could not be handled in an objective quantifiable manner.

TABLE IX

POINT SCORES AND RANKINGS FOR THE SUITABILITY OF THE 41 RIVERS RELATIVE TO MANAGEMENT CONSIDERATIONS

(Note: Because of the scoring system used by the consultant, a low point score yields a high rank -- the opposite of other tables -- for the left column only)

Name	NEGATIVE FACTORS (NUMBERS 1 TO 9)	POSITIVE FACTORS NUMBERS 12 AND 13)
MOUNTAINS & UPLANDS		
a) Cordilleran		
Arctic Red	1	2
Keele	1	1
Liard	0	4
Mountain	10	0
Peel	1	2
Redstone	1	1
South Nahanni	0	10
b) Arctic Islands Uplands		
Dewar (Baffin Is.)	6	0
Dodge	10	0
Hantzsch	10	0
Isortoq	6	0
Kuujjua	3	0
McKeand	1	0
No name (Devon Is.)	10	0
INTERIOR PLAINS		
Anderson	3	2
Great Bear	1	0
Hay	3	1
Horn	10	0
Hornaday	3	0
Horton	3	0
Mackenzie	0	3
Slave	1	1
Willowlake	3	1
SHIELD		
Back	1	0
Burnside	1	0
Coppermine	1	0
Dubawnt	1	1
Ellice	3	0
Hayes	4	0
Kazan	1	0
Lockart	0	0
Maguse	1	0
Quoich	10	0
Snare	1	0
Talston	1	1
TheIon	1	4
Thlewiaza	3	0
Yellowknife	1	1
ARCTIC ISLANDS LOWLANDS		
Bernard	4	1
Gifford	6	0
Thomsen	3	1

PHASE IV: RIVER SELECTION

Background

No individual river, or limited set of rivers, that could be considered most satisfactory for further study as candidates for inclusion in a national or territorial heritage river system, consistently and indisputably emerged from the statistical explorations of the study. The need for extensive exploration of alternatives for combining heritage values and management considerations is an indication of serious methodological problems and, more importantly, of constraints imposed by the superficial and uneven assessment of many heritage values and management considerations, especially the latter, due to the absence of readily applicable central sources of incisive information.

From the combining processes in which indexed final point scores for heritage values and management considerations were combined, a fairly consistent pattern emerged on the basis of the type of expression for management considerations employed. The situation can be briefly summarized as follows.

When negative point scores for management considerations were applied, the Anderson, Arctic Red and South Nahanni Rivers emerged as the top three. The Thelon, Mackenzie and Thlewiaza Rivers stood as the next group of three when unweighed and x1.5 weighted indexed point scores for heritage values were used. When suitability scores for management considerations were applied in the combining process, the South Nahanni, Mackenzie and Thelon Rivers stood as the top three. The Anderson, Arctic Red, Thlewiaza or Coppermine Rivers appeared as the next group of three depending on the weighting strengths applied. In the case of the use of negative point scores with a weight of 2.0x applied to heritage values, the pattern that is characteristic of the combining process using suitability scores begins to appear. Here the Anderson, South Nahanni and Thelon Rivers stand as the top three.

From the combining processes in which the raw, actual or non-indexed point scores for heritage values and management considerations are used, a second set of top or leading rivers emerges. The situation can be concisely summarized as follows.

In all cases where negative point scores are used in the combining procedure, regardless of weighings applied to the heritage values, the Thelon, Thlewiaza and Arctic Red Rivers stand as the top three. The Anderson, Coppermine and South Nahanni Rivers are as the next group of three with the Maguse River replacing the Coppermine River in the case where unweighed scores for heritage values are involved in the combination. When suitability scores for management considerations are used in the combining process along with unweighed scores, the Arctic Red, Thelon and Thlewiaza Rivers again occupy the top three positions. When weighted point scores for heritage values are used and suitability measures for management considerations, the top three rivers become the Thelon, Thlewiaza and Mackenzie. In effect, the Mackenzie River replaces the Arctic Red in the top three listing.

TABLE X

ALPHABETICAL LISTING OF HIGHEST RANKING RIVERS BASED ON EVALUATION OF COMBINED HERITAGE VALUES AND MANAGEMENT CONSIDERATIONS

Anderson

Arctic Red

Copper-mine

Great Bear

Kazan

Keele

Lockhart

Mackenzie

Maguse

South Nahanni

TheIon

Thlewiaza

Rationale for Selection

Final river selection was essentially a judgement process involving four factors taken in combination. These were:

the evidence provided by the results of the combining procedures presented in phase III of the study;

impressions from factual evidence which emerged during the assessment of heritage values and management considerations in phases II, III and IV of the study;

general background appreciation of the geography of the Northwest Territories resulting from past tourist, park and recreation studies undertaken therein by the consultant; and

regional representation.

More specifically, a choice was necessary with respect to the most satisfactory combining procedure in phase III of the study. In this regard, the following judgments guided the ultimate decision:

a) Considering the nature of the heritage river program as a whole, and the general nature of the assessment procedures of this study and their associated information inputs, it was judged that the natural heritage value category should be given preferential recognition. In part, this was achieved through the introduction of this category in the initial step of the combining procedures. However, something more was considered necessary and hence the use of weighting procedures was judged desirable.

b) The use of indexed final point scores for the natural heritage value category and management considerations in the combining processes was judged to be more statistically sound, given the assessment procedures and information inputs for the individual and grouped themes and sub-themes of the natural heritage value category and the parameters of management considerations.

c) Recognizing the foregoing points a) and b), the list of rivers that emerged conformed remarkably well with, or did not drastically violate, known geographic realities and regional distributions.

Final Choice

In the final river selection three rivers in three distinct physiographic settings emerged. They are the Thelon River (Shield setting), South Nahanni River (Cordilleran setting), and the Mackenzie River, (Interior Plains setting). All are exceptionally well endowed with heritage assets, and each has a particularly strong signature feature that tends to thrust it to the forefront.

In the combining procedure judged to be most satisfactory, the three rivers are about equal in point scores and ranking. A final ordering as follows was considered most suitable for the study by the consultant and representatives of the sponsoring agencies.

First Order: South Nahanni River (Cordillera Setting)

- The total score for this river was very substantially enhanced by its score for positive management considerations resulting from its association with the Nahanni National Park. However, this correctly reflects an important attribute of the river.

- Outstanding heritage values are associated primarily with natural and recreation/tourism heritage value categories. Scenery, white water opportunities and physiographic features (caves, hotsprings, mountain landforms) are strong.

Second Order: Mackenzie River (Interior Plains Setting)

- Scored consistently high for natural, historical/cultural and recreation/tourism heritage value categories. It is the most outstanding river with respect to historical/cultural values viewed from both national and territorial perspectives.

Third Order: Thelon River (Shield Setting)

- Strong and comprehensive natural and recreation/tourism heritage values are present making it highly representative of the best in this respect.

APPENDIX

MAP REFERENCES FOR RIVERS EXAMINED IN THE STUDY

Setting	Name	Latitude	Longitude
Mountain and Uplands			
a) Cordilleran	Arctic Red	67°26′	133°45′
	Keele	64°25′	124°48′
	Liard	61°51′	121°18′
	Mountain	65°41′	128°50′
	Peel	67°42′	134°32′
	Redstone	64°17′	124°33′
	South Nahanni	61°03′	123°21′
b) Arctic Islands Uplands	Dewar (Baffin Is.)	67°30′	72°00′
	Dodge	81°31′	68°40′
	Hantzsch	67°32′	72°25′
	Isortoq	69°58′	77°00′
	Kuujjua	71°16′	116°49′
	McKeand	65°34′	67°55′
	No name (Devon Is.)	75°40′	92°15′
Interior Plains	Anderson	69°43′	129°00′
	Great Bear	64°54′	124°35′
	Hay	60°52′	115°44′
	Horn	61°30′	118°01′
	Hornaday	69°19′	123°48′
	Horton	69°56′	126°48′
	Mackenzie	69°15′	134°08′
	Slave	61°18′	113°39′
	Willowlake	62°42′	123°08′
Shield	Back	67°15′	95°15′
	Burnside	66°51′	108°04′
	Coppermine	67°49′	115°04′
	Dubawnt	64°33′	100°06′
	Ellice	68°02′	103°58′
	Hayes	67°08′	95°17′
	Kazan	64°02′	95°30′
	Lockart	62°48′	108°55′
	Maguse	61°17′	94°04′
	Quoich	64°00′	93°30′
	Snare	63°07′	115°53′
	Talston	61°24′	112°46′
	TheIon	64°16′	96°05′
	Thlewiaza	60°29′	94°40′
	Yellowknife	62°30′	114°18′
Arctic Islands Lowlands	Bernard	73°34′	124°05′
	Gifford	70°19′	83°03′
	Thomsen	74°08′	119°45′