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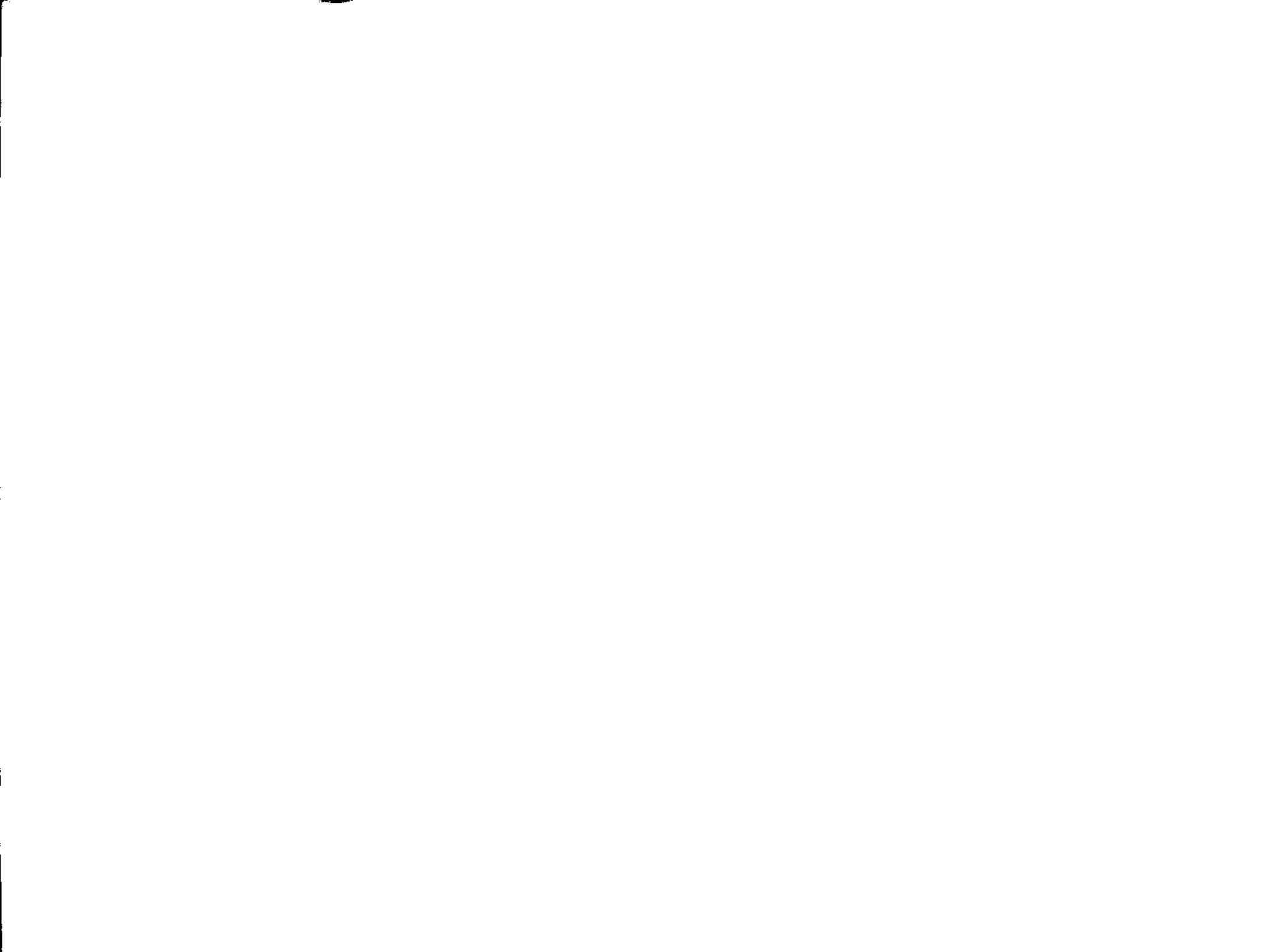


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# SKAGIT

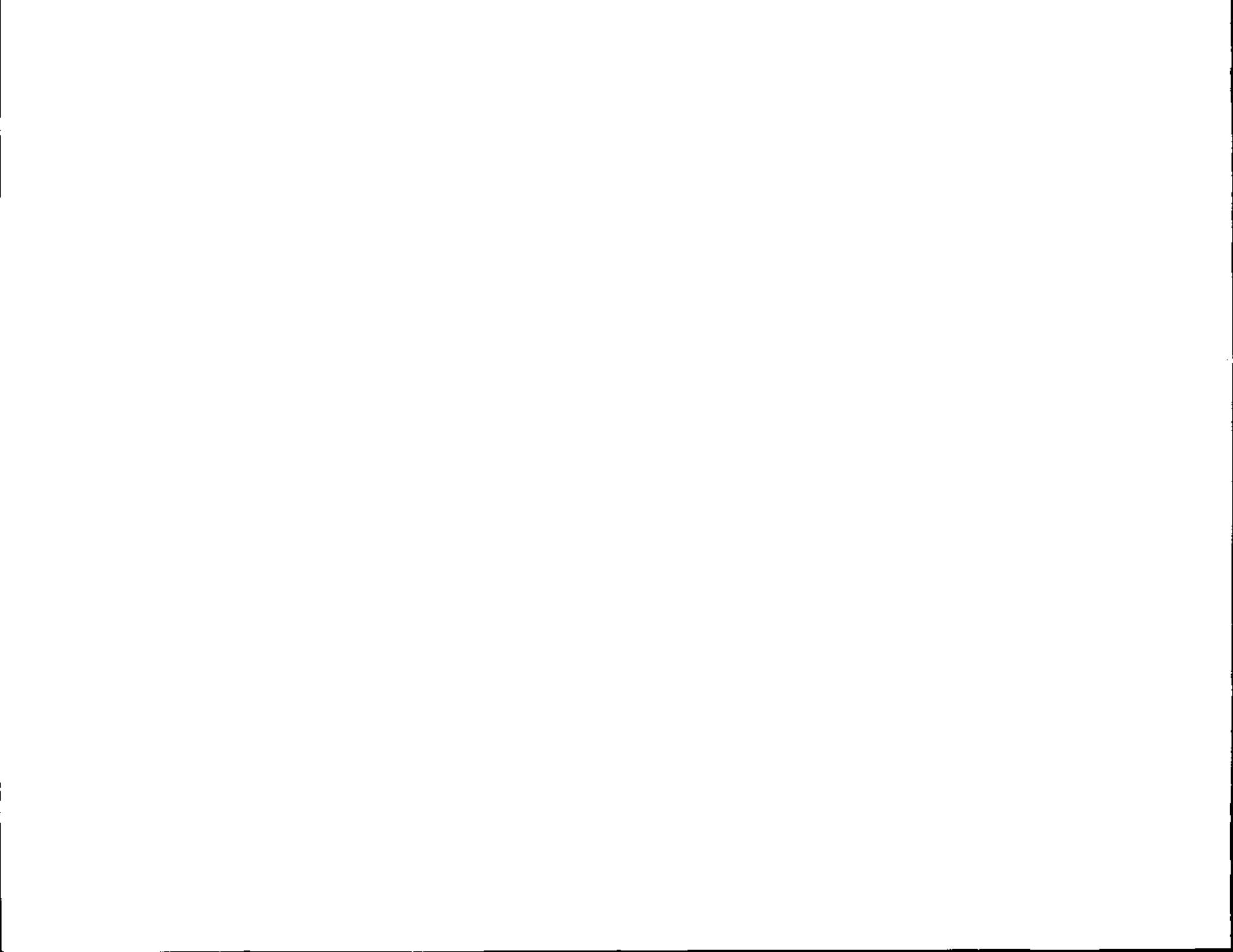
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Wild and Scenic River Study Report



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**PART**

**SUMMATION**



# INTRODUCTION

## A. THE WILD AND SCENIC RIVERS ACT

Congress enacted Public Law 90-542 on October 2, 1968. This law, known as the Wild and Scenic Rivers Act, established a National Wild and Scenic Rivers System; named eight rivers as "instant" components of the National System; named the Skagit as one of 27 "study rivers" for potential addition to the National System; and set up criteria for the addition of other rivers to the National System.

The intent of Congress in establishing a national system of Wild and Scenic Rivers is stated in Section 1(b) of the Act: "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 set up three different classifications for rivers and their adjacent shorelines. Depending upon their degree of development, rivers may be classified as Wild, Scenic or Recreational. Section 2(b) of the Act describes the characteristics of the three classifications.

Wild river areas - Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with water-

sheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

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 in places by roads.

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.

Other provisions of the Act, as amended by Public Law 93-279, which are pertinent to this proposal include:

Section 5(b) which stipulates that the study of potential additions to the National System (study rivers) may be carried out as a joint study, in cooperation with the state involved.

Section 6(b) which precludes condemnation for fee title acquisition once 50 percent of the entire acreage is owned by public agencies, but allows condemnation for the creation of scenic easements and public access on 100% of the area.

Section 7(b) which prohibits the licensing of any water projects under the Federal Power Act, on any study river, for a period of ten years plus the time necessary for Congressional review of any recommendations.

Copies of P.L. 90-542 and P.L. 93-279 are presented in Appendix A of this report.

## B. AGENCY INTERPRETATION

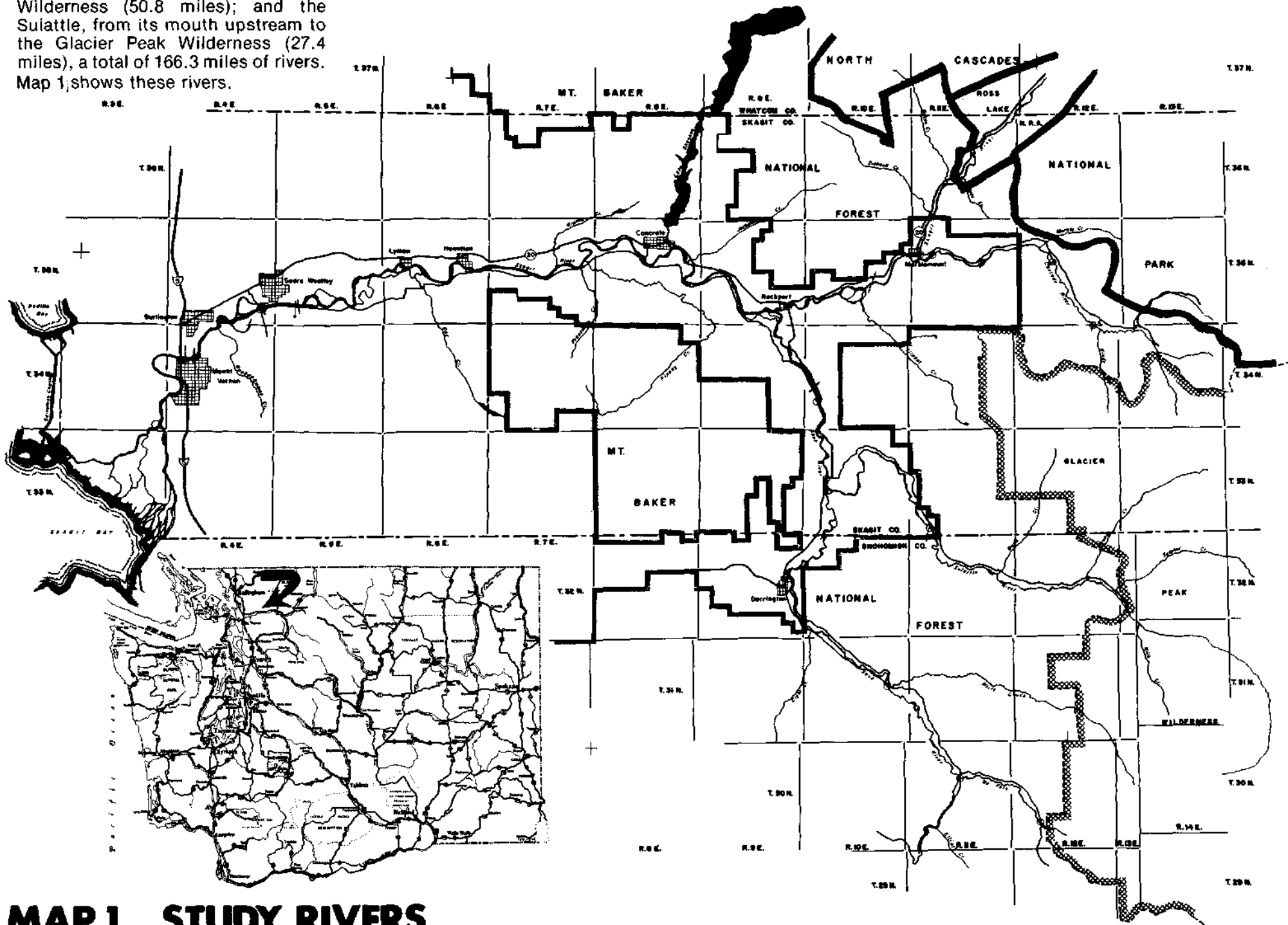
In February 1970 the Department of Agriculture and Department of the Interior jointly signed a document entitled "GUIDELINES FOR EVALUATING WILD, SCENIC AND RECREATIONAL RIVER AREAS PROPOSED FOR INCLUSION IN THE NATIONAL WILD AND SCENIC RIVERS SYSTEM UNDER SECTION 2, PUBLIC LAW 90-542."

These guidelines, a copy of which is included in Appendix A, supplement the criteria listed in the Wild and Scenic Rivers Act and Define minimum criteria for the classification and management of free-flowing river areas proposed for inclusion in the National System.

## C. STUDY RIVERS

The Skagit River was one of 27 study rivers named in the Wild and Scenic Rivers Act. The Act designated that the Skagit and three of its major tributaries should be studied for possible inclusion in the National Wild and Scenic Rivers System. Rivers named include the Skagit, from the town of Mount Vernon upstream to Bacon Creek (67.3 miles); the Cascade, from its mouth upstream to the junction of its North and South Forks, and up the South Fork to the Glacier Peak Wilderness (20.8 miles); the

Sauk, from its mouth upstream to Elliott Creek, and up its North Fork from its mouth to the Glacier Peak Wilderness (50.8 miles); and the Suiattle, from its mouth upstream to the Glacier Peak Wilderness (27.4 miles), a total of 166.3 miles of rivers. Map 1, shows these rivers.



**MAP 1 STUDY RIVERS**

# SUMMARY OF FINDINGS AND RECOMMENDATIONS

## D. STUDY APPROACH

The approach applied to the study of the Skagit River and its tributaries was directed toward two major aspects of the Wild and Scenic Rivers Act; (1) River classification, and (2) administration and management. This involved a step by step process to determine the degree to which the study rivers were eligible for a Wild, Scenic or Recreational Classification under Section 2(b) of the Act. Administration and management responded to Section 10(a) of the Act, which states that, "Each component of the National Wild and Scenic Rivers System shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its esthetic, scenic, historic, archeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

The River study process is outlined below:

**1. Inventory** - This element involved inventorying and summarizing all pertinent data associated with the land and water resources in the Skagit Basin. The resulting data is presented in Appendix B as background and supportive information.

**2. Eligibility** - This element was concerned with determining the classification eligibility of the study rivers, under criteria established by the Wild and Scenic Rivers Act. This analysis will be found in Part II, Chapter 2.

**3. Alternatives** - In this element the potential economic, social and environmental impacts of a series of classification alternatives were analyzed, and one of the alternatives was selected as the study proposal. This is discussed in Part II, Chapter 3.

**4. Administration** - In this portion of the study process, various administrative options were examined, and an option was selected as the proposed method for administering rivers recommended under the study proposal. Part II, Chapter 4 presents this analysis.

**5. Implementation** - Estimates for the cost of public recreation developments proposed during the first five years following classification, and for the acquisition of conservation easements and land in fee title were developed in this element. This discussion is located in Part II, Chapter 5.

## A. FINDINGS

The study finds that the Skagit River, along with its Cascade, Sauk and Suiattle tributaries and their immediate environment possess outstandingly remarkable fish, scenic and wildlife values, and exhibit the potential for the future development of recreation sites of significant value to local, regional and national populations. These values are of such quality and magnitude as to warrant their protection for the use and enjoyment of present and future generations.

In addition, the rivers meet the criteria established by the Wild and Scenic Rivers Act and the Supplemental criteria jointly agreed to by the Department of Agriculture and Department of the Interior. The rivers are free-flowing within the study area, and are suitable for water sports.

The Skagit River is eligible for a Recreational classification for its entire study area length. The Cascade, Sauk and Suiattle Rivers are eligible for a Scenic Classification for their entire study area length.

Classification of the Skagit River between the town of Mount Vernon and the pipeline-utility corridor crossing at Sedro Woolley would preclude the potential future development of a river basin flood control plan which could reduce the flood frequency for urban areas from once-in-14-years to once-in-100-years.



## B. RECOMMENDATIONS

To preserve these rivers and their immediate environments for the benefit and enjoyment of present and future generations, it is recommended:

1. That the Skagit River from the upstream side of the pipeline-utility corridor crossing at Sedro Woolley upstream to Bacon Creek (58.5 miles) be included in the National System as a Recreational River component; and that the Cascade River (20.8 miles), Sauk River (50.8 miles) and Suiattle River (27.4 miles), for their entire study area length, be included in the National System as Scenic River components. Rivers recommended for inclusion total 157.5 miles in length. The general location of the recommended boundary of the river area, as well as landownership within the recommended boundary, is shown on the maps in Appendix E.

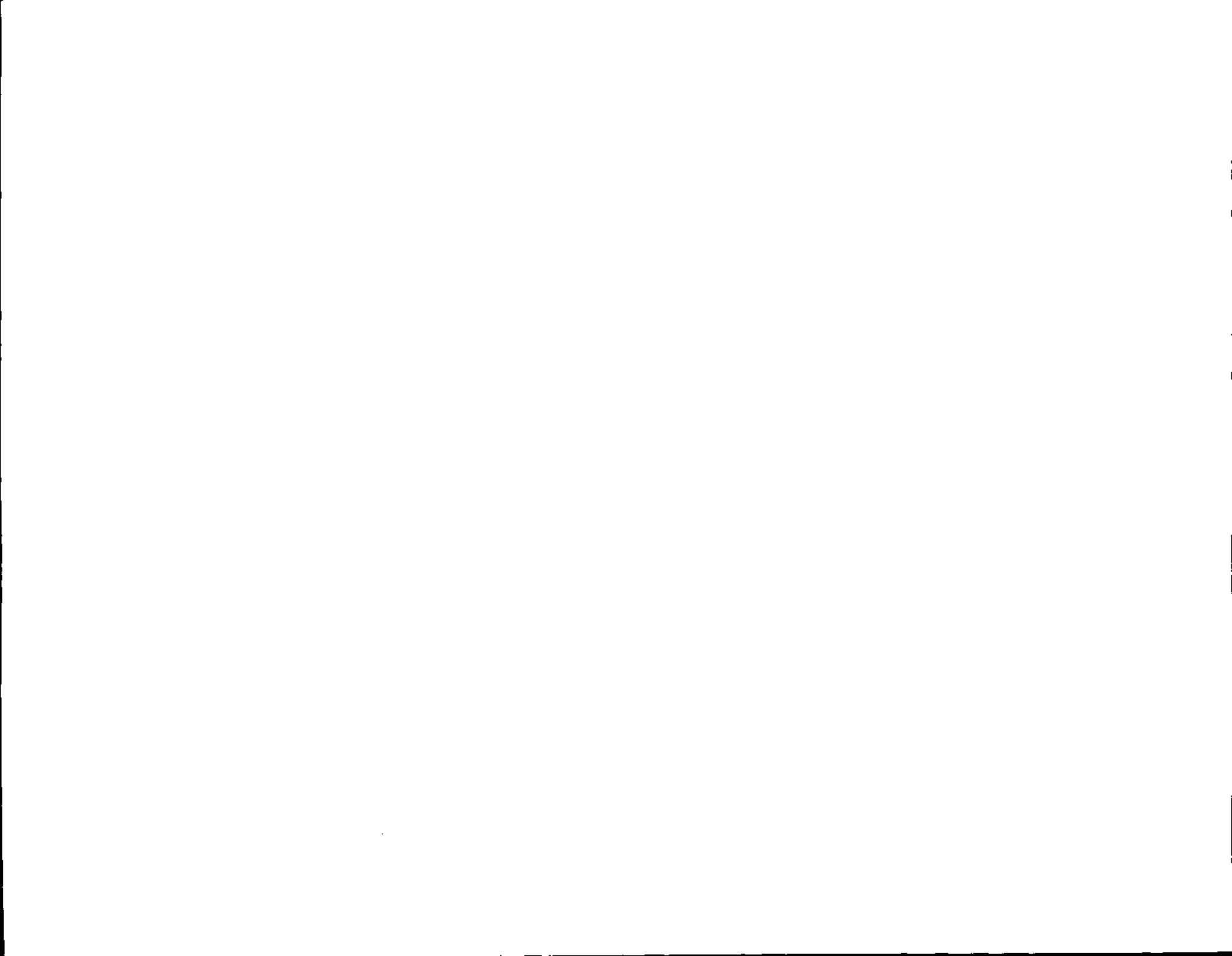
2. The area enclosed by the classified river area boundary contains approximately 34,650 acres of lands whose management is critical to the preservation of the rivers' scenic, recreational, natural and cultural values. Of this acreage, 16,605 acres are National Forest, 1,430 acres are owned by other public agencies, and the remaining 16,615 acres are in private ownership. Administrative agencies will purchase an estimated 1,728 acres, in fee title, and acquire conservation easements on an estimated 3,350 acres. The remaining 29,572 acres within the proposal area boundary are either presently admini-

stered by federal or state government, or are under the jurisdiction of the State Shorelines Management Act.

3. That administration of the proposal area be accomplished jointly by components of federal and state governments. The Forest Service, USDA, should serve as the federal administrative agency.

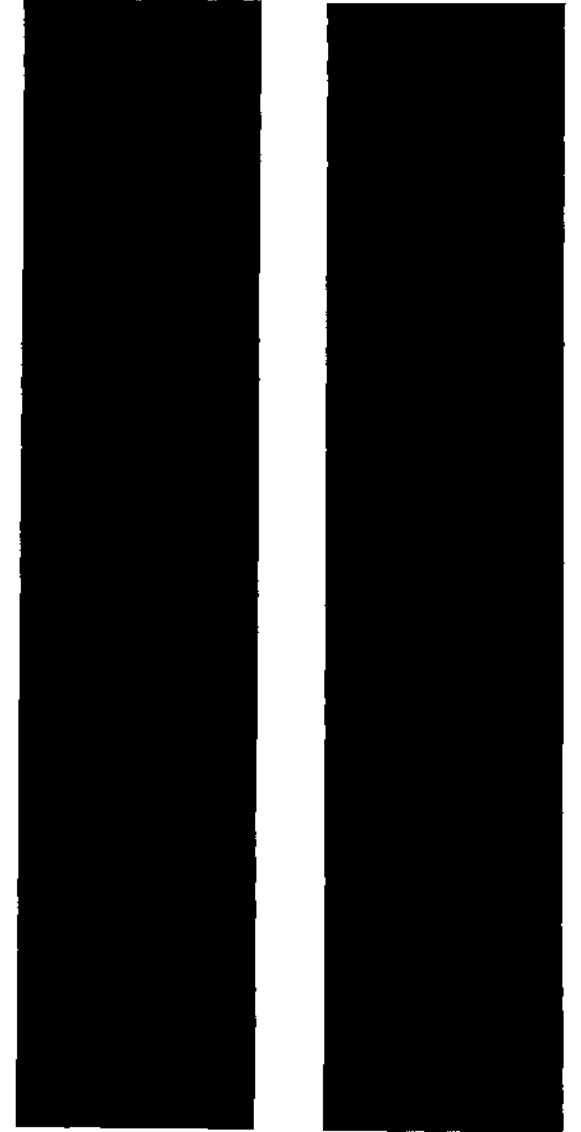
4. That a committee composed of representatives from each administrative agency, and representatives of appropriate county and local agencies, be formed to develop a master plan for the management and protection of the rivers and their adjacent lands within the river area boundary. Responsibility for the protection and management of the Skagit River and its adjacent lands should rest primarily with State and local administrative agencies, while responsibility for the protection and management of the Cascade, Sauk and Suiattle River components should rest primarily with the Federal administrative agency.

A discussion of the administration, land acquisition, recreation development and maintenance recommended under this proposal is found in Part II, Chapter 5 of this report.



**PART**

**THE STUDY**



# INVENTORY

The study summarized in this report covers the entire Skagit River drainage basin, from the Canadian border south-and-west to Puget Sound. While a great deal of information was gathered for the basin as a whole, the inventory was most intensive within a narrow corridor paralleling the study rivers, about one-half mile wide. This corridor was called the Study Area, and encompassed some 53,000 acres of land. (The Study Area proved to be somewhat larger than the corridor ultimately recommended as the classified River Area; control over many of the lands within the Study Area proved unnecessary for the preservation of the rivers' esthetic features.) Information gathered in the inventory was used for assessing the qualities and characteristics of the study rivers, both for classification eligibility and for management guidelines. Inventory data is summarized below. Parent data is located in Appendix B, under the following headings:

- B.1 Regional Setting
- B.2 Physical and Natural Characteristics
- B.3 History
- B.4 Socio-Economic Characteristics
- B.5 Land Use Patterns
- B.6 Resource Uses

## THE DRAINAGE BASIN

### Setting

The Skagit River drains an area of 3,105 square miles, 400 of which lie in Canada. The Skagit flows through the

northwest corner of Washington State, in the area between Puget Sound and the Cascade Mountains.

While the Skagit basin has a relatively low population density, it lies within an hour's drive of the Seattle metropolitan complex. The basin is traversed by State Highway 20, the only highway crossing the scenic North Cascades in the northern portion of the State. Interstate Highway 5, the major north-south artery on the West Coast, borders the basin on the west. An interlocking network of State, county and Forest Service roads provides vehicular access within the river basin.

The largest town on the Skagit is Mount Vernon, with a population of 8,532 in 1970. This is the most developed segment along the Skagit. There are other towns on the rivers, some of which are Sedro Woolley, Burlington, Lyman, Hamilton, Concrete, Rockport and Marblemount. Darrington, with a population of about 1,000, is the only town on the Sauk River; there are no towns on the Cascade or Suiattle.

Skagit County had a 1970 population of 52,000 with an estimate of 67,000 for 1985. Of its 1970 population, over half—53.6%—lived in rural areas.

### Description

The Skagit River flows roughly east-west through the northern Cascade Mountains, dissecting mountains and regional landforms which

trend generally north-northwest and expose rock ranging from Paleozoic to Tertiary in age. Glaciation has exerted a major influence on the Skagit River Valley. The pre-glacier river was probably running in a narrow V-shaped valley and was rapidly downcutting through bedrock on a comparatively steep gradient. Upon melting, the glacier left deep deposits that resulted in a broad, relatively flat valley bottom. These valley glacier deposits joined with the continental glacier deposits in the lower river reaches and together changed the original stream from one that was flowing rapidly in a narrow valley to one that is flowing slower and meandering across a wide valley bottom.

Air masses reaching the Skagit basin originate over the Pacific Ocean, giving the area a mid-latitude, West Coast, marine climate. The maritime air moderates both winter and summer seasons, producing a definite rainy season during the winter and a short, dry summer. The Cascade and Rocky Mountains shield the basin from cold air masses, while the Olympics and the Coast Range offer protection from the intense winter storms which buffet the coast. Rainfall averages 46 inches at Sedro Woolley, while the average high temperature is 60 degrees F. and the average annual low is 41. The mean length of the growing season is 193 days.

The Skagit River basin encompasses a wide range of mountainous topography. Western (seaward) elevations

range from sea level to 3,500 feet on the nearby mountain tops. East of Mount Vernon the relief increases and the terrain becomes extremely rugged. The crest of the Cascades forms the eastern boundary of the basin, and altitudes there range to over 8,000 feet. Characteristically, the mountains in the western portion of the basin are steep and timber covered. Eastward, the mountains increase in elevation, becoming very steep and precipitous. Timber becomes concentrated on the lower slopes. On higher slopes the timber is frequently interspersed with rock outcrops and talus. Extending upward this, in turn, gives way to a world dominated by rock, meadows, talus and perpetual snow. This portion of the basin is renowned for its alpine beauty. Photo 1 depicts the transition from the broad, flat, timbered valley floor to the heavily timbered lower mountains on which the signs of recent timber harvest are readily visible, and finally to the rock-and-glacier of the Cascade crest.

The basin was originally inhabited by Indians belonging to the Salish group. These early citizens lived in small, permanent villages in cedar-plank houses, and lived off the bounty of the land—fish, wild meat, berries and other natural foods. At their peak, the Indians boasted a population of about 2,000 people.

White settlement of the basin began in 1855 with the signing of an Indian treaty. Early settlement was confined to the fertile Skagit Delta, where phenomenal crops of grain were



raised. The 1879 gold rush triggered upriver settlement and, although gold fever subsided in 1880, farmers and loggers had been introduced to the rich upriver area. The railroads reached the basin in 1889, and by 1901 had moved upriver to Rockport. In 1918 the first hydropower structure was started on the Skagit, and the last of three

major hydroelectric facilities was completed in 1949. Road construction caused by the dams aided the construction of the North Cascades Highway, completed in 1972. This highway makes east-west travel across the North Cascades a reality after nearly a hundred years of planning.

Although the economy of the basin is less tied to the extractive industries—agriculture, forestry, fishing and mining—than it was during the settlement era, they still play an important role in its overall welfare. While extractive industry employs only 7% of the labor force in the five-county (Skagit, Whatcom, Snohomish, Island and San Juan) area, (as compared to 35% for manufacturing, 23% for trade and 22% for government) it is still important to these counties as a foundation for their general economy.

### Resources

Of the 1,776,000 surface acres in the Skagit River basin, about 53,000 are devoted to rangeland and crops. Farms are found mostly in the low, flat, fertile delta of the Skagit River, although some good cropland extends farther upstream along the north bank of the river to Cape Horn, about six miles downstream from Concrete. These rich farmlands produce 90% of the nation's supply of cabbage seed and a large portion of its beet, turnip and rutabaga seed. It is estimated that available farmland will increase by 15% in the next 50 years due to irrigation and land clearing. This increase may be curtailed by changes in land use from farming to residential developments or industrial sites, and by the loss of some farmland along the Skagit and Sauk Rivers due to bank erosion.

The basin is abundantly endowed with forests. About 75% of the total land area is forested. There are 834,730 acres of forest land capable of producing forest products on a continuing basis in the basin. These lands have a current inventory of 23.6 billion board feet. The basin supports 12 sawmills, 2 plywood plants and a paper mill, as well as exporting additional material to processors outside the basin. Current predictions are that 17% of the commercial forest land within the basin will be converted to other uses in the next 50 years.

The basin hosts vast "potential future sources" of minerals. The Bureau of Mines estimates deposits of 4.8 million ounces of gold, 149 million ounces of silver, 609,000 tons of copper, 1.1 million tons of lead, 320,000 tons of zinc, 9,000 tons of cobalt, 70,000 tons of molybdenum, 510,200 tons of nickel, 190,000 tons of iron and 5.8 million tons of arsenic. Non-metallic reserves include over 1 billion tons of limestone. In addition, vast quantities of sand, gravel and stone are found. With the exception of sand and gravel, none of these materials are presently mined within the study area. Gravel operations presently occur near Mount Vernon, near the Skagit River channel, but outside the streambed.

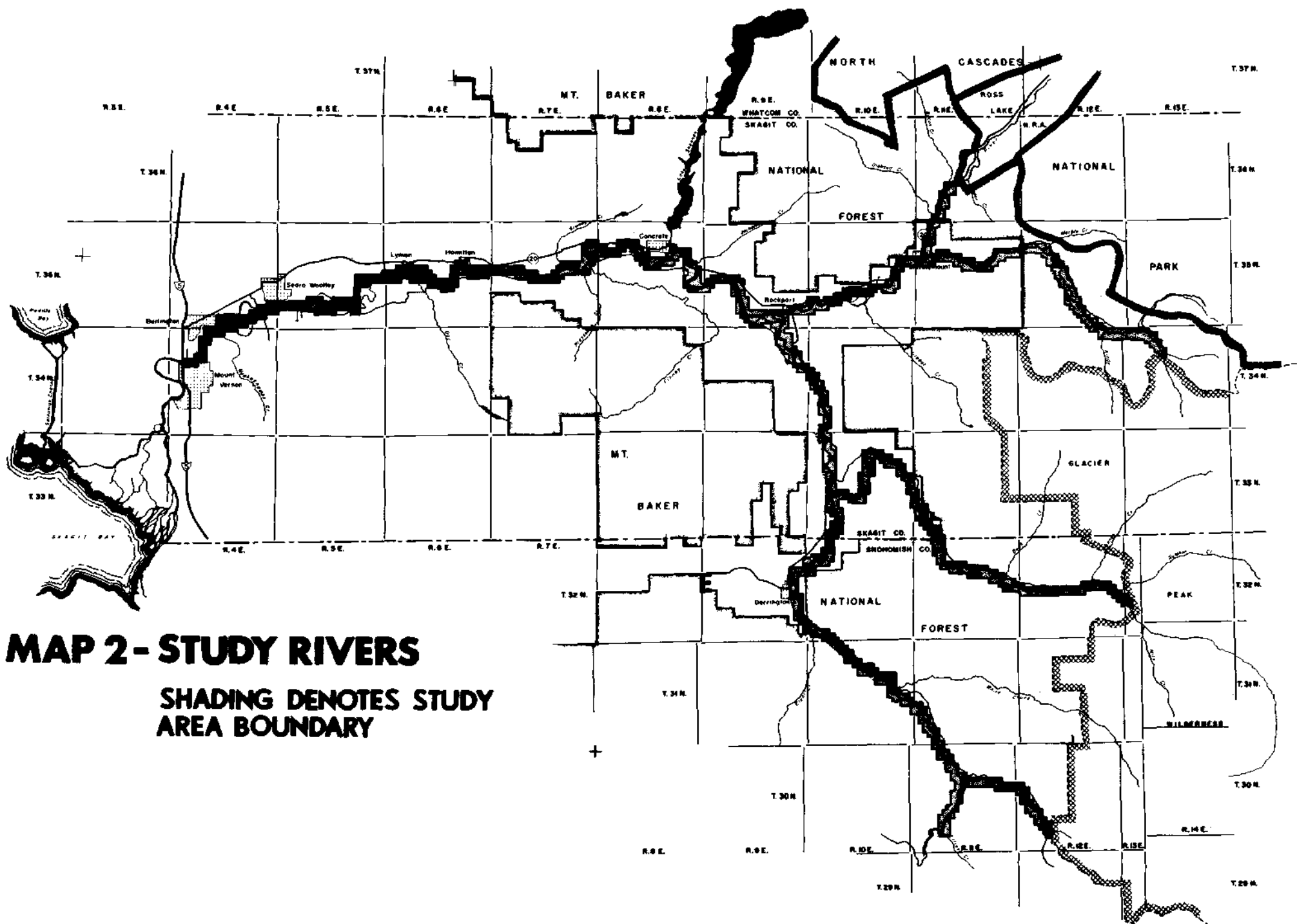
Land in the basin is extensively used for public recreation. About 70% of the land is Federally owned, and another 5 % is owned by the State. A total of 1,487,234 acres are open to the public. On this land 542 campsites,

250 picnic units, 1,621 parking spaces, 25 boat launches and 7 acres of swimming beaches are provided. There are 350,000 acres of National Forest Wilderness, 483,000 acres of National Park, and 107,000 acres of National Recreation Area. In total, some 940,000 acres, nearly 49% of the land in the basin, is under special designation.

## THE STUDY AREA

### Study Rivers

At its inception, the study laid out a 53,000 acre study area, consisting of the study rivers and their adjacent shoreline for about ¼ mile back from each river bank. The most intensive of the inventory, analysis and planning efforts were concentrated within this study area. The study area is shown on Map 2.



**MAP 2- STUDY RIVERS**

**SHADING DENOTES STUDY AREA BOUNDARY**

### Resources Within The Study Area

At Mount Vernon, the Skagit River has a mean flow of 16,250 cubic feet per second (cfs), which equals 10.5 billion gallons per day. There are no withdrawals from the river within the study area.

Water quality on all of the study rivers is good. The maximum recorded stream temperature for the study area was taken in the Skagit near Mount Vernon, and measured 64 degrees F. The mean high is 48.7. Dissolved oxygen concentrations are near saturation. The system transports about ten million tons of sediment annually, mostly of glacial origin. The concentration of dissolved solids is low; with the exception of iron concentrations, chemical water quality in all sections meets U. S. Public Health Service drinking water standards. Bacteriological quality is variable, with the count of coliform organisms increasing downstream from Marblemount, due to effluent arising from towns and residential tracts. Toxic or deleterious material concentrations are low. The biological quality of the study rivers is high, as witnessed by the high species diversity and their recognized productivity of both resident and anadromous fish. The Skagit is rated Class A from Burlington downstream. Above Burlington, and on all the tributaries, the rivers are rated Class AA, Extraordinary, under criteria established by the Federal Water Pollution Control Act (PL 84-660) of 1956.

The Skagit has a 90,000 acre flood

plain, beginning around the town of Concrete and extending downstream in a narrow belt to Sedro Woolley, where the valley floor widens to encompass the broad river delta. Upriver dams on the Skagit and Baker Rivers mitigate flooding to some extent, but urban areas within the flood plain are presently secure only against floods of a once-in-14-years magnitude or less.

Development of the lower flood plain is creating a growing clamor for increased flood protection.

The practice of bank stabilization in the form of rock riprap, placed at those points on the riverbank where valuable agricultural land or existing developed property would otherwise be avulsed by river currents, is an established and sometimes necessary practice on these rivers. As historically practiced by Skagit County, the placement of rock riprap along short stretches of river is not incompatible with either Recreational or Scenic classification on these rivers. The placement of artificial stabilization devices such as car bodies, concrete bunkers, bin walls, revetments and similar objects is incompatible with both Scenic and Recreational classification.

There are no hydroelectric generating facilities within the study area. Six operating facilities are located on rivers outside the study area; three on the Skagit River, two on the Baker River, and one on Newhalem Creek. Firm plans exist for raising Ross Dam on the upper Skagit to create a larger

reservoir capable of generating additional electricity. In addition, plans were recently announced for the construction of the first nuclear generating facility in the basin, which would be located northeast of Sedro Woolley, outside the study area. The facility would withdraw 100 cfs of water from the Skagit, within the study area, for cooling water; this volume equals 0.61% of the river's mean flow.

The Skagit, along with its Baker, Cascade, Sauk and Suiattle tributaries, comprises the largest drainage basin in Puget Sound. These water provide habitat for a vigorous, diverse fisher of national significance. Five species of salmon, three species of sea-going trout and a wide range of resident fish live and reproduce in these waters. The Skagit is nationally renowned for its sport steelhead fishery. Its role as a spawning ground for salmon is important to the State economy.

A vigorous wildlife community inhabits the study area. Deer, bear, waterfowl, fur-bearers and rodents all abound. Bald eagles gather in significant numbers along the middle Skagit during the winter to feed on migrating salmon. This congregation of eagles is reported to be the largest wintering group on the contiguous West Coast.

There are approximately 13,000 acres of privately owned commercial forest land within the proposal area. The available commercial forest lands have an average annual yield of about 6,500 MBF, and generate an estimated



# EVALUATION OF RIVERS AND ADJOINING LANDS

\$1,495,000 in primary income.

## History and Archeology

In accordance with Section 106 of the National Historic Preservation Act of 1966, the most recent listing of the National Register of Historic Places has been consulted. No National Register sites are located within the study area.

A letter from the Washington State Historic Preservation Officer, stating that no sites on the State or National Register of Historic Places lie within the study area, has been received.

A preliminary review of the potential for archeologically significant sites lying within the study area, by Washington State University, indicates that the possibility of the occurrence of such sites within the study area is very high.

## A. CRITERIA USED

1. **P.L. 90-542 Criteria** - The Wild and Scenic Rivers Act specifies four characteristics which must be evaluated in order to determine if rivers are eligible for inclusion in the National Wild and Scenic Rivers System. These criteria are: (1) the presence of structures which alter the free-flowing nature of the river, (2) the degree of accessibility, (3) the nature and extent of shoreline development, and (4) water quality. In addition, any outstanding characteristics which make the river a valuable addition to the system are to be considered. Outstanding characteristics include such things as scenic qualities, historical and cultural values, geological features, fish and wildlife, and recreational qualities.

2. **Evaluation Guidelines** - The joint Department of Agriculture - Department of the Interior guidelines for evaluating Wild and Scenic Rivers supplement criteria listed in the Wild and Scenic Rivers Act and define minimum criteria for classification and management of such rivers. The Guidelines' summary page follows.

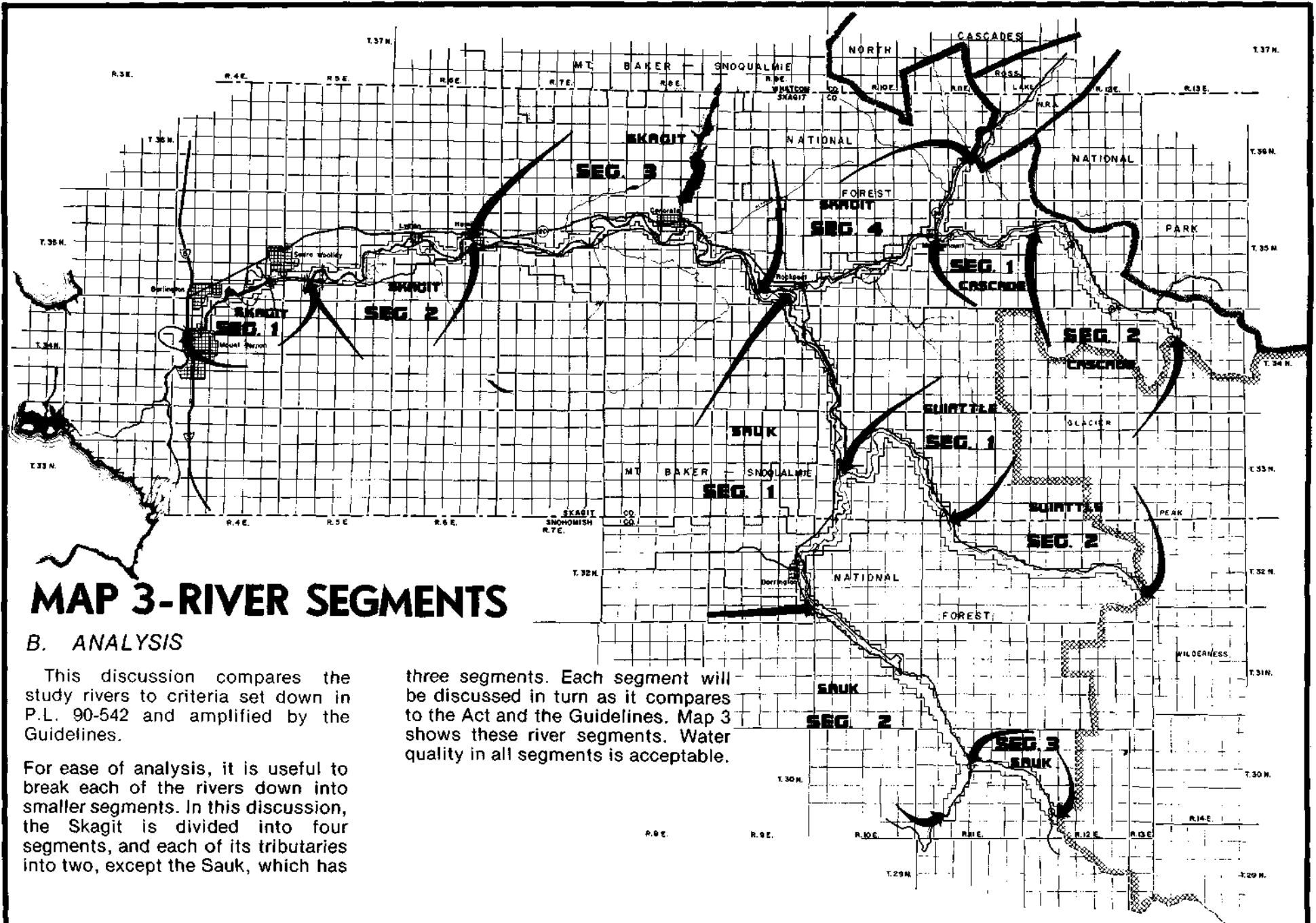
## SUMMARY 1/

## Attributes and management objectives of the three river classifications for inclusion in the National Wild and Scenic River System

	Wild	Scenic	Recreation
Attributes	<p>1. Free-flowing. Low dams, diversion works or other minor structures which do not inundate the natural riverbank may not bar consideration as wild. Future construction restricted.</p> <p>2. Generally inaccessible by road. One or two inconspicuous roads to the area may be permissible.</p> <p>3. Shorelines essentially primitive. One or two inconspicuous dwellings and land devoted to production of hay may be permitted. Watershed natural-like in appearance.</p> <p>4. Water quality meets minimum criteria for primary contact recreation except where such criteria would be exceeded by natural background conditions and esthetics 2/ and capable of supporting propagation of aquatic life normally adapted to habitat of the stream.</p>	<p>1. Free-flowing. Low dams, diversion works or other minor structures which do not inundate the natural riverbank may not bar consideration. Future construction restricted.</p> <p>2. Accessible by roads which may occasionally bridge the river area. Short stretches of conspicuous or longer stretches of inconspicuous and well-screened roads or railroads paralleling river area may be permitted.</p> <p>3. Shoreline largely primitive. Small communities limited to short reaches of total area. Agricultural practices which do not adversely affect river area may be permitted.</p> <p>4. Water quality should meet minimum criteria for desired types of recreation except where such criteria would be exceeded by natural background conditions and esthetics 2/ and capable of supporting propagation of aquatic life normally adapted to habitat of the stream, or is capable of and is being restored to that quality.</p>	<p>1. May have undergone some impoundment or diversion in the past. Water should not have characteristics of an impoundment for any significant distance. Future construction restricted.</p> <p>2. Readily accessible, with likelihood of paralleling roads or railroads along river banks and bridge crossings.</p> <p>3. Shoreline may be extensively developed.</p> <p>4. Water quality should meet minimum criteria for desired types of recreation except where such criteria would be exceeded by natural background conditions and esthetics 2/ and capable of supporting propagation of aquatic life normally adapted to habitat of the stream or is capable of and is being restored to that quality.</p>
Management objectives	<p>1. Limited motorized land travel in area.</p> <p>2. Nonharmonious or new habitations or improvements permitted.</p> <p>3. Only primitive-type public use provided.</p> <p>4. New structures and improvement of old ones prohibited if not in keeping with overall objectives.</p> <p>5. Unobtrusive fences, gauging stations and other management facilities may be permitted if no significant adverse effect on natural character of area.</p> <p>6. Limited range of agriculture and other resource uses permitted.</p>	<p>1. Motorized vehicles allowed on land area.</p> <p>2. Nonharmonious improvements and few habitations permitted.</p> <p>3. Limited modern screened public use facilities permitted, i. e. campgrounds, visitor centers, etc.</p> <p>4. Some new facilities allowed, such as unobtrusive marinas.</p> <p>5. Unobtrusive fences, gauging stations and other management facilities may be permitted if no significant adverse effect on natural character of area.</p> <p>6. Wide range of agriculture and other resource uses may be permitted.</p>	<p>1. Optimum accessibility by motorized vehicle.</p> <p>2. May be densely settled in places.</p> <p>3. Public use areas may be in close proximity to river.</p> <p>4. New structures allowed for both habitation and for intensive recreation use.</p> <p>5. Management practice facilities permitted.</p> <p>6. Full range of agriculture and other resource uses may be permitted.</p>

1/ To be used only in conjunction with the text.

2/ Federal Water Pollution Control Administration's Water Quality Criteria, April 1, 1968.



# MAP 3-RIVER SEGMENTS

## B. ANALYSIS

This discussion compares the study rivers to criteria set down in P.L. 90-542 and amplified by the Guidelines.

For ease of analysis, it is useful to break each of the rivers down into smaller segments. In this discussion, the Skagit is divided into four segments, and each of its tributaries into two, except the Sauk, which has

three segments. Each segment will be discussed in turn as it compares to the Act and the Guidelines. Map 3 shows these river segments. Water quality in all segments is acceptable.

### Skagit River - Segment 1

This segment includes the Skagit River from the Interstate Highway 5 bridge at Mount Vernon—the lower boundary of the study area—to the pipeline-utility corridor crossing at Sedro Woolley, a distance of 8.8 miles.

There are no dams or other slack-water impoundments in this segment. There are 11.3 miles of levees providing flood protection for urban areas. The levees are well sodded and natural in appearance. An additional 1.6 miles of river bank has been rock riprapped.

The entire 17.6 miles of shoreline in this segment is paralleled by existing roads. Of the total distance, 26.6% lies within 100 feet of a road; 48.2% within 100 feet to a quarter-mile; and the balance—25.2%—lies more than a quarter-mile from the nearest road.

There are five bridges, one powerline crossing, two pipeline crossings and three docks within this segment.

Shorelines are predominately agricultural land—71.0%. Natural forest covers 23.3% of the shoreline, and residential-commercial development occurs on 5.7% of the shoreline. There are 58 platted recreational subdivision lots in this segment.

The combination of levees, shoreline development and road accessibility limit this segment to Recreational classification.

### Skagit River - Segment 2

This segment begins at the Sedro Woolley pipeline-utility corridor crossing and continues upstream to the town of Hamilton, a distance of 15.6 miles.

There are no dams or slackwater impoundments within this segment. One mile of levee occurs at the town of Hamilton, and 2.1 miles of rock riprap, scattered in short stretches on the outside of bends. One short — 0.04 mile—wooden weir is built in the river channel. It is falling into disrepair and will probably disappear within 10 years.

All of the 31.2 miles of shoreline are paralleled by roads. Roads lying within 100 feet of the river occur in 14.7% of the segment; 23.4% is paralleled at between 100 feet and a quarter-mile; the balance—61.9%—has parallel roads beyond a quarter-mile of the river.

There is one powerline crossing this segment of the river.

Shorelines in the segment are forested for 75.3% of their length. Agricultural lands occupy 21.5%, and residential developments 3.2%. The segment has 37 platted recreation subdivision lots.

The combination of accessibility and shoreline development render this segment unsuitable for a Scenic classification. However, management of this segment under a Recreational classification should recognize the

pastoral and forest glade values present, and discourage future developments which threaten these values.

### Skagit River - Segment 3

This segment includes the Skagit River from the town of Hamilton upstream to the downstream mouth of McLeod Slough, a distance of 26.0 miles.

There are no dams or levees in this segment. Riprap work has been done on 2.2 miles of shoreline.

Of the 52 miles of shoreline, 34.4% is accessible from a road lying within 100 feet of the river. Another 37.7% has a road within the 100-foot to a quarter-mile distance. The balance, 27.9%, is paralleled by roads lying farther than a quarter-mile away.

One bridge crosses the river in this segment.

Agricultural lands occupy 26.9% of the shoreline in this segment, and 9.1% is developed residential areas. The remaining 64% of the shoreline is forested. The segment has 1108 platted recreation subdivision lots.

Because of the accessibility, shoreline development and high number of platted lots, this segment is eligible for a Recreational classification.

#### Skagit River - Segment 4

This segment includes the Skagit River from the downstream mouth of McLeod Slough upstream to Bacón Creek, the upper boundary of the study area on the Skagit, a distance of 16.9 miles.

There are no dams or levees within this segment. A total of 0.7 miles of shoreline have been riprapped.

Of the 33.8 miles of shoreline in this segment, 33.1% is paralleled by roads lying within 100 feet of the river. Another 19.8% is paralleled by roads at a distance of 100 feet to a quarter-mile. The remaining 47.1% of the shorelines are paralleled by roads lying more than a quarter-mile from the river.

One powerline and two bridges cross the river in this segment.

Residential development occurs on 5.6% of the shorelines, and agricultural lands occupy another 19.8%. The remaining 74.6% is forested. There are 78 platted recreation subdivision lots in the segment.

Because of its accessibility and shoreline developments, this segment meets the criteria for a Recreational classification.

Paradoxically, this segment also displays the most visually exciting scenic vistas on the Skagit River. It is in this segment where spectacular views of the glacier-clad North Cascades, Sauk Mountain and the Eldora does occur. Future management must

recognize these qualities and take steps to protect the scenic resource.

#### Cascade River - Segment 1

This segment includes the Cascade River from its mouth to the Mt. Baker-Snoqualmie National Forest boundary, a distance of 7.2 miles.

There are no impoundments within this segment, and only 0.2 miles of riprap which is well overgrown by brush and fairly natural in appearance.

Of the 14.4 miles of shoreline, 1.4% is accessible from a road lying within 100 feet of the river. A large part of the river, 64.6% is paralleled by roads at a distance between 100 feet and a quarter-mile. Another 24.3% has a parallel road system located over a quarter-mile away. The remaining 9.7% has no parallel road system. Two bridges cross the river in this segment.

The shoreline is forested along 76.4% of its length. Agricultural lands occupy 11.1% of the shoreline, and residential development another 12.5%. There are 449 platted recreation subdivision lots, located in one large tract.

Despite a fairly high percentage of agricultural and residential developments, the overall nature of the shoreline in this segment is natural. The percentage of closely paralleling roads is low. Scenic values are high. This segment qualifies for a Scenic classification.

#### Cascade River - Segment 2

This segment includes the Cascade River from the Mt. Baker-Snoqualmie National Forest boundary upstream to the Glacier Peak Wilderness boundary, a distance of 13.6 miles.

There are no impoundments or riprap within this segment.

Only 0.7% of the 27.2-mile shoreline is accessible from roads lying within 100 feet of the river. Roads lying at a distance from 100 feet and a quarter-mile parallel 38.6% of the shoreline. Another 29.4% has parallel roads more than a quarter-mile from the river. The remaining 31.3% has no existing road system. Two bridges cross the river in this segment.

The entire shoreline is undeveloped forest land.

Of all river segments within the study area, this segment comes closest to meeting the criteria for a Wild River. Because of the existing road system, however, it does not meet the Wild criteria. It is, in all respects, a high-quality example of a Scenic River.

Future management of this segment should recognize the near-Wild situation and act to preserve the primitive qualities of the river corridor.

### Sauk River - Segment 1

This segment begins at the mouth of the Sauk River near Rockport and continues upstream to the boundary of the Mt. Baker-Snoqualmie National Forest, a distance of 24.8 miles. The segment also includes McLeod Slough, which is the delta of the Sauk River.

There are no impoundments or riprap within this segment.

Of the 49.6 miles of shoreline in this segment, 15.5% is paralleled by roads lying within 100 feet of the river. Roads lying between 100 feet and a quarter-mile parallel the shorelines for 26.6% of the distance. The remaining 58.3% is paralleled by roads lying more than a quarter-mile from the river.

Three bridges and one powerline cross the river in this segment.

Only 1.2% of the shoreline is developed as commercial-residential land—principally the town of Darrington. Another 4.2% is agricultural land. The remaining 94.6% of the shoreline is forested. There are 307 recreation subdivision lots in this segment.

Because of the predominance of forested shoreline, the lower percentage of closely paralleling roads and the overall scenic nature of this segment, it is well suited for a Scenic classification.

### Sauk River - Segment 2

This segment includes the Sauk River from the Mt. Baker-Snoqualmie National Forest boundary upstream to Elliott Creek, a distance of 18.5 miles.

There are no impoundments or riprap within this segment.

Only 8.9% of the 37 miles of shoreline is paralleled by roads within 100 feet of the river. An additional 44.1% is paralleled by roads at a distance between 100 feet and a quarter-mile. The remaining 47% is paralleled by roads lying more than a quarter-mile from the river. Three bridges cross the river in this segment.

Residential development has occurred along 2.7% of the shoreline. The remaining 97.3% of the shoreline is forested. There are 144 platted recreation subdivision lots in this segment.

Because of the almost totally forested shoreline and low percentage of closely paralleling roads, this segment is aptly suited for a Scenic classification.

### Sauk River - Segment 3

This segment includes the North Fork Sauk River, from its mouth to the Glacier Peak Wilderness boundary, a distance of 7.5 miles.

There are no impoundments or riprap within this segment.

Only 1.3% of the 15 miles of shoreline is paralleled by a road within 100 feet of the river. Roads lying

within 100 feet to a quarter-mile occur on 27.3% of the shoreline. The remaining 18.7% of the roaded shoreline lies over a quarter-mile from any road, while 52.7% of the shoreline, predominantly located on the south bank, has no parallel road. Two bridges cross the river in this segment.

Other than a small primitive campground at the Wilderness boundary, there is no shoreline development. The 15-mile shoreline is 100% forested.

This segment would be admirably suitable for a Wild River classification, were it not for the existing road system. Because of the roads, it qualifies as a Scenic River.

### Suiattle River - Segment 1

This segment includes the Suiattle River from its mouth upstream to the boundary of the Mt. Baker-Snoqualmie National Forest, a distance of 12.2 miles.

There are no impoundments or riprap within the segment.

Of the 24.4 miles of shoreline, 4.1% is paralleled by roads lying within 100 feet of the river. Roads located at a distance of 100 feet to a quarter-mile occupy 38.1% of the shoreline, and the remaining 57.8% is paralleled by roads lying more than a quarter-mile from the river. One bridge crosses the river in this segment.

The shoreline is 100% forested. There are 34 recreation subdivision lots in the segment.

Because of the low percentage of closely paralleling roads, and the forested, undeveloped shoreline, this segment is well suited for a Scenic classification.

### **Suiattle River - Segment 2**

This segment includes the Suiattle River from the Mt. Baker-Snoqualmie National Forest boundary to the Glacier Peak Wilderness boundary, a distance of 15.2 miles.

There are no impoundments or riprap within this segment.

Of the 30.4 miles of shoreline, 9.2% is paralleled by roads lying within 100 feet of the river. An additional 61.2% is paralleled by roads lying at 100 feet to a quarter-mile from the river. Of the remainder, 25% of the shoreline has a parallel road system located over a quarter-mile from the river, and 4.6% has no road system. One bridge, a footbridge leading to a wilderness trail, crosses the river in this segment.

The shoreline is totally forested, with two primitive campgrounds, and no platted recreation subdivision lots.

Because of the undeveloped shoreline and low percentage of closely paralleling roads, this segment qualifies as a Scenic River.

A summary of statistics for each river segment, along with its classification eligibility, is presented in Table II-1 which follows.

**TABLE II - 1**  
**SUMMARY OF RIVER STATISTICS**

	Skagit 1	Skagit 2	Skagit 3	Skagit 4	Casc. 1	Casc. 2	Sauk 1	Sauk 2	Sauk 3	Suiat. 1	Suiat. 2	TOTAL
Segment Length - Miles	8.8	15.6	26.0	16.9	7.2	13.6	24.8	18.5	7.5	12.2	15.2	166.3
Levees-Miles	11.3	1.0	—	—	—	—	—	—	—	—	—	12.3
Riprap-Miles	1.6	2.1	2.2	0.7	0.2	—	—	—	—	—	—	6.8
Weirs-Miles	—	0.04	—	—	—	—	—	—	—	—	—	0.04
Accessibility-Percent												
Roads within 100 feet	26.6	14.7	34.4	33.1	1.4	0.7	15.1	8.9	1.3	4.1	9.2	16.1
Roads 100 feet to ¼-mile	48.2	23.4	37.7	19.8	64.6	38.6	26.6	44.1	27.3	38.1	61.2	37.1
Roads beyond ¼-mile	25.2	61.9	27.9	47.1	24.3	29.4	58.3	47.0	18.7	47.8	25.0	41.0
No parallel roads	—	—	—	—	9.7	31.3	—	—	52.7	—	4.6	5.8
Structures - Number												
Powerline crossings	1	—	—	1	—	—	1	—	—	—	—	3
Bridges	5	—	1	2	2	2	3	3	2	1	1	22
Pipelines	2	—	—	—	—	—	—	—	—	—	—	2
Docks	3	—	—	—	—	—	—	—	—	—	—	3
Shoreline Development-Percent												
Agriculture	71.0	21.5	26.9	19.8	11.1	—	4.2	—	—	—	—	13.1
Forest	23.3	75.3	64.0	74.6	76.4	100	94.6	97.3	100	100	100	83.3
Residential	5.7	3.2	9.1	5.6	12.5	—	1.2	2.7	—	—	—	3.6
Recreation Lots-Numbers	58	37	1108	78	449	—	307	144	—	34	—	2215
Classification Eligibility <sup>1</sup>	R	R	R	R	S	S	S	S	S	S	S	—

<sup>1</sup>R - Recreational  
S - Scenic

### C. OUTSTANDING CHARACTERISTICS

#### Fish

No discussion of the Skagit River system which ignores the significance of its fisheries is valid.

The rivers' role in providing spawning and rearing habitat for vast numbers of resident and anadromous fish is, beyond any question, the most significant fact pertaining to this

study. Although high quality alternatives are diminishing, there still are other places in Puget Sound where Man can go for similar recreation, timber, wildlife, hydroelectric power, and scenery. But there is no other fishery like the Skagit. Erradication of the Skagit basin fishery would be a loss of the first magnitude!

The Skagit River system is one of the few remaining systems in America which supports significant numbers

of the five salmon species native to North America, plus the three seagoing varieties of trout. The system's fishery produces an average of 2,210,000 anadromous fish each year. Of this number, about a half-million return to spawn; the balance is harvested by commercial and sport fishermen, or by natural predators at sea. These numbers of fish represent a significant percentage of the Puget Sound anadromous fish harvest (somewhere between 20% and 30%).



Clearly, any impact upon the Skagit River fishery will send reverberations through the entire northwest Washington region. A threat to the Skagit fishery will, by extension, impact the existing economic and recreational structure of the area, as well as striking at the fog-shrouded salmon mystique which is part and parcel of the unique life style of the Pacific Northwest.

### Scenic Qualities

The Skagit River basin ranks high in any scenic quality evaluation.

The Skagit, with its broad flood plain and densely forested slopes, is a river of broad vistas. Views of Mt. Baker, the Eldorados, Sauk Mountain and a dozen lesser peaks present themselves at numerous points. The Skagit emphasizes grandeur; great mountains, viewed from afar, framed by giant conifers and accented by a broad meandering river.

The lower Sauk River presents similar pageantry; glacier-clad mountains surrounded by forest, viewed from a broad flood plain.

Above Darrington, the Sauk becomes a more intimate river. The valley walls converge, white water becomes prevalent, and the visual focus is narrowed to a shorter range. River travelers in this segment are involved with the immediate river—its melody as it cascades over boulders and down steep chutes. It is an ever-changing scene, dominated by the roar of the water and the display of nature's inexorable forces at work.



**SKAGIT**



**SAUK**

The Suiattle is another river again. Broader, more regular in its descent, its banks are forested with magnificent old trees. Too fast and rough for any but the most experienced kayaker, the Suiattle is most spectacular near the forest boundary, where it has carved a broad rugged canyon.

The Cascade is the most intimate of the study rivers. Flowing through a narrow canyon whose walls are steep, rocky and high, the hiker feels himself an intruder in a lush green sanctuary. Impassable to watercraft, far below the nearest road, the Cascade presents itself in short views. Dominating the canyon floor, its beauty is not of the picture post card variety, but the personal, haunting kind that comes back to the memory a day, and a year later. It is an intensely personal river. No two persons perceive the Cascade exactly alike; each brings away his own private experience.

Certainly no amount of verbiage can describe the visual and emotional experiences of the study rivers. Nor is there any value in comparing them against the Grand Canyon or the Mississippi, since each is unique in its own way.

Ultimately, a subjective value judgment must be made.

The scenic values of the Skagit River system are very high. Certainly, they are one of the basin's most unique attributes. Nationally and regionally, alternate areas of equal stature are rare.

The esthetic values of the rivers, and their contribution to the psychic needs of man, must certainly be considered in the decision-making process relating to possible Wild and Scenic Rivers classification.

### Wildlife

Stable populations of big game animals occur throughout the study area, but the concentration of animals occurs upriver from Concrete, coincidental with the presence of undeveloped forest lands reaching down to the river. Along these forested upriver reaches, blacktailed deer are a common sight, particularly in late spring and early summer when the best forage is available in the river bottoms.

Black bear are fairly common. Although these man-avoiding creatures are rarely seen near a road, they are occasionally visible from the river. The sight of a bear foraging along a sand bar for spawning salmon is a rare bonus to those quietly drifting the upriver reaches.

Roosevelt elk are sometimes seen in the basin, although they are not residents. Mountain goats, mountain sheep and cougar are all established in the basin, but are seldom seen except by hikers in the remote high country.

Small game, waterfowl and upland game birds are abundant. These animals are more tolerant of the presence of man than are the larger animals, consequently, they are fre-

quently encountered within the study area, to the delight of visitors.

The Skagit River basin is home to three-rarely-seen species; the trumpeter swan, the whistling swan, and the bald eagle.

The bald eagle is most evident along the middle flood plain, in stretches of undeveloped timber land. Both adults and juveniles are frequently seen perched in trees along the river bank. A small number of these magnificent birds are permanent residents of the basin. Many additional eagles visit the basin during the height of the annual anadromous fish migration. Over two hundred have been counted during this period. This is reported to be the largest winter concentration in the contiguous United States. Efforts are presently underway by private organizations to establish a bald eagle sanctuary along this stretch of the Skagit.

Swans are not residents of the study area. The trumpeters are concentrated in the freshwater marshes on Nookachamps Creek, a tributary of the Skagit. Whistlers live in the brackish sloughs of Skagit Bay.

There are no wildlife considerations within the Skagit basin which argue overwhelmingly for its preservation. But the Skagit River basin is one of the lesser-developed major drainages on the west coast. That fact may become increasingly pertinent; one day soon, the Skagit basin may be distressingly unique by virtue of its near-natural state.

# CLASSIFICATION ALTERNATIVES, ANALYSIS & SELECTION OF STUDY PROPOSAL

## Archeology

There are many prehistoric archeological sites located along all of the study rivers. Sites can be found along river channels, sloughs, streams, and on high spots. Knowledge as to the whereabouts of some sites can still be found among the older residents of the Swinomish Indian Reservation. Other sites have been reported by area residents. However, no survey has been conducted to determine the archeological potential of the study area. Since little work has been done to date to determine the pre-history of the Skagit Indians, there is scientific value in any proposal which would tend to preserve these sites until investigation can be completed.

## A. BASIS OF ANALYSIS

The classification alternatives presented in this section discuss the impacts of varying degrees of river classification upon selected local, regional and national characteristics. The basis for measuring the impact of a given alternative upon each characteristic is the Present Situation. An alternative is said to have an impact upon a certain characteristic or effect only if it will result in a net change to that characteristic's present status.

Since alternative impacts are postulated against the Present Situation, it is first necessary to discuss conditions as they are today within and adjacent to the study area. The information for this discussion is digested from inventory data found in Appendix B.

## B. THE PRESENT SITUATION

**FLOOD CONTROL** - The Skagit River has a 90,000 acre flood plain which is periodically inundated. Most flooding, particularly in the lower agricultural lands, is caused by rainfall and a seasonally heightened water table, rather than by "direct" inundation from flood crests on the river. Serious flooding, however, occurs when the Skagit's peak flows either overtop or break through an existing dike. In 1966 the Corps of Engineers determined that the average annual flood damage was about \$3 million. This figure was projected to rise to \$4.25 million by 1980. This increase was attributed to development within the flood plain.

Existing flood control measures and structures combine to mitigate potential flood damage somewhat, but maximum protection for urban areas within the flood plain only offers security against floods of less than a once-in-14-years interval. Some "protected" agricultural lands are flooded by waters of a once-in-3-years interval.

A recent comprehensive river basin study<sup>1</sup> has presented two different plans for accomplishing flood protection for the basin. The Study's **Plan A** suggests the construction of a joint hydroelectric-flood control dam on the lower Sauk River, the construction of a flood crest "bypass" from the Skagit River near the town of Avon to Padilla Bay, a change in operation of Baker Lake Dam whereby more flood storage capacity is provided, the construction of new levees, and the improvement of existing levees. This plan would provide protection from once-in-100-year floods for urban areas in the flood plain.

**Plan B** proposes the construction of a larger Avon Bypass, along with the change of operation at Upper Baker Lake, the construction of new levees, and the improvement of existing levees. This plan would provide protection from once-in-100-year floods for urban areas in the flood plain.

<sup>1</sup>Comprehensive Study of Water and Related Land Resources, Puget Sound and Adjacent Waters. State of Washington; Pacific Northwest River Basins Commission, 1970.

The Corps of Engineers is presently investigating the proposal to purchase additional storage capacity at Upper Baker Lake, and may soon inaugurate this project, which is common to both Plan A and Plan B.

The estimated cost of implementing Plan A is \$104 million, while the estimated cost of implementing Plan B is \$53 million.

Plan B was developed specifically to accommodate Wild and Scenic Rivers status for the Skagit and its tributaries, while still achieving an acceptable level of flood damage reduction.

**HYDROELECTRIC POWER** - There are six dams in the Skagit Basin; three on the Skagit River, two on the Baker River and one on Newhalem Creek. The Federal Power Commission has identified<sup>2</sup> 13 sites within the study area which have a potential for hydro-power development. Included in this number is the lower Sauk site, which could be developed in conjunction with the flood control dam discussed in Plan A above. The development costs of the hydroelectric portion of this dam were estimated at \$68 million. In all, the 13 sites (including lower Sauk) have a potential for generating 978,850 kilowatts of power. Puget Sound Power and Light is presently proposing the construction of a nuclear generating facility northeast of Sedro Woolley. This site has a potential of 2,000,000 kilowatts.

<sup>2</sup>Hydroelectric Power Potential of Rivers Named in Public Law 90-542, The Wild and Scenic Rivers Act, Federal Power Commission, Bureau of Power, March, 1969.

There are presently no generating facilities or reservoirs within the study area.

**PUBLIC RECREATION OPPORTUNITIES** - Outside the boundaries of the Mt. Baker-Snoqualmie National Forest, there are very few public lands. The state owns several small tracts which are developed as boat launches, as well as the 447-acre Rockport State Park. Skagit County operates one first-rate campground at Rockport, and a lesser developed site on the Sauk River. Short-range plans call for the possible expansion of the county park at Rockport, and for the construction of a campground on state lands along the lower Cascade River. Many privately-owned lands along the four rivers are presently open to the public; these lands are primarily owned by private timber companies. With the creation of the North Cascades National Park and the opening of the North Cascades Highway, the demand for public recreation facilities throughout Skagit County has been increased. The county and the state are taking some positive steps to meet this need.

**TIMBER MANAGEMENT** - Of the 34,650 acres of land located within the proposed river area boundary, 30,000 acres are potentially operable commercial forest land. Of this amount, 16,600 acres are located within the National Forest boundary; the remaining 13,400 acres are privately owned. About half of the private acreage is devoted to timber production. The available commercial forest lands

have an average yield of about 6,500 thousand board feet (MBF), and generate an estimated \$1,495,000 in primary income each year.

Timber harvest activity on privately owned lands within the river area boundary is regulated by the recently enacted State Forest Practices Act, which includes a requirement for the reforestation of all cutover lands, and the State Shorelines Management Act, which initiated a permit system for timber harvest along the shorelines of principal rivers in the state. Management activities on National Forest lands have been curtailed in recent years due to management for water quality and scenic values.

**AGRICULTURE** - Within the study area, most farming occurs on the north bank of the Skagit River, downstream from Concrete. These lands are primarily used for pasture or forage production. State laws regulate the handling of pesticides and animal wastes along the rivers.

**NAVIGATION** - No commercial shipping occurs within the study area. Navigation today consists solely of pleasure craft. The Skagit, and the Sauk below Darrington, is generally navigable throughout the year. The dams on the Skagit fluctuate its level by a foot or more twice each day.

**STREAMBED OWNERSHIP** - The Corps of Engineers lists the Skagit River as navigable from its mouth to Marblemount—a distance of 78 miles. Under the State Constitution, the State of Washington claims owner-

ship to the beds and shores of all navigable waters in the State, up to the line of ordinary high water.

In the case of a non-navigable river, the riparian owners own the riverbed.

**IRRIGATION** - There are no existing diversion dams or impoundments for irrigation within the study area. Some minor withdrawals occur from time to time, but they are insignificant. No significant water rights are known to be claimed on any of the rivers.

**TRANSPORTATION AND UTILITIES** - Within the study area there are 22 bridge crossings and 4 utility crossings, including one transmission line just completed by the Bonneville Power Administration. This line, which crosses the Skagit River approximately 1.5 miles upstream from the recommended lower boundary of the classified river area, was authorized by Congress in 1968, prior to enactment of the Wild and Scenic Rivers Act. The Skagit River is proposed for a Recreational classification; this new transmission line is compatible with that classification. Bonneville Power has agreed to some special management techniques to mitigate the visual impacts of the line.

River crossings are currently regulated by the Corps of Engineers, and the U.S. Coast Guard. State law requires an easement for utility crossings; present policy is to grant such an easement only if no practical alternative exists.

**MUNICIPAL-INDUSTRIAL WATER SUPPLY** - During periods of peak demand, the City of Anacortes draws some water directly from the Skagit River; this withdrawal occurs below the study area boundary. No other municipal-industrial water supply is drawn directly from study rivers. The proposed Puget Sound Power and Light nuclear generator would withdraw 50-100 cubic feet per-second (cfs) from wells drilled near the Skagit. The present mean flow at this point along the river averages 16,000 cfs.

**STREAMBANK EROSION PROTECTION** - Existing state laws require the issuance of a permit before any work or installation can be accomplished in streambeds. The Corps of Engineers exercises similar regulatory authority over all of the Skagit River within the study area. Most of the bank stabilization work taking place on the Skagit and the Sauk Rivers is done by Skagit County. Bank stabilization (rock riprapping) work can be accomplished without a permit, if the project is considered an emergency by county authorities. Riprap tends to revegetate quickly in the Skagit basin climate. Riprap, as practiced by Skagit County, generally appears compatible with Recreational or Scenic classification.

**MINING** - Mining in the Skagit River drainage has been confined mainly to the production of nonmetallic commodities, principally sand, gravel, and stone. Large quantities of limestone, used in the production of cement, have also been mined. A state

or federal permit is required before any materials can be mined from the bed of any river. With the exception of the occasional "scalping" of sand bars for gravel used in road construction, which is strictly controlled by the State Departments of Game and Fisheries, no commercial mining takes place within the study area.

**WATER QUALITY** - Although some pollution sources exist, water quality meets or exceeds nearly all criteria for interstate waters, as discussed in Water Quality in this report. Enforcement of existing state and federal laws is bringing about the gradual elimination of pollution sources.

**LAND USE PLANNING** - Skagit County is in the process of developing a comprehensive land use plan and zoning ordinance for the County. At present, an "interim" zoning plan regulates land uses. The County presently enforces a 25 foot setback for construction along study rivers, and does not allow construction within the 15 year flood plain along the river. These practices have limited potential impacts to esthetic values along the rivers.

**WILD AND SCENIC RIVERS** - Alteration of the natural shoreline of all study rivers is partially regulated by the State Shorelines Management Act. There is no established system for identifying or safeguarding individual tracts of undeveloped land. At present, there are no state or federal designated Wild, Scenic or Recreational rivers in the State of Washington; a bill may be presented for

consideration by the next session of the state legislature to create such a system, patterned after the federal system.

**FISH** - The Skagit River fishery provides an estimated 30% of the young anadromous fish entering salt water in Puget Sound. The value of these fish to commercial fishermen has been estimated to be nearly \$17 million in odd-numbered years when the prolific pink salmon migrate upstream, and over \$6 million during even-numbered years when the pink salmon are absent. The Skagit also supports one of the largest sports fisheries in the state.

**WILDLIFE** - Near Barnaby Slough on the Skagit River is an area which provides habitat for winter populations of bald eagles. The birds spend two or three months wintering along the Skagit, feeding on spawned out salmon. Elsewhere along the river undeveloped land provides cover and habitat for many different species. The river bottoms are particularly important during the winter when deer retreat to the brushy areas to find winter browse.

**SCENIC QUALITY** - Within the study area, and particularly immediately adjacent to the rivers, development, alteration or other encroachments have impacted scenic values at some points. The recent acceleration of subdivision development along the rivers could affect the immediate shoreline's natural beauty.

**LOCAL ECONOMY** - The economy

of Skagit County and the eastern half of Snohomish County is based on agriculture and forestry. Industry and tourism have become significant contributors in recent years. Light industry is being encouraged. The assessed value of Real Property in Skagit County in 1974 was \$288,287,000. Taxes levied on this property totaled \$989,650.

Several federally-sponsored studies are underway in an effort to determine the economic opportunities of the area, and to encourage the formulation of plans for capitalizing on those opportunities. Although some of these studies are still incomplete, those completed favor the preservation of the existing agriculture-forestry economic base, augmented by tourism and some light industry. The studies all favor inclusion of the Skagit and its tributaries in the National Wild and Scenic Rivers System, based on the additional potential tourist traffic and beneficial aspects of preserving natural qualities along the river.

### C. ARRAY OF ALTERNATIVES

The classification eligibility analysis found in Chapter 2 of this section provides a basis from which to examine classification alternatives for the study rivers. The natural limits of the alternative array range from no classification to total classification. Within this spectrum lie virtually dozens of alternatives varying only slightly in degree or effect. Consequently, only those alternatives which present discernible differences in

effect upon the present situation were selected for formal analysis here.

Four alternatives were ultimately selected for analysis. They are presented here, and are followed by a section which analyzes the impact of each upon the present situation, and the interrelationship of the four with the proposed action.

The study proposal was originally developed as Alternative D in the array of alternatives. A sixth alternative (Alternative B, Total Classification, Recreational) was also developed; however, it presented no significant differences from the Total Classification alternative, and was not considered in the final analysis.

### ALTERNATIVE A — TOTAL CLASSIFICATION

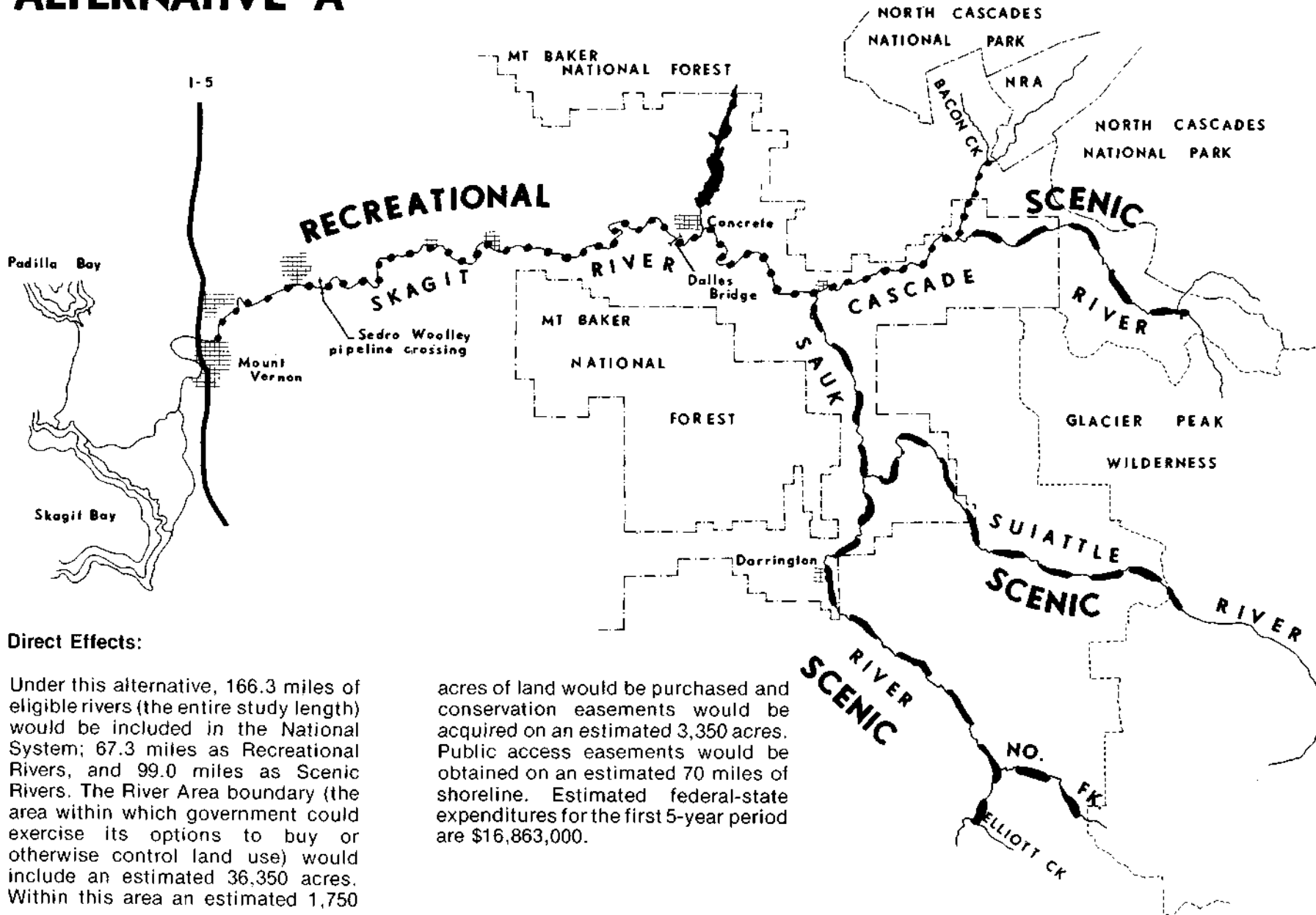
#### Description:

Under this alternative the Skagit River from Mount Vernon to Bacon Creek would be classified Recreational. The Cascade, Sauk and Suiattle Rivers would be classified Scenic for their entire study area length.

#### Purpose:

This alternative forecasts the various impacts to the Present Situation of including all of the study rivers in the National Wild and Scenic Rivers System. With respect to the Principles and Standards for Planning established by the Water Resources Council, this alternative represents an environmental quality alternative.

# ALTERNATIVE A



## Direct Effects:

Under this alternative, 166.3 miles of eligible rivers (the entire study length) would be included in the National System; 67.3 miles as Recreational Rivers, and 99.0 miles as Scenic Rivers. The River Area boundary (the area within which government could exercise its options to buy or otherwise control land use) would include an estimated 36,350 acres. Within this area an estimated 1,750

acres of land would be purchased and conservation easements would be acquired on an estimated 3,350 acres. Public access easements would be obtained on an estimated 70 miles of shoreline. Estimated federal-state expenditures for the first 5-year period are \$16,863,000.

**ALTERNATIVE C —  
CLASSIFICATION ABOVE  
THE DALLES BRIDGE**

**Description:**

Under this alternative the Skagit River from Mount Vernon to the Dalles Bridge near concrete would remain unclassified. The Skagit River from the Dalles Bridge upstream to Bacon Creek would be classified Recreational. The Cascade, Sauk and Suiattle Rivers would be classified Scenic for their entire study area length.

**Purpose:**

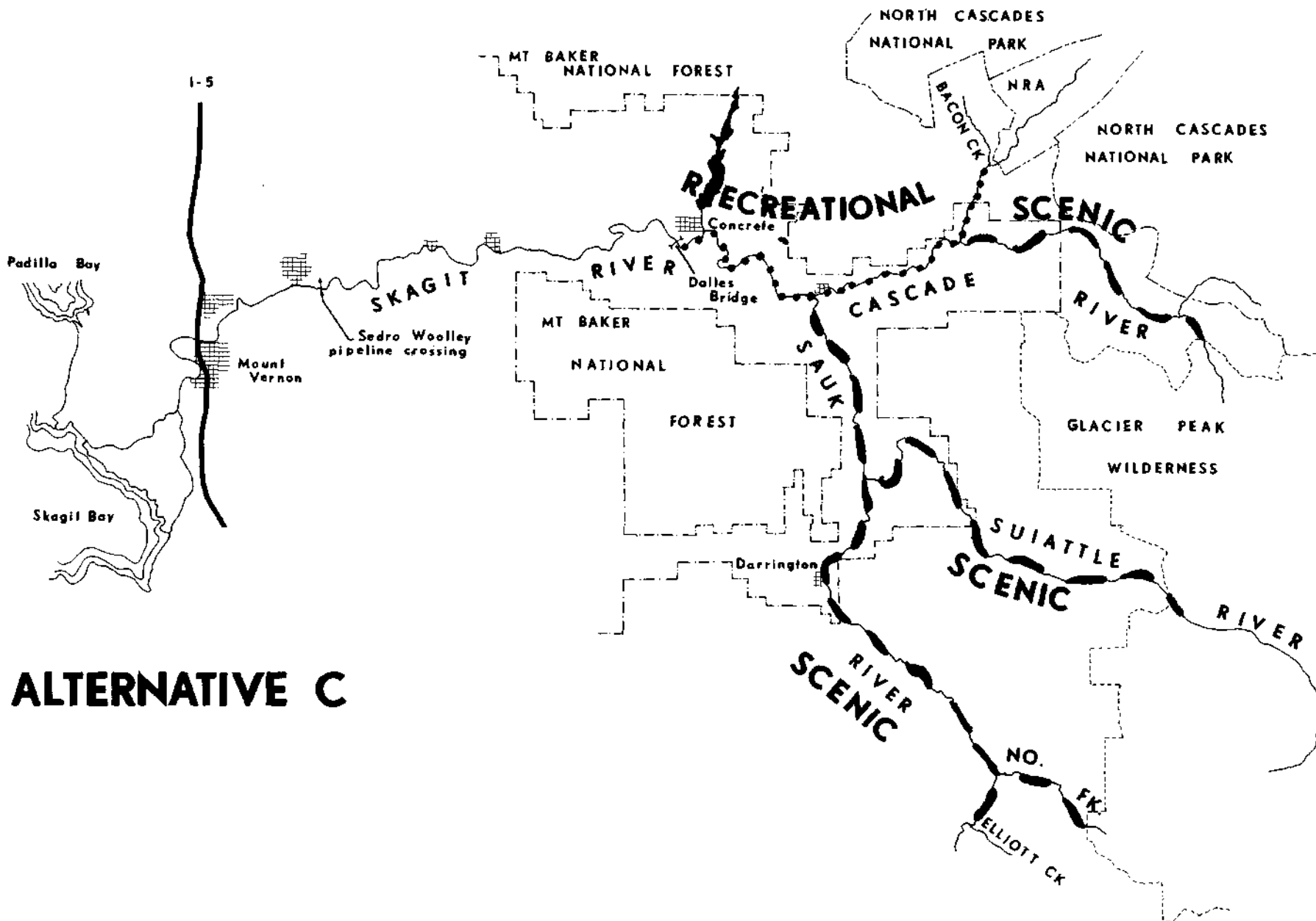
The purpose of this alternative is to forecast the effects upon the Present Situation of including the upriver portion of the study area in the National Wild and Scenic Rivers System, while excluding the mainstem of the Skagit River downstream from the bridge. With respect to the Principles and Standards for Planning established by the Water Resources Council, this alternative represents a trade-off alternative, since it accommodates the completion of PS&AW flood control Plan B, and imposes no federal management options on private property below the bridge.

**Direct Effects:**

Under this alternative 127.8 miles of eligible rivers would be included in the National System; 28.8 miles as Recreational Rivers and 99.0 miles as Scenic Rivers. The River Area boundary would include an estimated 28,950 acres. Within this area an

estimated 1,728 acres of land would be purchased, and conservation easements would be acquired on an estimated 3,350 acres. Public access easements would be obtained on an estimated 50 miles of shoreline. Estimated federal-state expenditures for the first 5-year period are \$16,144,000.





**ALTERNATIVE C**

## **ALTERNATIVE E — PARTIAL CLASSIFICATION**

### **Description:**

Under this alternative the Sauk and Suiattle Rivers, and the Skagit River downstream from the pipeline-utility corridor crossing at Sedro Woolley would remain unclassified. The Skagit River from the pipeline-utility corridor crossing upstream to Bacon Creek would be classified Recreational. The Cascade River would be classified Scenic for its entire study area length.

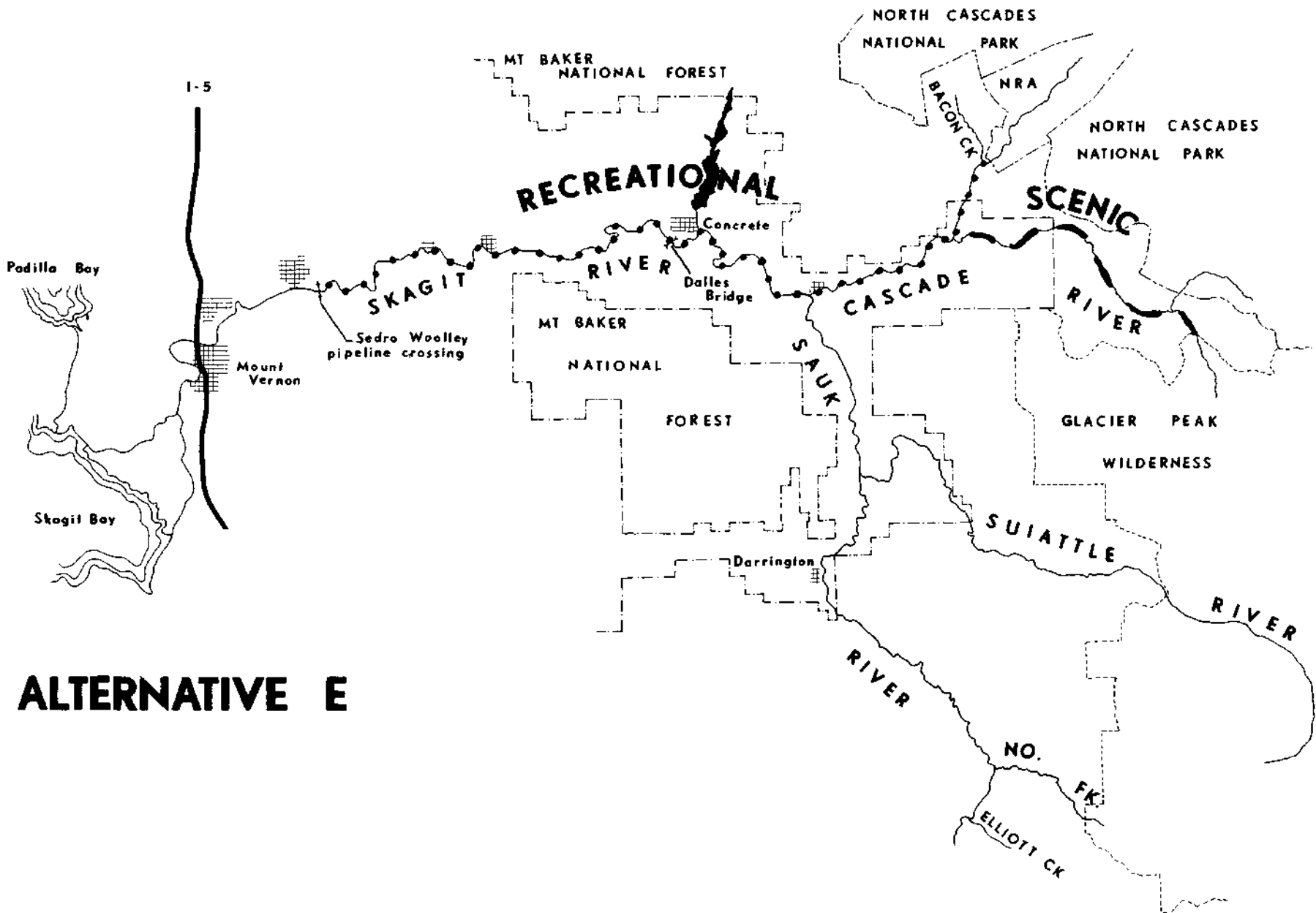
### **Purpose:**

The purpose of this alternative is to forecast the effects upon the Present Situation of including only those eligible rivers or segments which could be included in the National Wild and Scenic Rivers System while still maintaining the option to complete PS&AW flood control Plan A. With respect to the Principles and Standards for Planning established by the Water Resources Council, this alternative represents an economic development alternative. Construction of a dam on the Sauk River would be possible under this alternative.

### **Direct Effects:**

Under this alternative 79.3 miles of eligible rivers would be included in the National System; 58.5 miles as Recreational Rivers and 20.8 as Scenic Rivers. The river area boundary would include an estimated 13,950 acres. Within this area an estimated 76 acres of land would be purchased,

and conservation easements would be acquired on an estimated 1,000 acres. Public access easements would be obtained on an estimated 35 miles of shoreline. Estimated federal-state expenditures for the first 5-year period are \$4,867,000.



# ALTERNATIVE E

**ALTERNATIVE F —  
NO CLASSIFICATION**

**Description:**

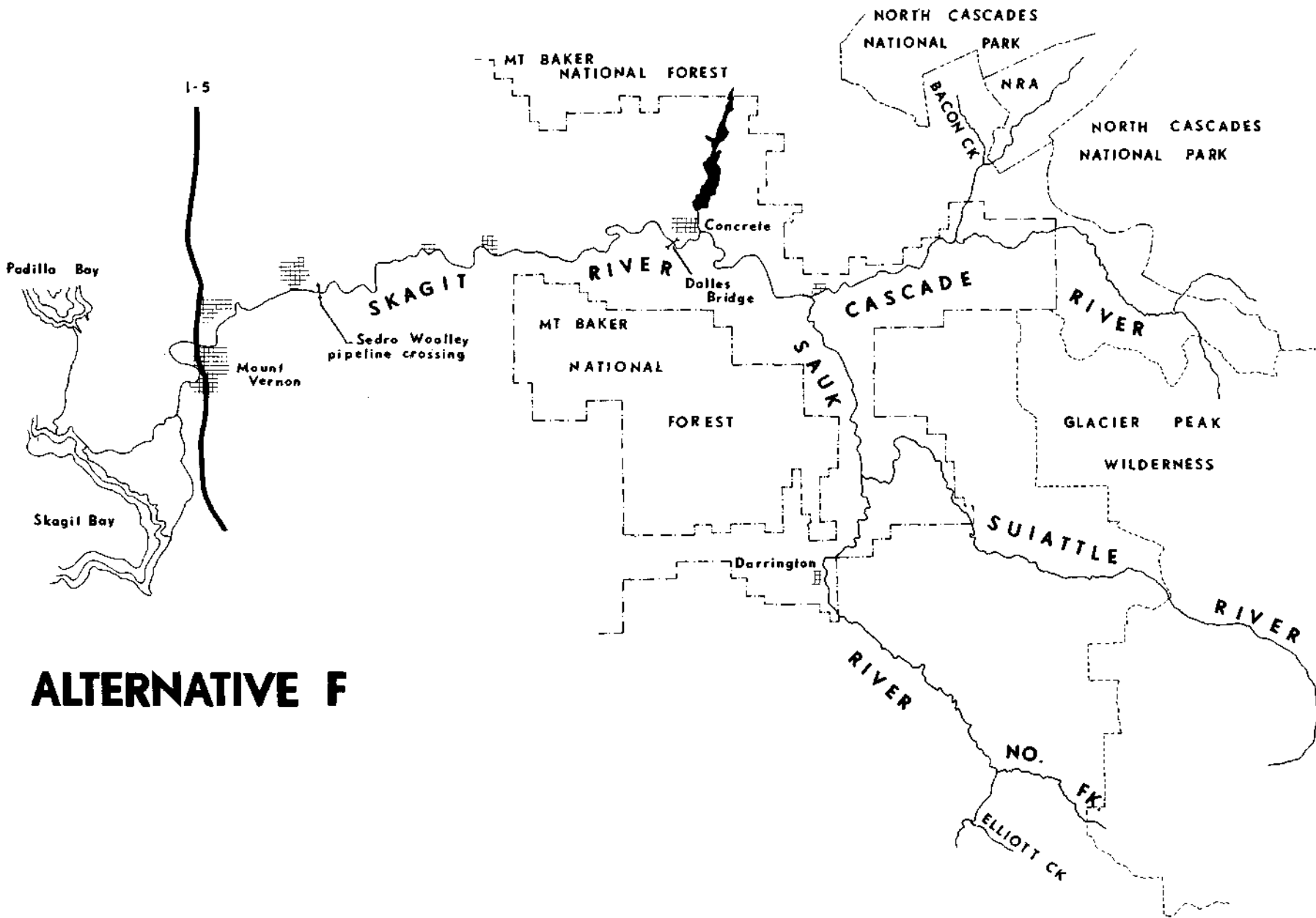
Under this alternative, none of the study rivers would be included in the National Wild and Scenic Rivers System.

**Purpose:**

The purpose of this alternative is to forecast the effects upon the Present Situation of excluding all eligible rivers from the National Wild and Scenic Rivers System. With respect to the Principles and Standards for Planning established by the Water Resources Council, this alternative represents the **status quo** alternative.

**Direct Effects:**

Under this alternative no eligible rivers would be included in the National System. No government land acquisition or additional control would be accomplished. No government money would be invested in public recreation facilities.



# ALTERNATIVE F

**PROPOSED ACTION —  
CLASSIFICATION ABOVE  
SEDRO WOOLLEY**

state expenditures for the first 5-year period are \$16,615,000.

**Description:**

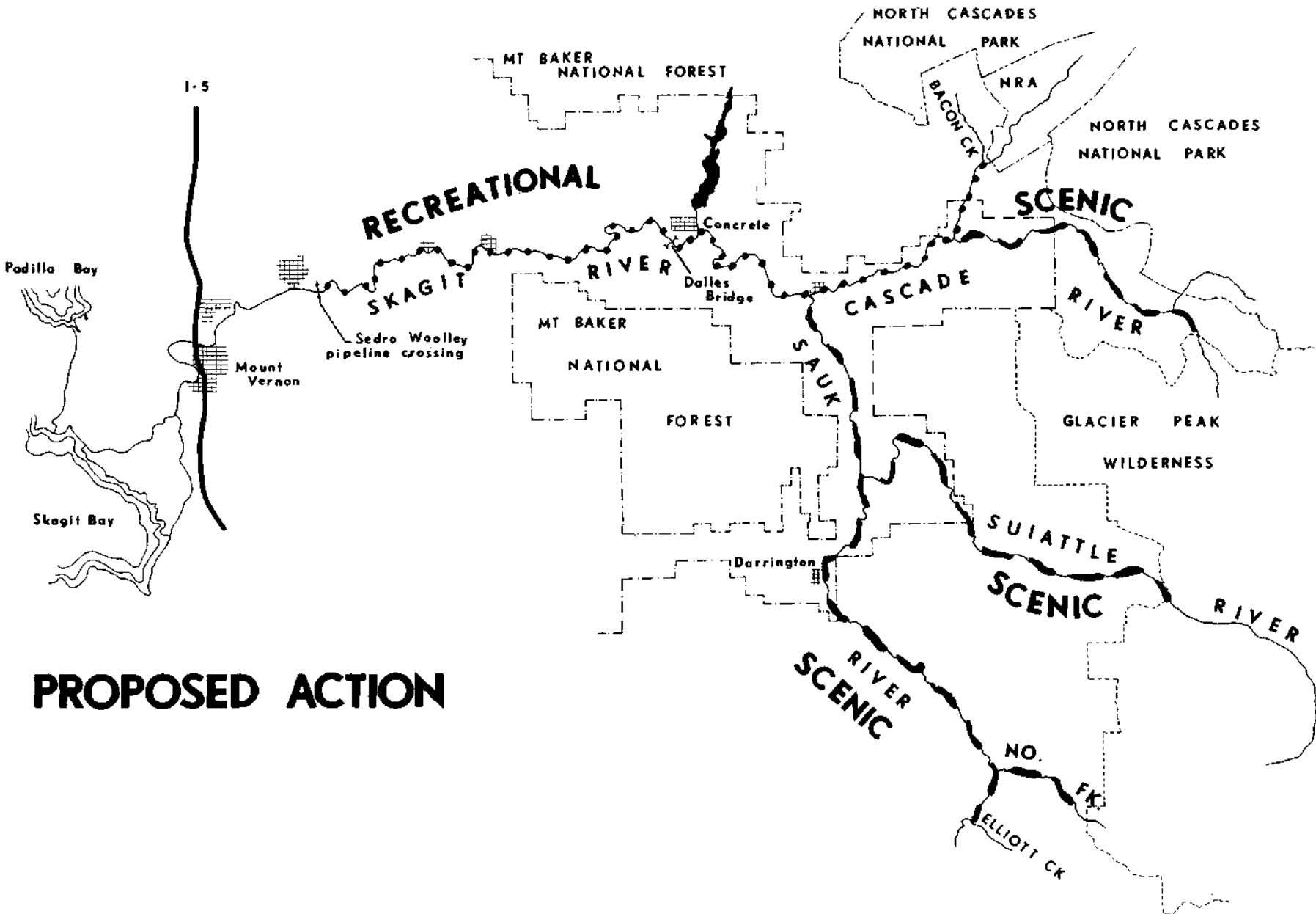
Under the proposed action the Skagit River from Mount Vernon upstream to the pipeline-utility corridor crossing at Sedro Woolley would remain unclassified. The Skagit River from the pipeline crossing upstream to Bacon Creek would be classified Recreational. The Cascade, Sauk and Suiattle Rivers would be classified Scenic for their entire study area length.

**Purpose:**

The proposed action is presented here to forecast the effects upon the Present Situation of including all eligible segments of river except those necessary for the accomplishment of PS&AW flood control Plan B in the National Wild and Scenic Rivers System.

**Direct Effects:**

Under the proposed action 157.5 miles of eligible rivers would be included in the National System; 58.5 miles as Recreational Rivers and 99.0 miles as Scenic Rivers. The river area boundary would include an estimated 34,650 acres. Within this area an estimated 1,728 acres of land would be purchased, and conservation easements would be acquired on an estimated 3,350 acres. Public access easements would be obtained on an estimated 70 miles of shoreline. Estimated federal-



**PROPOSED ACTION**

## D. ANALYSIS OF ALTERNATIVES

Two different points of departure are combined in this analysis. The first, as emphasized earlier in this chapter, reflects changes to the Present Situation forecast for each alternative. The second involves the application of three "accounts" as set down by the National Environmental Policy Act and the Water Resources Council. These accounts include Economic Effects, Social Effects, and Environmental Effects.

For this analysis these two systems have been combined, resulting in three accounts - economic, social and environmental - each of which portrays the foreseeable impacts of each alternative upon the conditions outlined in the Present Situation portion of this chapter. In many cases, an alternative may have no foreseeable impact upon one or more conditions.

### 1. Economic Effects

**Flood Control** - All alternatives would accommodate additional flood storage capacity at Upper Baker Lake, along with the construction of new levees and the improvement of existing levees. In addition, flood plain management ordinances could be initiated under all alternatives. Alternatives A and C, along with the Proposed Action, would preclude the construction of the lower Sauk Dam. These impacts, along with predicted level of flood protection for each alternative, are arrayed below.

As stated in the discussion of present conditions, the estimated cost of flood control Plan A is \$104 million, and \$53 million for Plan B.\*

**Hydroelectric Power** - Of the 13 potential hydropower sites within the study area, only Alternative F would make it possible to develop all 13 sites, generating 978,000 kw of additional electricity. Alternative E would facilitate the development of 8 of the 13 sites, with a total potential of 460,000 kw.

Alternative A, C and the Proposed Action would foreclose the opportunity to develop any of the 13 sites. With the exception of the lower Sauk site, investment costs for the 13 sites have not been determined.

## POTENTIAL FOR FUTURE FLOOD CONTROL DEVELOPMENT

	A	Alternative			Proposed	Present
		C	E	F	Action	Situation
Flood Control Plan A*	No	No	Yes	Yes	No	Yes
Flood Control Plan B*	No	Yes	Yes	Yes	Yes	Yes
Flood Plain Management	Yes	Yes	Yes	Yes	Yes	Yes
Dike Construction	Yes	Yes	Yes	Yes	Yes	Yes
Potential Level of Urban Protection	Once-in-50-Years	Once-in-100-Years	Once-in-100-Years	Once-in-100-Years	Once-in-100-Years	Once-in-14-Years

\*Developed in Puget Sound and Adjacent Waters Study (PS&AW).



## POTENTIAL HYDROPOWER SITES LEFT OPEN TO DEVELOPMENT

	A	Alternative			Proposed Action	Present Situation
		C	E	F		
kw Potential	0	0	460,000	978,000	0	978,000
Number of Sites	0	0	8	13	0	13

**Public Recreation Opportunities -** Federal-state investment in the development of public recreation facilities within the study area during the first five years after classification varies with the amount of rivers which would be included. Estimated investments, by alternative, are portrayed below.

## ESTIMATED FEDERAL-STATE RECREATION INVESTMENT, FIRST FIVE YEARS

	Alternative				Proposed Action
	A	C	E	F	
<b>TRAILS, State</b>	182,000	-0-	96,000	-0-	96,000
Federal	193,000	193,000	140,000	-0-	193,000
Total	375,000	193,000	236,000	-0-	289,000
<b>CAMPGROUNDS</b>					
State	-0-	-0-	-0-	-0-	-0-
Federal	126,000	126,000	-0-	-0-	126,000
Total	126,000	126,000	-0-	-0-	126,000
<b>DAY USE SITES</b>					
State	126,000	126,000	126,000	-0-	126,000
Federal	-0-	-0-	-0-	-0-	-0-
Total	126,000	126,000	126,000	-0-	126,000
<b>SIGNS, State</b>	10,000	4,000	8,000	-0-	8,000
Federal	13,000	13,000	5,000	-0-	13,000
Total	23,000	17,000	13,000	-0-	21,000
<b>MAINTENANCE</b>					
State	64,000	26,000	46,000	-0-	46,000
Federal	114,000	114,000	34,000	-0-	144,000
Total	178,000	150,000	90,000	-0-	160,000
<b>ADMINISTRATION</b>					
State	300,000	140,000	280,000	-0-	280,000
Federal	420,000	420,000	50,000	-0-	420,000
Total	720,000	560,000	330,000	-0-	700,000
<b>TOTAL, State</b>	682,000	296,000	556,000	-0-	556,000
Federal	818,000	818,000	224,000	-0-	818,000
Total	1,548,000	1,162,000	795,000	-0-	1,422,000

**Timber Management** - Proposed guidelines for timber management along classified rivers suggest a reduction in harvest near Recreational Rivers and more stringent harvest curtailments near Scenic Rivers. The potential impacts of this policy are shown below. This display includes projected effects on both private and National Forest timberlands, which amounts to 30,000 acres of potentially operable commercial forest land within the proposed river area boundary.

### PROJECTED EFFECTS UPON TIMBER HARVEST

	Alternative				Proposed Action
	A	C	E	F	
Average Annual Income Reduction	\$228,000	\$201,000	\$ 55,000	0	\$221,000
Average Annual Volume Reduction	990 MBF	875 MBF	220 MBF	0	960 MBF
Timber Industry Job Reduction	12	11	3	0	12

**Agriculture** - Implementation of any of the alternatives would have virtually no effect upon agricultural production within the study area. Existing agricultural practices are generally compatible with Recreational and Scenic classification. Some practices, such as the operation of a high density cattle feedlot, might be curtailed along classified rivers, but such practices are not known to occur within the study area.

**Transportation and Utilities** - No alternative calls for the relocation of any road or utility structures. Alternatives A, C, E and the Proposed Action would restrict future road and utility crossings to existing corridors on Scenic rivers, and would allow the upgrading of existing crossings to meet increases in traffic.

**Streambank Erosion Protection** - Federal agencies would not participate financially, either directly or indirectly, in any bankside stabilization project which threatened the visual or free-flowing characteristics of classified rivers. Each such project would be judged on its own merits; all Federal support would be withdrawn for projects adjudged "non-compatible." This criterion would be applied under Alternatives A, C, E and the Proposed Action for all classified rivers or river segments. This policy would generally allow the placement of rock riprap for the protection of homes and property.

**Mining** - Existing or future mining operations located on federal land within the river area boundary are subject to regulation by the Secretary of Agriculture or Secretary of Interior under Alternatives A, C, E and the

Proposed Action. Such regulations may raise production costs due to additional water quality, air quality or visual standards which must be met, causing an increase in labor costs, waste disposal costs or operating expenses.

**Wild and Scenic Rivers** - Estimated land acquisition programs and costs are shown below, by alternative. Acreage purchased in fee title would be removed from tax rolls.

**ESTIMATED LAND AND CONSERVATION EASEMENT ACQUISITION, AND ESTIMATED FEDERAL-STATE ACQUISITION EXPENDITURES**

Action	Alternative				Proposed Action
	A	C	E	F	
<b>LAND ACQUISITION</b>					
State, Acres	98	76	76	-0-	76
Federal, Acres	1,652	1,652	-0-	-0-	1,652
Total Acres	1,750	1,728	76	-0-	1,728
State, Cost \$	1,724,000	1,602,000	1,602,000	-0-	1,602,000
Federal, Cost \$	5,816,000	5,816,000	-0-	-0-	5,816,000
Total Cost \$	7,540,000	7,418,000	1,602,000	-0-	7,418,000
<b>CONSERVATION EASEMENT</b>					
State, Acres	620	620	620	-0-	620
Federal, Acres	2,730	2,730	380	-0-	2,730
State, Cost \$	1,302,000	1,302,000	1,302,000	-0-	1,302,000
Federal, Cost \$	5,733,000	5,733,000	798,000	-0-	5,733,000
<b>PUBLIC ACCESS</b>					
State, Miles	53	38	26	-0-	53
Federal, Miles	17	12	9	-0-	17
Total Miles	70	50	35	-0-	70
State, Cost \$	555,000	397,000	275,000	-0-	555,000
Federal, Cost \$	185,000	132,000	95,000	-0-	185,000
Total Cost \$	740,000	529,000	370,000	-0-	740,000
<b>TOTAL PROGRAM</b>					
Purchase, Acres	1,750	1,728	76	-0-	1,728
Scenic Easement, Acres	3,350	3,350	1,000	-0-	3,350
Public Access, Miles	70	50	35	-0-	70
Cost, State \$	3,581,000	3,301,000	3,179,000	-0-	3,459,000
Cost, Federal \$	11,734,000	11,681,000	893,000	-0-	11,734,000
Total Cost \$	15,315,000	14,982,000	4,072,000	-0-	15,193,000

**Fish** - The potential for the construction of artificial spawning devices is not precluded by either Recreational or Scenic river status. The cost of constructing such devices would probably be increased in a classified river segment in order to mitigate or nullify the visual impacts.

**Scenic Quality** - Most traffic in the study area travels along roads which parallel the study rivers. Alternatives A, C, E and the Proposed Action tend to maintain visual quality as perceived from both the rivers and the parallel road systems.

**Local Economy** - Classification under Alternatives A, C, E and the Proposed Action would tend to draw additional visitors to the basin to "see" a National River. Estimated impacts of government land acquisition upon county tax revenue derived from Real Property are arrayed below, by Alternative.

## 2. Social Effects

**Flood Control** - Each of the five alternatives offers some opportunities for reducing the risk of flood damage to lives and property. Although the maximum potential flood protection statistics have been summarized in the economic account, they are again summarized here.

	POTENTIAL FLOOD PROTECTION				Proposed Action	Present Situation
	Alternative					
Potential Level of Urban Protection	A	C	E	F		
	Once- in-50- Years	Once- in-100- Years	Once- in-100- Years	Once- in-100- Years	Once- in-100- Years	Once- in-14- Years

## IMPACT TO LOCAL TAX REVENUE

		Alternative				Proposed Action	Present Situation 1974 Levy
		A	C	E	F		
Reduction of Real Property Levy.	\$	26,250	25,920	1,140	-0-	25,290	989,650

**Public Recreation Opportunities -** Federal-state investment in public recreation facilities will make additional outdoor recreation facilities available to national, regional and local populations. The magnitude of projected recreation developments during the first five year following classification is presented below for each alternative.

**Land Use Planning -** Within the River Area boundary, federal, state and county governments would be able to exercise varying degrees of control over the use of land, through their options to purchase land outright, to purchase conservation easements or public access easements, to initiate zoning ordinances, and through management guidelines developed under the Shorelines Management Act. The acres within this boundary are shown below, by alternative.

**Fish -** Alternatives A, C and the Proposed Action, which show the greatest potential for maintaining and enhancing fish production in the basin, would also tend to maintain and enhance the quality and productivity of the recreation fishery, a natural resource that is nationally renowned for steelhead and salmon. Alternatives E and F retain the potential for the deterioration of this significant fishery.

### PROPOSED PUBLIC RECREATION DEVELOPMENT, FIRST FIVE YEARS

	Alternative				Proposed Action
	A	C	E	F	
Hiking Trails, (Miles)	36.1	15.3	22.0	0	27.3
Campgrounds, (Persons at one Time)	150	150	0	0	150
Day Use Areas (Persons at one Time)	400	400	400	0	400
Public Access Easements (Miles)	70	50	35	0	70

### ACREAGE ENCLOSED BY RIVER AREA BOUNDARY

Estimated Acres	Alternative				Proposed Action
	A	C	E	F	
	36,350	28,950	13,950	0	34,650

**Scenic Quality** - One of the expressed desires of both area and regional residents is to keep the Skagit Basin "the way it is now." Classification under Alternatives A, C or the Proposed Action would help to satisfy this social goal by maintaining the visual and natural elements which give the river zone its beauty and emotional appeal.

**Local Economy** - Alternatives A, C and the Proposed Action, which would foreclose the option of dam building on study rivers, would insure that the economic and social disruption associated with such projects would not occur within the study area; that the pace and quality of life in the basin would tend to stay "the way it is now."

### 3. Environmental Effects

**Flood Control and Hydroelectric Power** - The acreage which would be inundated by the implementation of flood control Plan A and by the various hydropower reservoirs identified as potential sites has not been researched by the agencies involved. However, it can be safely concluded that if all the potential reservoirs identified in this study were to be built, the study rivers would exist predominately as a chain of artificial lakes, linked together by short stretches of river. These reservoirs would naturally fill the flat bottom lands along the rivers - the same lands which are so vital for winter wildlife habitat, and equally vital in terms of land available for human use. In addition, it is possible,

despite the fishery-enhancement devices which undoubtedly would be installed in conjunction with each reservoir, that the Skagit basin anadromous fishery could suffer a severe decline such as has affected other "controlled" rivers across the nation. Thus, while Alternatives E and F do not propose to build these structures, the potential of their construction nevertheless remains under these two alternatives. While no environmental studies have been made to determine the effect of any of these projects, it can be inferred that their completion could irreversibly alter the entire biosphere of the Skagit basin. Although other forms of human modification may occur along the rivers under Alternatives A, C and the Proposed Action, the interrelationship between the rivers, the forests, and the creatures of the basin - including man - would remain reasonably intact.

**Public Recreation Opportunities** - The development of new public recreation facilities proposed in Alternatives A, C, E and the Proposed Action would introduce additional numbers of people to the river and the river corridor. There is no question that additional recreation visitors can adversely affect fish and animal populations. However, administrative agencies still have management techniques at their disposal which can concentrate many kinds of human use in those river areas which are not critical to wildlife purposes; conversely, human use can be limited in areas

vital for animals. In this manner, the impact of additional recreational visitors within the River Area can be successfully managed.

**Timber Management** - Alternatives A, C and the Proposed Action present nearly identical impacts to the management of timber within the study area. In exchange for this reduction in annual harvest (which represents 0.03% of the projected 1980 harvest from Puget Sound) numerous benefits would accrue to the environmental account. The logging policies proposed in these alternatives would tend to protect water quality, provide wildlife food and habitat, retain the scenic qualities of the river corridor and provide a large, permanent site for dispersed human use in a natural setting.

**Agriculture** - Although agriculture is generally considered compatible with classification, some controls might be placed upon agricultural practices within the river area boundary to maintain or upgrade water quality and scenic values.

**Transportation and Utilities** - Controls over road and utility crossings suggested in Alternatives A, C, E and the Proposed Action would serve to prevent future visual intrusions on Scenic rivers.

**Streambank Erosion Protection** - Classification under Alternatives A, C, E and the Proposed Action would actively discourage the completion of non-compatible bank stabilization

works or other water resource projects. This policy would maintain the free-flowing character of the river, and would prevent the completion of such projects as would detract from scenic values, while allowing projects necessary to protect homes and property.

**Mining** - Alternatives A, C, E and the Proposed Action would permit the production of minerals located on federal land within the river area, but would require such operations to protect water quality, scenic values and other important environmental considerations.

**Water Quality** - Classification under Alternatives A, C, E and the Proposed Action would tend to reinforce existing state and federal laws which seek to preserve or upgrade the quality of study river waters.

**Wild and Scenic Rivers** - The free-flowing characteristics and natural shorelines of study rivers would tend to be preserved within classified river segments. Miles of rivers and shorelines which would be preserved are arrayed below, by alternative.

**Fish** - Alternatives A, C, and the Proposed Action, which foreclose the future option of dam building on study rivers, would tend to maintain the quality and quantity of the present fishery, an outstanding resource of the study area. These alternatives would also accommodate the construction of compatible fisheries enhancement devices.

**Wildlife** - Alternatives A, C, E and the Proposed Action could secure a permanent winter habitat for bald eagles near Barnaby Slough, and would provide varying acreages of suitable habitat for wildlife.

#### E. EVALUATION OF THE PROPOSED ACTION

When reviewing the foregoing analysis, several factors can logically be excluded from further consideration, since they are unchanged by any alternative. Included in this group are Navigation and Irrigation, which are totally unaffected by any of the alternatives. Several other factors are somewhat affected by one or another of the alternatives - but to such a minor degree that the effects can be

readily discounted. Within this grouping fall Agriculture, Transportation and Utilities, Municipal and Industrial Water Supply, and Local Economy. Water Quality also falls into this group. Because water quality is a classification criterion explicitly stated in the Wild and Scenic Rivers Act, it is dropped from further consideration only after making the considered judgment that it will remain fairly constant under any alternative, due to the action of existing state and federal laws.

Hydroelectric Power is another factor which is not impacted. Although the potential for the development of new sources of electricity within the study area appears to relate significantly to the selection of a study proposal, the recent announcement of plans to construct a nuclear generating facility in the basin effectively negates this consideration. If built as presently proposed, the "nuke" will produce far more electricity than the 13 potential dams in the basin, and will be on-line years sooner than could any of the dams. Since classification does not preclude the opportunity for some future Congress of the United States to judge that hydroelectric power is a vital nec-

#### MILES OF FREE-FLOWING RIVER INCLUDED IN THE NATIONAL SYSTEM

	Alternative				Proposed Action
	A	C	E	F	
Free-flowing Rivers, miles	166.3	127.8	79.3	0	157.5

essity and declassify all or part of the proposal area, the interim loss of the area's potential hydropower sites does not irreversibly affect national power planning.

The matrix below portrays the effects of each alternative upon those factors which were used for final analysis, and serves as the basis for evaluation of the Proposed Action. The standards for this evaluation reflect two overriding concepts; (1)

that the purpose of the Wild and Scenic Rivers Act is to preserve those rivers which possess outstanding characteristics of national merit, and (2) that major adverse impacts to local, regional and national populations should be avoided.

### REVIEW OF CLASSIFICATION ALTERNATIVES WITH RESPECT TO MAJOR IMPACTS AND CONTRIBUTIONS TO THE NATIONAL WILD AND SCENIC RIVERS SYSTEM

Definition Of Major Impact	ALTERNATIVE				Proposed Action
	A	C	E	F	
FLOOD CONTROL - Potential to meet or exceed desired flood control goals (1 : 100)	NO	YES	YES	YES	YES
STREAMBANK EROSION PROTECTION - Permit vital bank stabilization work	YES	YES	YES	YES	YES
FISH - Precludes potential for future detriment while permitting enhancement	YES	YES	NO	NO	YES
LAND USE PLANNING - Offers positive program to assist in control of future development along rivers	YES	PARTLY	YES	NO	YES
SCENIC QUALITY - Acts to maintain study area "the way it is now."	YES	PARTLY	NO	NO	YES
WILDLIFE - Opportunity to secure winter habitat	YES	YES	YES	NO	YES
PUBLIC RECREATION OPPORTUNITIES - Provides additional supply of public recreation facilities	YES	YES	YES	NO	YES
TIMBER MANAGEMENT - Avoids significant reduction in national timber supply	YES	YES	YES	YES	YES
MINING - Allows removal of future locatable minerals	YES	YES	YES	YES	YES
WILD AND SCENIC RIVERS - Includes major portion of eligible rivers in National System	YES	NO	NO	NO	YES



# JURISDICTION

None of the four alternatives successfully meet all of the evaluative criteria. Because it succeeds in including most of the eligible rivers in the National Wild and Scenic Rivers System while avoiding significant impacts to local, regional and national populations, the Proposed Action—which was originally presented to the public as Alternative D—was selected.

Through the analysis of river classification alternatives in Chapter 3, along with their relative impacts to the present situation and an aggressive public involvement effort, the Proposed Action was developed.

Consideration is now directed toward potential administrative arrangements to determine “who” should administer the rivers discussed in the previous chapters.

Three **potential** administrative arrangements have been identified:

**1. State Administration** - Under State administration, the river areas could be protected by an appropriate state agency, or through some other state governmental arrangement. The state would need to enact scenic river legislation, then make application to the Secretary of the Interior pursuant to Section 2 (a) (ii) of the Wild and Scenic Rivers Act, if it wanted to include the rivers in the National Wild and Scenic Rivers System.

**2. Joint Administration (Federal-State)** - Under joint administration, the State of Washington and the Secretary of Agriculture would share administrative responsibilities for the rivers. Written cooperative agreements between the state and federal government would be entered into, outlining the responsibilities of each party for land acquisition, development, and management. Under this alternative the rivers could be added to the National Wild and Scenic Rivers

System by an Act of Congress. Detailed plans would be jointly prepared after the legislation was enacted.

**3. Federal Administration** - Under Federal administration, the principal federal agency in the River Area would administer the entire river system. Since National Forest land is involved in this proposal, the Forest Service would probably be the administering agency. Under this arrangement, rivers would become part of the National Wild and Scenic Rivers System by an Act of Congress.

Section 2 of the Wild and Scenic Rivers Act specifies:

“Sec. 2. (a) The National Wild and Scenic Rivers System shall comprise rivers (i) that are authorized for inclusion therein by Act of Congress, or (ii) that are designated as wild, scenic or recreational rivers by or pursuant to an act of the legislature of the State or States concerned without expense to the United States, that are found by the Secretary of the Interior, upon application of the Governor of the State or the Governors of the States concerned, or a person or persons thereunto duly appointed by him or them, to meet the criteria established in this Act and such criteria supplementary thereto as he may prescribe, and that are approved by him for inclusion in the system . . . .”

An **analysis** of each of the three administrative arrangements is shown below:

1. Under **State Administration**, the federal government could not contribute or participate in the acquisition and management of lands within the river area, except for National Forest lands. The State has no scenic river legislation. Funds for the protection and development of the rivers would probably come from L&WCF monies and would represent a drain on outdoor recreation projects elsewhere in the State. The State could not prohibit the licensing of a dam and reservoir within the proposal area.

2. Under **Joint Administration**, federal and state governments would play a co-dominant role in river administration. County and municipal governments could also participate. Administrative duties, responsibilities and costs would be shared. Legislative authority at all levels would be employed to protect the rivers. Due to the predominance of private land adjacent to proposal rivers, it is appropriate to have active state and local participation in acquisition and management programs.

a. Of the 157.5 miles of river recommended for classification, only 54.8 miles are within the boundary of the Mt. Baker-Snoqualmie National Forest. The remaining 102.7 miles are under state, local government, or private ownership.

b. Many state agencies already have significant management responsibilities for the river and its resources, including the Departments of Fisheries, Game, Natural Resources, Ecology and the Parks and Recreation Commission.

3. Under **Federal Administration** the total cost of acquisition and management would rest with the federal government. The necessary acquisition of private property would require the appropriation of over \$60 million of Federal funds. Approximately two-thirds of the land within the river area is outside the existing National Forest boundary.

The administrative arrangement which best satisfies the future management needs of the Skagit River and its Cascade, Sauk and Suiattle tributaries under the Wild and Scenic Rivers Act is **Joint Administration**.

Under Joint Administration, the State of Washington would lead protection and development activities along the Skagit River (58.5 miles); the federal government would fulfill the same responsibilities along the Cascade, Sauk and Suiattle Rivers

(99.0 miles). The rivers would be administered in accordance with the following management guidelines. Detailed plans would be prepared jointly after legislation is enacted. County and municipal governments would participate in the preparation of management plans.

### *Proposed Management Guidelines for Joint Administration*

1. The State of Washington to be responsible for the administration of the Skagit River component; the federal government for the Cascade, Sauk and Suiattle River components of the National System.

2. The respective administrative agencies for the state and federal governments, in cooperation with appropriate county and municipal agencies, to jointly develop a land, public access and conservation easement acquisition plan which fulfills the requirements and intent of the Wild and Scenic Rivers Act.

3. The administrative agencies to seek to substantially execute the acquisition plan within five years after inclusion of the rivers in the National Wild and Scenic Rivers System.

4. The administrative agencies to jointly prepare a management plan which identifies compatible and non-compatible land and resource uses, both existing and potential, and identifies methods to be used to meet management goals. This plan to interact with the land acquisition plan

# RECREATION DEVELOPMENT, MAINTENANCE, ADMINISTRATION AND ACQUISITION COST ESTIMATES

to help determine acquisition form and priority.

5. The administrative agencies, working in conjunction with associated federal, state and local government agencies, to plan the development of public recreation facilities within the river area sufficient to meet a proportionate shore of the public demand.

6. The administrative agencies to jointly develop such cooperative agreements, memorandums of understanding, working agreements, etc., as may be necessary to administer the classified river area, and to protect or enhance the many values which caused its inclusion in the National Wild and Scenic Rivers System.

## A. RECREATION DEVELOPMENT PROGRAM

A conceptual recreation development program has been prepared for the proposal area, to provide some public facilities development during the first five years following classification. This program should accommodate any initial surge of tourism to the proposal area, while allowing long-range planning to follow future demands as they evolve.

Recommended developments include:

1. A 12-mile foot trail between Sedro Woolley and Lyman on the north bank of the Skagit River. This trail should be slated for eventual upgrading to accommodate bicycles. For the present, it should be closed to all but pedestrian traffic. Estimated construction cost for the project is \$96,000. This project lies within the state's area of administrative responsibility, and is proposed for completion by the state.

2. A 10-mile foot trail on the north bank of the Cascade River, beginning at the existing trailhead near the Glacier Peak Wilderness, and continuing downstream to Marble Creek campground. Estimated cost is \$140,000. This trail should be closed to all but pedestrian traffic. This would be a federal project.

3. A 5.3-mile foot trail on the west bank of the Sauk River, from the Suiattle River bridge (M. P. 12.3) downstream to Government Bridge (M. P. 7.0). This trail should be closed

to all but pedestrian traffic. Estimated construction cost for the project is \$53,000. This would be a federal project.

4. One moderate-sized campground is proposed for construction during this period. A 30-unit campground, accommodating about 150 persons at one time, could be located along the south bank of the Suiattle River, near its confluence with the Sauk River, in the scenic Sauk Prairie. Estimated cost of this facility is \$126,000. The campground would be developed with federal funds.

5. The construction of day use areas along the Skagit River, accommodating a total of 400 persons-at-one-time. Estimated construction cost is \$126,000. These facilities lie within the state's area of administrative responsibility and are proposed for state completion.

6. A program to provide adequate signing for the proposal area is estimated to cost \$21,000. The state share of the signing program is estimated at \$8,000, and the Federal portion at \$13,000.

7. A program to perform necessary maintenance and reconstruction in developed National Forest campgrounds within the river area. This work is required to bring the sites up to current standards. This program will cost \$48,000, all Federal Funds.

Estimated expenditures for land acquisition necessary to the completion of this proposal are included in the Acquisition Program discussion,

which follows this section.

The total estimated cost for this development program is \$610,000. The estimated state portion under this proposal is \$230,000. Total estimated federal recreation expenditures for the first five years following classification under this proposal are \$380,000.

#### **B. MAINTENANCE PROGRAM**

Maintenance costs are based on 10% of the previous years' investments. Total estimated cost of the maintenance program for the first five years is \$112,000 of which \$66,000 is the estimated proportionate federal share. Estimated state maintenance costs are \$46,000.

#### **C. ADMINISTRATION PROGRAM**

Administration costs for the first five years following classification are estimated at \$420,000 for the federal government and \$280,000 for the state.

#### **D. ACQUISITION PROGRAM**

To accomplish the management and recreation development programs outlined in the earlier parts of this chapter, the acquisition of some land is necessary. Since an actual acquisition plan should not be prepared until classification for the proposal area is a fact, land acquisition planning at this time need only provide a basis for reasonably estimating the acreage and cost involved. This discussion provides that estimate, and leaves the identification of individual tracts for the first phase of planning by the river area administrators.

There are four options for achieving land use control. The first involves the application of existing county, state and federal laws for protecting the rivers and their adjacent lands. County zoning ordinances, flood plain management policies and master plans, the State Shorelines Management Act, and federal water quality laws and laws regulating the uses of navigable rivers are examples of such existing controls which serve to protect various aspects of the rivers. This body of laws, regulations and policies, taken together as a management option, can serve to successfully regulate use along many river segments within the proposal area.

The second management option involves fee-title acquisition of land. This option includes such practices as outright purchase, exchange, donations, and buy-lease back. In general, these practices are referred to as "purchase" in this discussion.

The third management option open to future administrators is the purchase of conservation easements. This option will normally be used where it is desirable to continue an existing land use, modify a non-compatible land use, or provide an acceptable level of scenic quality for a particular view or panorama where outright ownership of the land is unnecessary. Conservation easements will purchase only certain property rights from the legal owner, leaving the land on the local tax rolls and otherwise under the control of the landowner. Consequently, conserva-

tion easements should cost somewhat less, per acre, than purchase.

The fourth option involves the acquisition of public access easements. These easements may either be acquired in conjunction with conservation easements, or may be acquired alone. In either case, their function is to provide ingress, egress, or lateral access at appropriate points along the rivers.

The acquisition cost estimate is based on a use intensity inventory and a resulting series of assumptions. Too complex to present here, the inventory and assumptions are presented in Appendix D, in the chapter entitled "Use Intensity Inventory."

Estimated acquisition costs are based on the purchase of some lands, the acquisition of conservation easements on the other lands, and the acquisition of public access easements on some additional lands.

Based on recent transaction evidence in the proposal area, estimated costs were averaged at \$3,500 per acre for fee title purchase of land, \$2,100 per acre for conservation easement acquisition, \$5,600 per acre for the purchase of trail sites, and \$2.00 per lineal foot for public access easements.

Conservation easements would seek to maintain the natural qualities of specific portions of the designated river area. Most lands within the designated river area which are in private ownership will be adequately

protected by state and county laws. These laws include the State Shorelines Management Act, the State Forest Practices Act, and the county zoning ordinances. Conservation easements will be acquired on less than 10% of the land within the river area boundary. On those lands placed under conservation easement, the following management guidelines would apply:

Timber harvest would be regulated to maintain existing scenic values, wildlife habitat, water quality and other values.

Established agricultural uses would continue.

Future subdivision or development would be limited.

Sand and gravel quarrying would not be permitted. Mining operations would be subject to state and federal regulations.

Except for prior established uses, no portable housing would be permitted, whether for permanent or overnight uses.

No commercial signing or advertisements would be permitted except on existing business premises.

No rubbish, junk or garbage dumping would be permitted.

Maintenance, repair or replacement of existing structures would generally be permitted.

The establishment or maintenance of a vegetative screen between the river and roads, utility lines and structures would be encouraged.

Additional road construction within view of the river would be precluded.

The maintenance or enhancement of the overall scenic quality of the river and its adjacent shoreline would be sought.

Based on the above, and the information in Appendix D, "Use Intensity Inventory," the following acquisition cost estimates were developed:

RIVER	ACTION	STATE	FEDERAL
Skagit	Acquire conservation easements on 620 acres.	\$1,302,000	
Sauk	Acquire conservation easements on 1,170 acres outside National Forest boundary and 380 acres within National Forest boundary. Purchase 800 acres.		\$3,255,000 \$2,800,000
Suiattle	Acquire conservation easements on 670 Acres outside National Forest boundary and 130 acres within National Forest boundary. Purchase 816 acres.		\$1,680,000 \$2,856,000
Cascade	Acquire conservation easements on 380 acres within National Forest boundary.		\$ 798,000
All Rivers	Acquire 369,000 lineal feet (70 miles) of public access easements.	\$ 555,000	\$ 185,000

In addition, the following land acquisition must be accomplished to accommodate the proposed recreation developments:

RIVERS	ACTION	STATE	FEDERAL
Skagit	Acquire 36 acres of shoreline for trail construction at an estimated \$5,600 per acre.	\$ 202,000	
	Acquire 40 acres for development as day use areas at an estimated \$3,500 per acre.	\$1,400,000	
Sauk	Acquire 16 acres of shoreline for trail construction at an estimated \$5,600 per acre.		\$ 90,000
	Acquire 20 acres for development of campground at an estimated \$3,500 per acre.		\$ 70,000

It is anticipated that the State of Washington will acquire the lands and conservation easements needed for protection, recreation development and public access on the Skagit River. Some or all of the funds used for this acquisition may come from Land and Water Conservation Fund monies, which would increase the federal government's expenditures while decreasing those of the state.

#### SUMMARY OF ACQUISITION COSTS ESTIMATES

Land Purchase .....	1,728 acres	\$ 7,418,000
Conservation Easements .....	3,350 acres	\$ 7,035,000
Public Access Easements .....	70 miles	\$ 740,000
TOTAL .....		\$15,193,000

**ESTIMATED STATE EXPENDITURES**

Land Purchase .....	76 acres	\$ 1,602,000
Public Access Easements .....	53 miles	\$ 555,000
Conservation Easements .....	620 acres	\$ 1,302,000
<b>TOTAL .....</b>		<b>\$ 3,459,000</b>

**ESTIMATED FEDERAL EXPENDITURES**

Land Purchase .....	1,652 acres	\$ 5,816,000
Public Access Easements .....	17 miles	\$ 185,000
Conservation Easements .....	2,730 acres	\$ 5,733,000
<b>TOTAL .....</b>		<b>\$11,734,000</b>

Estimated costs to federal and state governments for implementing this proposal for the first five years following classification are shown below.

**ESTIMATED FEDERAL EXPENDITURES**

<b>Activity</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Total</b>
Administration	\$ 84,000	\$ 84,000	\$ 84,000	\$ 84,000	\$ 84,000	\$ 420,000
Acquisition	1,760,000	1,760,000	2,347,000	2,933,000	2,934,000	11,734,000
Recreation Development	66,000	66,000	66,000	66,000	68,000	332,000
Maintenance <sup>1</sup>	9,600	16,600	22,600	29,600	35,600	114,000
<b>TOTAL</b>	<b>\$1,919,600</b>	<b>\$1,926,600</b>	<b>\$2,519,600</b>	<b>\$3,112,600</b>	<b>\$3,121,600</b>	<b>\$12,600,000</b>

<sup>1</sup>Includes \$9,600/year for existing campground maintenance program.

**ESTIMATED STATE EXPENDITURES**

<b>Activity</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Total</b>
Administration	\$ 56,000	\$ 56,000	\$ 56,000	\$ 56,000	\$ 56,000	\$ 280,000
Acquisition	519,000	519,000	691,000	865,000	865,000	3,459,000
Recreation Development	46,000	46,000	46,000	46,000	46,000	230,000
Maintenance	—	5,000	9,000	14,000	18,000	46,000
<b>TOTAL</b>	<b>\$ 621,000</b>	<b>\$ 626,000</b>	<b>802,000</b>	<b>981,000</b>	<b>\$ 985,000</b>	<b>\$ 4,015,000</b>

**TOTAL ESTIMATED EXPENDITURES**

<b>Activity</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Total</b>
Administration	\$ 140,000	\$ 140,000	\$ 140,000	\$ 140,000	\$ 140,000	\$ 700,000
Acquisition	2,279,000	2,279,000	3,038,000	3,798,000	3,799,000	15,193,000
Recreation Development	112,000	112,000	112,000	112,000	114,000	562,000
Maintenance	9,600	21,600	31,600	43,600	53,600	160,000
<b>TOTAL</b>	<b>\$2,540,600</b>	<b>\$2,552,600</b>	<b>\$3,321,600</b>	<b>\$4,093,600</b>	<b>\$4,106,000</b>	<b>\$16,615,000</b>





**APPENDIX**

**A**



Public Law 90-542  
90th Congress, S. 119  
October 2, 1968

## An Act

To provide for a National Wild and Scenic Rivers System, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) this Act may be cited as the "Wild and Scenic Rivers Act".

(b) It is hereby declared 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.

(c) The purpose of this Act is to implement this policy by instituting a national wild and scenic rivers system, by designating the initial components of that system, and by prescribing the methods by which and standards according to which additional components may be added to the system from time to time.

Sec. 2. (a) The national wild and scenic rivers system shall comprise rivers (i) that are authorized for inclusion therein by Act of Congress, or (ii) that are designated as wild, scenic or recreational rivers by or pursuant to an act of the legislature of the State or States through which they flow, that are to be permanently administered as wild, scenic or recreational rivers by an agency or political subdivision of the State or States concerned without expense to the United States, that are found by the Secretary of the Interior, upon application of the Governor of the State or the Governors of the States concerned, or a person or persons thereunto duly appointed by him or them, to meet the criteria established in this Act and such criteria supplementary thereto as he may prescribe, and that are approved by him for inclusion in the system, including, upon application of the Governor of the State concerned, the Allagash Wilderness Waterway, Maine, and that segment of the Wolf River, Wisconsin, which flows through Langlade County.

(b) A wild, scenic or recreational river area eligible to be included in the system is a free-flowing stream and the related adjacent land area that possesses one or more of the values referred to in section 1, subsection (b) of this Act. 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 rivers 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 in places by roads.

(3) Recreational river areas—Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some

Wild and Scenic  
Rivers Act.

National wild  
and scenic  
rivers system.

82 STAT. 906  
82 STAT. 907

Eligibility  
for inclusion.

National wild  
and scenic  
rivers.

82 STAT. 907  
82 STAT. 908.

Pub. Law 90-542 - 2 - October 2, 1968

development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Sec. 3 (a) The following rivers and the land adjacent thereto are hereby designated as components of the national wild and scenic rivers system:

(1) CLEARWATER, MIDDLE FORK, IDAHO.—The Middle Fork from the town of Kooskia upstream to the town of Lowell; the Lochsa River from its junction with the Selway at Lowell forming the Middle Fork, upstream to the Powell Ranger Station; and the Selway River from Lowell upstream to its origin; to be administered by the Secretary of Agriculture.

(2) ELEVEN POINT, MISSOURI.—The segment of the river extending downstream from Thomasville to State Highway 142; to be administered by the Secretary of Agriculture.

(3) FEATHER, CALIFORNIA.—The entire Middle Fork; to be administered by the Secretary of Agriculture.

(4) RIO GRANDE, NEW MEXICO.—The segment extending from the Colorado State line downstream to the State Highway 96 crossing, and the lower four miles of the Red River; to be administered by the Secretary of the Interior.

(5) ROGUE, OREGON.—The segment of the river extending from the mouth of the Applegate River downstream to the Lobster Creek Bridge; to be administered by agencies of the Departments of the Interior or Agriculture as agreed upon by the Secretaries of said Departments or as directed by the President.

(6) SAINT CROIX, MINNESOTA AND WISCONSIN.—The segment between the dam near Taylors Falls, Minnesota, and the dam near Gordon, Wisconsin, and its tributary, the Namekagon, from Lake Namekagon downstream to its confluence with the Saint Croix; to be administered by the Secretary of the Interior: *Provided*, That except as may be required in connection with items (a) and (b) of this paragraph, no funds available to carry out the provisions of this Act may be expended for the acquisition or development of lands in connection with, or for administration under this Act of, that portion of the Saint Croix River between the dam near Taylors Falls, Minnesota, and the upstream end of Big Island in Wisconsin, until sixty days after the date on which the Secretary has transmitted to the President of the Senate and Speaker of the House of Representatives a proposed cooperative agreement between the Northern States Power Company and the United States (a) whereby the company agrees to convey to the United States, without charge, appropriate interests in certain of its lands between the dam near Taylors Falls, Minnesota, and the upstream end of Big Island in Wisconsin, including the company's right, title, and interest to approximately one hundred acres per mile, and (b) providing for the use and development of other lands and interests in land retained by the company between said points adjacent to the river in a manner which shall complement and not be inconsistent with the purposes for which the lands and interests in land donated by the company are administered under this Act. Said agreement may also include provision for State or local governmental participation as authorized under subsection (c) of section 10 of this Act.

(7) SALMON, MIDDLE FORK, IDAHO.—From its origin to its confluence with the main Salmon River; to be administered by the Secretary of Agriculture.

(8) WOLF, WISCONSIN.—From the Langlade-Menominee County line downstream to Keshena Falls; to be administered by the Secretary of the Interior.

(b) The agency charged with the administration of each component of the national wild and scenic rivers system designated by subsection

(a) of this section shall, within one year from the date of this Act, establish detailed boundaries therefor (which boundaries shall include an average of not more than three hundred and twenty acres per mile on both sides of the river); determine which of the classes outlined in section 2, subsection (b), of this Act best fit the river or its various segments; and prepare a plan for necessary developments in connection with its administration in accordance with such classification. Said boundaries, classification, and development plans shall be published in the Federal Register and shall not become effective until ninety days after they have been forwarded to the President of the Senate and the Speaker of the House of Representatives.

Sec. 4. (a) The Secretary of the Interior or, where national forest lands are involved, the Secretary of Agriculture or, in appropriate cases, the two Secretaries jointly shall study and from time to time submit to the President and the Congress proposals for the addition to the national wild and scenic rivers system of rivers which are designated herein or hereafter by the Congress as potential additions to such system; which, in his or their judgment, fall within one or more of the classes set out in section 2, subsection (b), of this Act; and which are proposed to be administered, wholly or partially, by an agency of the United States. Every such study and plan shall be coordinated with any water resources planning involving the same river which is being conducted pursuant to the Water Resources Planning Act (79 Stat. 244; 42 U.S.C. 1962 et seq.).

Each proposal shall be accompanied by a report, including maps and illustrations, showing among other things the area included within the proposal; the characteristics which make the area a worthy addition to the system; the current status of landownership and use in the area; the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the national wild and scenic rivers system; the Federal agency (which in the case of a river which is wholly or substantially within a national forest, shall be the Department of Agriculture) by which it is proposed the area be administered; the extent to which it is proposed that administration, including the costs thereof, be shared by State and local agencies; and the estimated cost to the United States of acquiring necessary lands and interests in land and of administering the area as a component of the system. Each such report shall be printed as a Senate or House document.

(b) Before submitting any such report to the President and the Congress, copies of the proposed report shall, unless it was prepared jointly by the Secretary of the Interior and the Secretary of Agriculture, be submitted by the Secretary of the Interior to the Secretary of Agriculture or by the Secretary of Agriculture to the Secretary of the Interior, as the case may be, and to the Secretary of the Army, the Chairman of the Federal Power Commission, the head of any other affected Federal department or agency and, unless the lands proposed to be included in the area are already owned by the United States or have already been authorized for acquisition by Act of Congress, the Governor of the State or States in which they are located or an officer designated by the Governor to receive the same. Any recommendations or comments on the proposal which the said officials furnish the Secretary or Secretaries who prepared the report within ninety days of the date on which the report is submitted to them, together with the Secretary's or Secretaries' comments thereon, shall be included with the transmittal to the President and the Congress. No river or portion of any river shall be added to the national wild and scenic rivers system subsequent to enactment of this Act until the close of the next full session of the State legislature, or legislatures in case more than one

Publication in Federal Register.

82 STAT. 908

82 STAT. 909

Publication in Federal Register.

Potential additions. Designation.

Report, maps, etc.

Printing as Senate or House document.

82 STAT. 910

State is involved, which begins following the submission of any recommendation to the President with respect to such addition as herein provided.

(c) Before approving or disapproving for inclusion in the national wild and scenic rivers system any river designated as a wild, scenic or recreational river by or pursuant to an act of a State legislature, the Secretary of the Interior shall submit the proposal to the Secretary of Agriculture, the Secretary of the Army, the Chairman of the Federal Power Commission, and the head of any other affected Federal department or agency and shall evaluate and give due weight to any recommendations or comments which the said officials furnish him within ninety days of the date on which it is submitted to them. If he approves the proposed inclusion, he shall publish notice thereof in the Federal Register.

Sec. 5. (a) The following rivers are hereby designated for potential addition to the national wild and scenic rivers system:

- (1) Allegheny, Pennsylvania: The segment from its mouth to the town of East Brady, Pennsylvania.
- (2) Bruneau, Idaho: The entire main stem.
- (3) Buffalo, Tennessee: The entire river.
- (4) Chattooga, North Carolina, South Carolina, and Georgia: The entire river.
- (5) Clarion, Pennsylvania: The segment between Ridgway and its confluence with the Allegheny River.
- (6) Delaware, Pennsylvania and New York: The segment from Hancock, New York, to Matamoras, Pennsylvania.
- (7) Flathead, Montana: The North Fork from the Canadian border downstream to its confluence with the Middle Fork; the Middle Fork from its headwaters to its confluence with the South Fork; and the South Fork from its origin to Hungry Horse Reservoir.
- (8) Gasconade, Missouri: The entire river.
- (9) Illinois, Oregon: The entire river.
- (10) Little Beaver, Ohio: The segment of the North and Middle Forks of the Little Beaver River in Columbiana County from a point in the vicinity of Negly and Elkton, Ohio, downstream to a point in the vicinity of East Liverpool, Ohio.
- (11) Little Miami, Ohio: That segment of the main stem of the river, exclusive of its tributaries, from a point at the Warren-Clermont County line at Loveland, Ohio, upstream to the sources of Little Miami including North Fork.
- (12) Maumee, Ohio and Indiana: The main stem from Perrysburg, Ohio, to Fort Wayne, Indiana, exclusive of its tributaries in Ohio and inclusive of its tributaries in Indiana.
- (13) Missouri, Montana: The segment between Fort Benton and Ryan Island.
- (14) Moyie, Idaho: The segment from the Canadian border to its confluence with the Kootenai River.
- (15) Obed, Tennessee: The entire river and its tributaries, Clear Creek and Daddys Creek.
- (16) Penobscot, Maine: Its east and west branches.
- (17) Pere Marquette, Michigan: The entire river.
- (18) Pine Creek, Pennsylvania: The segment from Ansonia to Waterville.
- (19) Priest, Idaho: The entire main stem.
- (20) Rio Grande, Texas: The portion of the river between the west boundary of Hudspeth County and the east boundary of Terrell County on the United States side of the river: *Provided*, That before undertaking any study of this potential scenic river, the Secretary of the Interior shall determine, through the channels of appropriate

executive agencies, that Mexico has no objection to its being included among the studies authorized by this Act.

(21) Saint Croix, Minnesota and Wisconsin: The segment between the dam near Taylors Falls and its confluence with the Mississippi River.

(22) Saint Joe, Idaho: The entire main stem.

(23) Salmon, Idaho: The segment from the town of North Fork to its confluence with the Snake River.

(24) Skagit, Washington: The segment from the town of Mount Vernon to and including the mouth of Bacon Creek; the Cascade River between its mouth and the junction of its North and South Forks; the South Fork to the boundary of the Glacier Peak Wilderness Area; the Suittle River from its mouth to the Glacier Peak Wilderness Area boundary at Milk Creek; the Sauk River from its mouth to its junction with Elliott Creek; the North Fork of the Sauk River from its junction with the South Fork of the Sauk to the Glacier Peak Wilderness Area boundary.

(25) Suwannee, Georgia and Florida: The entire river from its source in the Okefenokee Swamp in Georgia to the gulf and the outlying Ichetucknee Springs, Florida.

(26) Upper Iowa, Iowa: The entire river.

(27) Youghiogheny, Maryland and Pennsylvania: The segment from Oakland, Maryland, to the Youghiogheny Reservoir, and from the Youghiogheny Dam downstream to the town of Connellsville, Pennsylvania.

(b) The Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture shall proceed as expeditiously as possible to study each of the rivers named in subsection (a) of this section in order to determine whether it should be included in the national wild and scenic rivers system. Such studies shall be completed and reports made thereon to the President and the Congress, as provided in section 4 of this Act, within ten years from the date of this Act: *Provided, however*, That with respect to the Suwannee River, Georgia and Florida, and the Upper Iowa River, Iowa, such study shall be completed and reports made thereon to the President and the Congress, as provided in section 4 of this Act, within two years from the date of enactment of this Act. In conducting these studies the Secretary of the Interior and the Secretary of Agriculture shall give priority to those rivers with respect to which there is the greatest likelihood of developments which, if undertaken, would render them unsuitable for inclusion in the national wild and scenic rivers system.

(c) The study of any of said rivers shall be pursued in as close cooperation with appropriate agencies of the affected State and its political subdivisions as possible, shall be carried on jointly with such agencies if request for such joint study is made by the State, and shall include a determination of the degree to which the State or its political subdivisions might participate in the preservation and administration of the river should it be proposed for inclusion in the national wild and scenic rivers system.

(d) In all planning for the use and development of water and related land resources, consideration shall be given by all Federal agencies involved to potential national wild, scenic and recreational river areas, and all river basin and project plan reports submitted to the Congress shall consider and discuss any such potentials. The Secretary of the Interior and the Secretary of Agriculture shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas within the United States shall be evaluated in planning reports by all Federal agencies as potential alternative uses of the water and related land resources involved.

Land acquisition. SEC. 6. (a) The Secretary of the Interior and the Secretary of Agriculture are each authorized to acquire lands and interests in land within the authorized boundaries of any component of the national wild and scenic rivers system designated in section 3 of this Act, or hereafter designated for inclusion in the system by Act of Congress, which is administered by him, but he shall not acquire fee title to an average of more than 100 acres per mile on both sides of the river. Lands owned by a State may be acquired only by donation, and lands owned by an Indian tribe or a political subdivision of a State may not be acquired without the consent of the appropriate governing body thereof as long as the Indian tribe or political subdivision is following a plan for management and protection of the lands which the Secretary finds protects the land and assures its use for purposes consistent with this Act. Money appropriated for Federal purposes from the land and water conservation fund shall, without prejudice to the use of appropriations from other sources, be available to Federal departments and agencies for the acquisition of property for the purposes of this Act.

(b) If 50 per centum or more of the entire acreage within a federally administered wild, scenic or recreational river area is owned by the United States, by the State or States within which it lies, or by political subdivisions of those States, neither Secretary shall acquire fee title to any lands by condemnation under authority of this Act. Nothing contained in this section, however, shall preclude the use of condemnation when necessary to clear title or to acquire scenic easements or such other easements as are reasonably necessary to give the public access to the river and to permit its members to traverse the length of the area or of selected segments thereof.

(c) Neither the Secretary of the Interior nor the Secretary of Agriculture may acquire lands by condemnation, for the purpose of including such lands in any national wild, scenic or recreational river area, if such lands are located within any incorporated city, village, or borough which has in force and applicable to such lands a duly adopted, valid zoning ordinance that conforms with the purposes of this Act. In order to carry out the provisions of this subsection the appropriate Secretary shall issue guidelines, specifying standards for local zoning ordinances, which are consistent with the purposes of this Act. The standards specified in such guidelines shall have the object of (A) prohibiting new commercial or industrial uses other than commercial or industrial uses which are consistent with the purposes of this Act, and (B) the protection of the bank lands by means of acreage, frontage, and setback requirements on development.

(d) The appropriate Secretary is authorized to accept title to non-Federal property within the authorized boundaries of any federally administered component of the national wild and scenic rivers system designated in section 3 of this Act or hereafter designated for inclusion in the system by Act of Congress and, in exchange therefor, convey to the grantor any federally owned property which is under his jurisdiction within the State in which the component lies and which he classifies as suitable for exchange or other disposal. The values of the properties so exchanged either shall be approximately equal or, if they are not approximately equal, shall be equalized by the payment of cash to the grantor or to the Secretary as the circumstances require.

(e) The head of any Federal department or agency having administrative jurisdiction over any lands or interests in land within the authorized boundaries of any federally administered component of the national wild and scenic rivers system designated in section 3 of this Act or hereafter designated for inclusion in the system by Act of Congress is authorized to transfer to the appropriate secretary jurisdic-

tion over such lands for administration in accordance with the provisions of this Act. Lands acquired by or transferred to the Secretary of Agriculture for the purposes of this Act within or adjacent to a national forest shall upon such acquisition or transfer become national forest lands.

(f) The appropriate Secretary is authorized to accept donations of lands and interests in land, funds, and other property for use in connection with his administration of the national wild and scenic rivers system.

(g) (1) Any owner or owners (hereinafter in this subsection referred to as "owner") of improved property on the date of its acquisition, may retain for themselves and their successors or assigns a right of use and occupancy of the improved property for noncommercial residential purposes for a definite term not to exceed twenty-five years or, in lieu thereof, for a term ending at the death of the owner, or the death of his spouse, or the death of either or both of them. The owner shall elect the term to be reserved. The appropriate Secretary shall pay to the owner the fair market value of the property on the date of such acquisition less the fair market value on such date of the right retained by the owner.

(2) A right of use and occupancy retained pursuant to this subsection shall be subject to termination whenever the appropriate Secretary is given reasonable cause to find that such use and occupancy is being exercised in a manner which conflicts with the purposes of this Act. In the event of such a finding, the Secretary shall tender to the holder of that right an amount equal to the fair market value of that portion of the right which remains unexpired on the date of termination. Such right of use or occupancy shall terminate by operation of law upon tender of the fair market price.

(3) The term "improved property", as used in this Act, means a detached, one-family dwelling (hereinafter referred to as "dwelling"), the construction of which was begun before January 1, 1967, together with so much of the land on which the dwelling is situated, the said land being in the same ownership as the dwelling, as the appropriate Secretary shall designate to be reasonably necessary for the enjoyment of the dwelling for the sole purpose of noncommercial residential use, together with any structures accessory to the dwelling which are situated on the land so designated.

Sec. 7. (a) The Federal Power Commission shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act (41 Stat. 1063), as amended (16 U.S.C. 791a et seq.), on or directly affecting any river which is designated in section 3 of this Act as a component of the national wild and scenic rivers system or which is hereafter designated for inclusion in that system, and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration. Nothing contained in the foregoing sentence, however, shall preclude licensing of, or assistance to, developments below or above a wild, scenic or recreational river area or on any stream tributary thereto which will not invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area on the date of approval of this Act. No department or agency of the United States shall recommend authorization of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration, or request appropriations to begin

Right of use and occupancy.

"Improved property."

Water resources projects. Restrictions.

construction of any such project, whether heretofore or hereafter authorized, without advising the Secretary of the Interior or the Secretary of Agriculture, as the case may be, in writing of its intention so to do at least sixty days in advance, and without specifically reporting to the Congress in writing at the time it makes its recommendation or request in what respect construction of such project would be in conflict with the purposes of this Act and would affect the component and the values to be protected by it under this Act.

(b) The Federal Power Commission shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act, as amended, on or directly affecting any river which is listed in section 5, subsection (a), of this Act, and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river might be designated, as determined by the Secretary responsible for its study or approval—

(i) during the five-year period following enactment of this Act unless, prior to the expiration of said period, the Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture, on the basis of study, conclude that such river should not be included in the national wild and scenic rivers system and publish notice to that effect in the Federal Register, and

(ii) during such additional period thereafter as, in the case of any river which is recommended to the President and the Congress for inclusion in the national wild and scenic rivers system, is necessary for congressional consideration thereof or, in the case of any river recommended to the Secretary of the Interior for inclusion in the national wild and scenic rivers system under section 2(a)(ii) of this Act, is necessary for the Secretary's consideration thereof, which additional period, however, shall not exceed three years in the first case and one year in the second.

Nothing contained in the foregoing sentence, however, shall preclude licensing of, or assistance to, developments below or above a potential wild, scenic or recreational river area or on any stream tributary thereto which will not invade the area or diminish the scenic, recreational, and fish and wildlife values present in the potential wild, scenic or recreational river area on the date of approval of this Act. No department or agency of the United States shall, during the periods hereinbefore specified, recommend authorization of any water resources project on any such river or request appropriations to begin construction of any such project, whether heretofore or hereafter authorized, without advising the Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture in writing of its intention so to do at least sixty days in advance of doing so and without specifically reporting to the Congress in writing at the time it makes its recommendation or request in what respect construction of such project would be in conflict with the purposes of this Act and would affect the component and the values to be protected by it under this Act.

(c) The Federal Power Commission and all other Federal agencies shall, promptly upon enactment of this Act, inform the Secretary of the Interior and, where national forest lands are involved, the Secretary of Agriculture, of any proceedings, studies, or other activities within their jurisdiction which are now in progress and which affect or may affect any of the rivers specified in section 5, subsection (a), of this Act. They shall likewise inform him of any such proceedings, studies, or other activities which are hereafter commenced or resumed before they are commenced or resumed.

49 Stat. 863. 16 USC 791a.

Publication in Federal Register.

(d) Nothing in this section with respect to the making of a loan or grant shall apply to grants made under the Land and Water Conservation Fund Act of 1965 (78 Stat. 897; 16 U.S.C. 4601-5 et seq.).

SEC. 8. (a) All public lands within the authorized boundaries of any component of the national wild and scenic rivers system which is designated in section 3 of this Act or which is hereafter designated for inclusion in that system are hereby withdrawn from entry, sale, or other disposition under the public land laws of the United States.

(b) All public lands which constitute the bed or bank, or are within one-quarter mile of the bank, of any river which is listed in section 5, subsection (a), of this Act are hereby withdrawn from entry, sale, or other disposition under the public land laws of the United States for the periods specified in section 7, subsection (b), of this Act.

SEC. 9. (a) Nothing in this Act shall affect the applicability of the United States mining and mineral leasing laws within components of the national wild and scenic rivers system except that—

Mining and mineral leasing laws.

(i) all prospecting, mining operations, and other activities on mining claims which, in the case of a component of the system designated in section 3 of this Act, have not heretofore been perfected or which, in the case of a component hereafter designated pursuant to this Act or any other Act of Congress, are not perfected before its inclusion in the system and all mining operations and other activities under a mineral lease, license, or permit issued or renewed after inclusion of a component in the system shall be subject to such regulations as the Secretary of the Interior or, in the case of national forest lands, the Secretary of Agriculture may prescribe to effectuate the purposes of this Act;

(ii) subject to valid existing rights, the perfection of, or issuance of a patent to, any mining claim affecting lands within the system shall confer or convey a right or title only to the mineral deposits and such rights only to the use of the surface and the surface resources as are reasonably required to carrying on prospecting or mining operations and are consistent with such regulations as may be prescribed by the Secretary of the Interior or, in the case of national forest lands, by the Secretary of Agriculture; and

(iii) subject to valid existing rights, the minerals in Federal lands which are part of the system and constitute the bed or bank or are situated within one-quarter mile of the bank of any river designated a wild river under this Act or any subsequent Act are hereby withdrawn from all forms of appropriation under the mining laws and from operation of the mineral leasing laws including, in both cases, amendments thereto.

Regulations issued pursuant to paragraphs (i) and (ii) of this subsection shall, among other things, provide safeguards against pollution of the river involved and unnecessary impairment of the scenery within the component in question.

(b) The minerals in any Federal lands which constitute the bed or bank or are situated within one-quarter mile of the bank of any river which is listed in section 5, subsection (a) of this Act are hereby withdrawn from all forms of appropriation under the mining laws during the periods specified in section 7, subsection (b) of this Act. Nothing contained in this subsection shall be construed to forbid prospecting or the issuance or leases, licenses, and permits under the mineral leasing laws subject to such conditions as the Secretary of the Interior and, in the case of national forest lands, the Secretary of Agriculture find appropriate to safeguard the area in the event it is subsequently included in the system.

Administration.

SEC. 10. (a) Each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its esthetic, scenic, historic, archeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area.

(b) Any portion of a component of the national wild and scenic rivers system that is within the national wilderness preservation system, as established by or pursuant to the Act of September 3, 1964 (78 Stat. 890; 16 U.S.C., ch. 23), shall be subject to the provisions of both the Wilderness Act and this Act with respect to preservation of such river and its immediate environment, and in case of conflict between the provisions of these Acts the more restrictive provisions shall apply.

(c) Any component of the national wild and scenic rivers system that is administered by the Secretary of the Interior through the National Park Service shall become a part of the national park system, and any such component that is administered by the Secretary through the Fish and Wildlife Service shall become a part of the national wildlife refuge system. The lands involved shall be subject to the provisions of this Act and the Acts under which the national park system or national wildlife system, as the case may be, is administered, and in case of conflict between the provisions of these Acts, the more restrictive provisions shall apply. The Secretary of the Interior, in his administration of any component of the national wild and scenic rivers system, may utilize such general statutory authorities relating to areas of the national park system and such general statutory authorities otherwise available to him for recreation and preservation purposes and for the conservation and management of natural resources as he deems appropriate to carry out the purposes of this Act.

(d) The Secretary of Agriculture, in his administration of any component of the national wild and scenic rivers system area, may utilize the general statutory authorities relating to the national forests in such manner as he deems appropriate to carry out the purposes of this Act.

Cooperative agreements with State or local governments.

(e) The Federal agency charged with the administration of any component of the national wild and scenic rivers system may enter into written cooperative agreements with the Governor of a State, the head of any State agency, or the appropriate official of a political subdivision of a State for State or local governmental participation in the administration of the component. The States and their political subdivisions shall be encouraged to cooperate in the planning and administration of components of the system which include or adjoin State- or county-owned lands.

Assistance in financing State and local projects.

16 USC 4601-4 note.

16 USC 4601-4601-3.

SEC. 11. (a) The Secretary of the Interior shall encourage and assist the States to consider, in formulating and carrying out their comprehensive statewide outdoor recreation plans and proposals for financing assistance for State and local projects submitted pursuant to the Land and Water Conservation Fund Act of 1965 (78 Stat. 897), needs and opportunities for establishing State and local wild, scenic and recreational river areas. He shall also, in accordance with the authority contained in the Act of May 28, 1963 (77 Stat. 49), provide technical assistance and advice to, and cooperate with, States, political subdivisions, and private interests, including nonprofit organizations, with respect to establishing such wild, scenic and recreational river areas.

(b) The Secretaries of Agriculture and of Health, Education, and Welfare shall likewise, in accordance with the authority vested in them, assist, advise, and cooperate with State and local agencies and private interests with respect to establishing such wild, scenic and recreational river areas.

Sec. 12. (a) The Secretary of the Interior, the Secretary of Agriculture, and heads of other Federal agencies shall review administrative and management policies, regulations, contracts, and plans affecting lands under their respective jurisdictions which include, border upon, or are adjacent to the rivers listed in subsection (a) of section 5 of this Act in order to determine what actions should be taken to protect such rivers during the period they are being considered for potential addition to the national wild and scenic rivers system. Particular attention shall be given to scheduled timber harvesting, road construction, and similar activities which might be contrary to the purposes of this Act.

(b) Nothing in this section shall be construed to abrogate any existing rights, privileges, or contracts affecting Federal lands held by any private party without the consent of said party.

(c) The head of any agency administering a component of the national wild and scenic rivers system shall cooperate with the Secretary of the Interior and with the appropriate State water pollution control agencies for the purpose of eliminating or diminishing the pollution of waters of the river.

Sec. 13. (a) Nothing in this Act shall affect the jurisdiction or responsibilities of the States with respect to fish and wildlife. Hunting and fishing shall be permitted on lands and waters administered as parts of the system under applicable State and Federal laws and regulations unless, in the case of hunting, those lands or waters are within a national park or monument. The administering Secretary may, however, designate zones where, and establish periods when, no hunting is permitted for reasons of public safety, administration, or public use and enjoyment and shall issue appropriate regulations after consultation with the wildlife agency of the State or States affected.

(b) The jurisdiction of the States and the United States over waters of any stream included in a national wild, scenic or recreational river area shall be determined by established principles of law. Under the provisions of this Act, any taking by the United States of a water right which is vested under either State or Federal law at the time such river is included in the national wild and scenic rivers system shall entitle the owner thereof to just compensation. Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to exemption from State water laws.

(c) Designation of any stream or portion thereof as a national wild, scenic or recreational river area shall not be construed as a reservation of the waters of such streams for purposes other than those specified in this Act, or in quantities greater than necessary to accomplish these purposes.

(d) The jurisdiction of the States over waters of any stream included in a national wild, scenic or recreational river area shall be unaffected by this Act to the extent that such jurisdiction may be exercised without impairing the purposes of this Act or its administration.

(e) Nothing contained in this Act shall be construed to alter, amend, repeal, interpret, modify, or be in conflict with any interstate compact made by any States which contain any portion of the national wild and scenic rivers system.

(f) Nothing in this Act shall affect existing rights of any State, including the right of access, with respect to the beds of navigable streams, tributaries, or rivers (or segments thereof) located in a national wild, scenic or recreational river area.

Administration  
and management  
policies.  
Review.

Fish and wild-  
life.  
Jurisdiction  
under State  
and Federal  
laws.

Compensation  
for water  
rights.

82 STAT. 917

82 STAT. 918

Easements and  
rights-of-way.

Claim and allow-  
ance as chari-  
table contri-  
bution or gift.  
76 Stat. 1034.  
68A Stat. 410.

Definitions.

Appropriations.

(g) The Secretary of the Interior or the Secretary of Agriculture, as the case may be, may grant easements and rights-of-way upon, over, under, across, or through any component of the national wild and scenic rivers system in accordance with the laws applicable to the national park system and the national forest system, respectively: *Provided*, That any conditions precedent to granting such easements and rights-of-way shall be related to the policy and purpose of this Act.

Sec. 14. The claim and allowance of the value of an easement as a charitable contribution under section 170 of title 26, United States Code, or as a gift under section 2522 of said title shall constitute an agreement by the donor on behalf of himself, his heirs, and assigns that, if the terms of the instrument creating the easement are violated, the donee or the United States may acquire the servient estate at its fair market value as of the time the easement was donated minus the value of the easement claimed and allowed as a charitable contribution or gift.

Sec. 15. As used in this Act, the term—

(a) "River" means a flowing body of water or estuary or a section, portion, or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes.

(b) "Free-flowing", as applied to any river or section of a river, means existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence, however, of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion: *Provided*, That this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the national wild and scenic rivers system.

(c) "Scenic easement" means the right to control the use of land (including the air space above such land) for the purpose of protecting the scenic view from the river, but such control shall not affect, without the owner's consent, any regular use exercised prior to the acquisition of the easement.

Sec. 16. There are hereby authorized to be appropriated such sums as may be necessary, but not more than \$17,000,000, for the acquisition of lands and interests in land under the provisions of this Act.

Approved October 2, 1968.

#### LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 1623 accompanying H. R. 18260 (Comm. on Interior & Insular Affairs) and No. 1917 (Comm. of Conference).

SENATE REPORT No. 491 (Comm. on Interior & Insular Affairs).

#### CONGRESSIONAL RECORD:

Vol. 113 (1967): Aug. 8, considered and passed Senate.

Vol. 114 (1968): July 15, Sept. 12, considered and passed House, amended, in lieu of H. R. 18260.

Sept. 25, House agreed to conference report.

Sept. 26, Senate agreed to conference report.





GUIDELINES FOR EVALUATING WILD,  
SCENIC AND RECREATIONAL RIVER  
AREAS PROPOSED FOR INCLUSION IN  
THE NATIONAL WILD AND SCENIC  
RIVERS SYSTEM UNDER SECTION 2,  
PUBLIC LAW 90-542.

PURPOSE

The following criteria supplement those listed in Section 2 of the Wild and Scenic Rivers Act, which states that rivers included in the National Wild and Scenic Rivers System shall be free-flowing streams which possess outstandingly remarkable scenic, recreational, geological, fish and wildlife, historic, cultural and other similar values.

These guidelines are intended to define minimum criteria for the classification and management of free-flowing river areas proposed for inclusion in the national system by the Secretary of the Interior or the Secretary of Agriculture, and for State rivers included in the system by the Secretary of the Interior.

In reading these guidelines and in applying them to real situations of land and water it is important to bear one important qualification in mind. There is no way for these statements of criteria to be written so as to mechanically or automatically indicate which rivers are eligible and what class they must be. It is important to understand each criterion; but it is perhaps even more important to understand their collective intent. The investigator has to exercise his judgment, not only on the specific criteria as they apply to a particular river, but on the river as a whole, and on their relative weights. For this reason, these guidelines are not absolutes. There may be extenuating circumstances which would lead the appropriate Secretary to recommend, or approve pursuant to Section 2(a)(ii), a river area for inclusion in the system because it is exceptional in character and outstandingly remarkable even though it does not meet each of the criteria set forth in these guidelines. However, exceptions to these criteria should be recognized only in rare instances and for compelling reasons.

The three classes of river areas described in Section 2(b) of the Wild and Scenic Rivers Act are as follows:

- "(1) Wild river areas--Those rivers 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 in places by roads.

"(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."

#### GENERAL CHARACTERISTICS

The Wild and Scenic Rivers Act, Section 10(a), states that, "Each component of the national wild and scenic rivers system shall be administered in such manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration primary emphasis shall be given to protecting its esthetic, scenic, historic, archeologic, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

In order to qualify for inclusion in the national system, a State free-flowing river area must be designated as a wild, scenic, or recreational river by act of the State legislature, with land areas wholly and permanently administered in a manner consistent with the designation by any agency or political subdivision of the State at no cost to the Federal Government, and be approved by the Secretary of the Interior as meeting the criteria established by the Wild and Scenic Rivers Act and the guidelines contained herein. A river or related lands owned by an Indian tribe cannot be added to the national system without the consent of the appropriate governing body.

In evaluating a river for possible inclusion in the system or for determining its classification, the river and its immediate land area should be considered as a unit, with primary emphasis upon the quality of the experience and overall impressions of the recreationist using the river or the adjacent riverbank. Although a free-flowing river or river unit frequently will have more than one classified area, each wild, scenic, or recreational area must be long enough to provide a meaningful experience. The number of different classified areas within a unit should be kept to a minimum.

Any activity, use, or development which is acceptable for a wild river is also acceptable for scenic and recreational river areas, and that which is acceptable for a scenic river is acceptable for a recreation river area. Activity and development limitations discussed below should not necessarily be interpreted as the desired level to which development or management activity should be planned. Hunting and fishing will be permitted, subject to appropriate State and Federal laws.

- The Wild and Scenic Rivers Act provides that rivers must be in a free-flowing natural condition, i.e., a flowing body of water or estuary or a section, portion, or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes which are without impoundment, diversion, straightening, rip-rapping or other modification of the waterway. However, low dams, diversion works, and other minor structures will not automatically preclude the river unit from being included in the National Wild and Scenic Rivers System, providing such structures do not unreasonably diminish the free-flowing nature of the stream and the scenic, scientific, geological, historical, cultural, recreational, and fish and wildlife values present in the area.

- The river or river unit must be long enough to provide a meaningful experience. Generally, any unit included in the system should be at least 25 miles long. However, a shorter river or segment that possesses outstanding qualifications may be included in the system.

- There should be sufficient volume of water during normal years to permit, during the recreation season, full enjoyment of water-related outdoor recreation activities general-

ly associated with comparable rivers. In the event the existing supply of water is inadequate, it would be necessary to show that additional water can be provided reasonably and economically without unreasonably diminishing the scenic, recreational, and fish and wildlife values of the area.

● The river and its environment should be outstandingly remarkable and, although they may reflect substantial evidence of man's activity, should be generally pleasing to the eye.

● The river should be of high quality water or susceptible of restoration to that condition. A concept of nondegradation whereby existing high water quality will be maintained to the maximum extent feasible will be followed in all river areas included in the national system.

All rivers included in the national system should meet the "Aesthetics--General Criteria" as defined by the National Technical Advisory Committee on Water Quality in the Federal Water Pollution Control Administration's Water Quality Criteria, April 1, 1968. Water quality should meet the criteria for fish, other aquatic life, and wildlife, as defined in that document, so as to support the propagation of those forms of life which normally would be adapted to the habitat of the stream. Where no standards exist or where existing standards will not meet the objectives of these criteria, standards should be developed or raised to achieve those objectives. Wild river areas can be included in the national system only if they also meet the minimum criteria for primary contact recreation, except as these criteria might be exceeded by natural background conditions. Scenic or recreation river areas which qualify for inclusion in the system in all respects except for water quality may be added to the system provided adequate and reasonable assurance is given by the appropriate Federal or State authority that the water quality can and will be upgraded to the prescribed level for the desired types of recreation, and support aquatic life which normally would be adapted to the habitat of the stream at the prescribed level of water quality. At such time as water quality fully meets the criteria, it may be desirable to change the classification of a river.

● New public utility transmission lines, gas lines, water

lines, etc., in river areas being considered for inclusion in the national system are discouraged. However, where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are indicated, the scenic, recreational, and fish and wildlife values must be evaluated in the selection of the site in accordance with the general guidelines described in the Report of the Working Committee on Utilities prepared for the President's Council on Recreation and Natural Beauty, December 1968.

● Mineral activity subject to regulations under the Act must be conducted in a manner that minimizes surface disturbance, sedimentation and pollution, and visual impairment. Specific controls will be developed as a part of each management plan.

#### CRITERIA FOR RIVER DESIGNATION

The following criteria for classification, designation, and administration of river areas are prescribed by the Act. These criteria are not absolutes, nor can they readily be defined quantitatively. In a given river, a departure from these standards might be more than compensated by other qualities. However, if several "exceptions" are necessary in order for a river to be classified as wild, it probably should be classified as scenic. If several "exceptions" are necessary in order for a river to be classified as scenic, it probably should be classified as recreational.

#### Wild River Areas

The Wild and Scenic Rivers Act states that "these represent vestiges of primitive America," and they possess these attributes:

1. "Free of impoundments"
2. "Generally inaccessible except by trail"
3. "Watersheds or shorelines essentially primitive"
4. "Waters unpolluted"

● Classification criteria.

Despite some obvious similarities, the "wildness" associated with a wild river area is not synonymous with the "wildness"

involved in wilderness classification under the Wilderness Act of 1964. One major distinction, in contrast to wilderness, is that a wild river area also may contain recreation facilities for the convenience of the user in keeping with the primitive setting.

1. An "impoundment" is a slack water pool formed by any man-made structure. Except in rare instances in which esthetic and recreational characteristics are of such outstanding quality as to counterbalance the disruptive nature of an impoundment, such features will not be allowed on wild river areas. Future construction of such structures that would have a direct and adverse effect on the values for which that river area was included in the national system, as determined by the Secretary charged with the administration of the area, would not be permitted. In the case of rivers added to the national system pursuant to Sec.2(a)(ii), such construction could result in a determination by the Secretary of the Interior to reclassify or withdraw the affected river area from the system.

2. "Generally inaccessible" means there are no roads or other provisions for overland motorized travel within a narrow, incised river valley, or if the river valley is broad, within 1/4 mile of the riverbank. The presence, however, of one or two inconspicuous roads leading to the river area will not necessarily bar wild river classification.

3. "Essentially primitive" means the shorelines are free of habitation and other substantial evidence of man's intrusion. This would include such things as diversions, straightening, rip-rapping, and other modifications of the waterway. These would not be permitted except in instances where such developments would not have a direct and adverse effect on the values for which that river area was included in the national system as determined by the Secretary charged with the administration of the area. In the case of rivers added to the national system pursuant to Section 2(a)(ii), such construction could result in a determination by the Secretary of the Interior to reclassify or withdraw the affected river area from the system. With respect to watersheds, "essentially primitive" means that the portion of the watershed within the boundaries has a natural-like appearance. As with shorelines, developments within the boundaries should emphasize a natural-

like appearance so that the entire river area remains a vestige of primitive America. For the purposes of this Act, a limited amount of domestic livestock grazing and pasture land and cropland devoted to the production of hay may be considered "essentially primitive." One or two inconspicuous dwellings need not necessarily bar wild river classification.

4. "Unpolluted" means the water quality of the river at least meets the minimum criteria for primary contact recreation, except where exceeded by natural background conditions, and esthetics as interpreted in the Federal Water Pollution Control Administration's Water Quality Criteria, April 1, 1968. In addition, the water presently must be capable of supporting the propagation of aquatic life, including fish, which normally would be adapted to the habitat of the stream. Where no standards exist or where existing standards will not meet the objectives of these criteria, standards should be developed or raised to achieve those objectives.

● Management objectives.

The administration of a wild river area shall give primary emphasis to protecting the values which make it outstandingly remarkable while providing river-related outdoor recreation opportunities in a primitive setting.

To achieve these objectives in wild river areas, it will be necessary to:

1. Restrict or prohibit motorized land travel, except where such uses are not in conflict with the purposes of the Act.
2. Acquire and remove detracting habitations and other non-harmonious improvements.
3. Locate major public-use areas, such as large campgrounds, interpretive centers or administrative headquarters, outside the wild river area. Simple comfort and convenience facilities, such as fireplaces, shelters, and toilets, may be provided for recreation users as necessary to provide an enjoyable experience, protect popular sites, and meet the management objectives. Such facilities will be of a design and

location which harmonize with the surroundings.

4. Prohibit improvements or new structures unless they are clearly in keeping with the overall objectives of the wild river area classification and management. The design for any permitted construction must be in conformance with the approved management plan for that area. Additional habitations or substantial additions to existing habitations will not be permitted.
5. Implement management practices which might include construction of minor structures for such purposes as improvement of fish and game habitat; grazing; protection from fire, insects, or disease; rehabilitation or stabilization of damaged resources, provided the area will remain natural appearing and the practices or structures will harmonize with the environment. Such things as trail bridges, an occasional fence, natural-appearing water diversions, ditches, flow measurement or other water management devices, and similar facilities may be permitted if they are unobtrusive and do not have a significant direct and adverse effect on the natural character of the area.

#### Scenic River Areas

The Wild and Scenic Rivers Act states that scenic rivers:

1. Are "free of impoundments".
2. Are "accessible in places by road"
3. Have "shorelines or watersheds still largely primitive and shorelines largely undeveloped"

#### ● Classification criteria.

1. An "impoundment" is a slack water pool formed by any man-made structure. Except in rare instances in which esthetic and recreational characteristics are of such outstanding quality as to counterbalance the disruptive nature of an impoundment, such features will not be allowed on scenic river areas. Future construction of such structures that would have a direct and adverse effect on the values for which that river area was included in the national system as determined by the Secretary charged with the administration of the area, would not be permitted. In the case of rivers added to the national

system pursuant to Section 2(a)(ii), such construction could result in a determination by the Secretary of the Interior to reclassify or withdraw the affected river area from the system.

2. "Accessible in places by road" means that roads may occasionally bridge the river area. Scenic river areas will not include long stretches of conspicuous and well-traveled roads closely paralleling the riverbank. The presence, however, of short stretches of conspicuous or longer stretches of inconspicuous and well-screened roads or screened railroads will not necessarily preclude scenic river designation. In addition to the physical and scenic relationship of the free-flowing river area to roads, consideration should be given to the type of use for which such roads were constructed and the type of use which would occur within the proposed scenic river area.

3. "Largely primitive" means that the shorelines and the immediate river environment still present an overall natural character, but that in places, land may be developed for agricultural purposes. A modest amount of diversion, straightening, rip-rapping, and other modification of the waterway would not preclude a river from being considered for classification as a scenic river. Future construction of such structures would not be permitted except in instances where such developments would not have a direct and adverse effect on the values for which that river area was included in the national system as determined by the Secretary charged with the administration of the area.

In the case of rivers added to the national system pursuant to Section 2(a)(ii), such construction could result in a determination by the Secretary of the Interior to reclassify or withdraw the affected river area from the system. "Largely primitive" with respect to watersheds means that the portion of the watershed within the boundaries of the scenic river area should be scenic, with a minimum of easily discernible development. Row crops would be considered as meeting the test of "largely primitive," as would timber harvest and other resource use, providing such activity is accomplished without a substantially adverse effect on the natural-like appearance of the river or its immediate environment.

4. "Largely undeveloped" means that small communities or any concentration of habitations must be limited to relatively short reaches of the total area under consideration for designation as a scenic river area.

● Management objectives.

A scenic river area should be managed so as to maintain and provide outdoor recreation opportunities in a near natural setting. The basic distinctions between a "wild" and a "scenic" river area are degree of development, type of land use, and road accessibility. In general, a wide range of agricultural, water management, silvicultural and other practices could be compatible with the primary objectives of a scenic river area, providing such practices are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

The same considerations enumerated for wild river areas should be considered, except that motorized vehicle use may in some cases be appropriate and that development of larger scale public-use facilities within the river area, such as moderate size campgrounds, public information centers, and administrative headquarters, would be compatible if such structures were screened from the river.

Modest facilities, such as unobtrusive marinas, also would be possible if such structures were consistent with the management plans for that area.

Recreational River Areas

The Wild and Scenic Rivers Act states that recreational rivers:

1. Are "readily accessible by road or railroad"
2. "May have some development along their shoreline"
3. May have "undergone some impoundment or diversion in the past"

● Classification criteria.

1. "Readily accessible" means the likelihood of paralleling roads or railroads on one or both banks of the river, with the possibility of several bridge crossings and numerous

river access points.

2. "Some development along their shorelines" means that lands may be developed for the full range of agricultural uses and could include small communities as well as dispersed or cluster residential developments.

3. "Undergone some impoundment or diversion in the past" means that there may be water resources developments and diversions having an environmental impact greater than that described for wild and scenic river areas. However, the degree of such development should not be to the extent that the water has the characteristics of an impoundment for any significant distance.

Future construction of impoundments, diversions, straightening, rip-rapping, and other modification of the waterway or adjacent lands would not be permitted except in instances where such developments would not have a direct and adverse effect on the values for which that river area was included in the national system as determined by the Secretary charged with the administration of the area. In the case of rivers added to the national system pursuant to Section 2(a)(ii), such construction could result in a determination by the Secretary of the Interior to reclassify or withdraw the affected river area from the system.

● Management objectives.

Management of recreational river areas should be designed to protect and enhance existing recreational values. The primary objectives will be to provide opportunities for engaging in recreation activities dependent on or enhanced by the largely free-flowing nature of the river.

Campgrounds and picnic areas may be established in close proximity to the river, although recreational river classification does not require extensive recreational developments. Recreational facilities may still be kept to a minimum, with visitor services provided outside the river area.

Adopted:

*Harrison Loesch* 2-2-70  
Department of the Interior (Date)

*Edward P. Cliff* 2-3-70  
Department of Agriculture (Date)

## SUMMARY 1/

Attributes and management objectives of the three river classifications for inclusion in the National Wild and Scenic River System

	Wild	Scenic	Recreation
Attributes	<p>1. Free-flowing. Low dams, diversion works or other minor structures which do not inundate the natural riverbank may not bar consideration as wild. Future construction restricted.</p> <p>2. Generally inaccessible by road. One or two inconspicuous roads to the area may be permissible.</p> <p>3. Shorelines essentially primitive. One or two inconspicuous dwellings and land devoted to production of hay may be permitted. Watershed natural-like in appearance.</p> <p>4. Water quality meets minimum criteria for primary contact recreation except where such criteria would be exceeded by natural background conditions and esthetics 2/ and capable of supporting propagation of aquatic life normally adapted to habitat of the stream.</p>	<p>1. Free-flowing. Low dams, diversion works or other minor structures which do not inundate the natural riverbank may not bar consideration. Future construction restricted.</p> <p>2. Accessible by roads which may occasionally bridge the river area. Short stretches of conspicuous or longer stretches of inconspicuous and well-screened roads or railroads paralleling river area may be permitted.</p> <p>3. Shoreline largely primitive. Small communities limited to short reaches of total area. Agricultural practices which do not adversely affect river area may be permitted.</p> <p>4. Water quality should meet minimum criteria for desired types of recreation except where such criteria would be exceeded by natural background conditions and esthetics 2/ and capable of supporting propagation of aquatic life normally adapted to habitat of the stream, or is capable of and is being restored to that quality.</p>	<p>1. May have undergone some impoundment or diversion in the past. Water should not have characteristics of an impoundment for any significant distance. Future construction restricted.</p> <p>2. Readily accessible, with likelihood of paralleling roads or railroads along river banks and bridge crossings.</p> <p>3. Shoreline may be extensively developed.</p> <p>4. Water quality should meet minimum criteria for desired types of recreation except where such criteria would be exceeded by natural background conditions and esthetics 2/ and capable of supporting propagation of aquatic life normally adapted to habitat of the stream or is capable of and is being restored to that quality.</p>
Management objectives	<p>1. Limited motorized land travel in area.</p> <p>2. No unharmonious or new habitations or improvements permitted.</p> <p>3. Only primitive-type public use provided.</p> <p>4. New structures and improvement of old ones prohibited if not in keeping with overall objectives.</p> <p>5. Unobtrusive fences, gauging stations and other management facilities may be permitted if no significant adverse effect on natural character of area.</p> <p>6. Limited range of agriculture and other resource uses permitted.</p>	<p>1. Motorized vehicles allowed on land area.</p> <p>2. No unharmonious improvements and few habitations permitted.</p> <p>3. Limited modern screened public use facilities permitted, i. e. campgrounds, visitor centers, etc.</p> <p>4. Some new facilities allowed, such as unobtrusive marinas.</p> <p>5. Unobtrusive fences, gauging stations and other management facilities may be permitted if no significant adverse effect on natural character of area.</p> <p>6. Wide range of agriculture and other resource uses may be permitted.</p>	<p>1. Optimum accessibility by motorized vehicle.</p> <p>2. May be densely settled in places.</p> <p>3. Public use areas may be in close proximity to river.</p> <p>4. New structures allowed for both habitation and for intensive recreation use.</p> <p>5. Management practice facilities permitted.</p> <p>6. Full range of agriculture and other resource uses may be permitted.</p>

1/ To be used only in conjunction with the text.

2/ Federal Water Pollution Control Administration's Water Quality Criteria, April 1, 1968.

February 1970

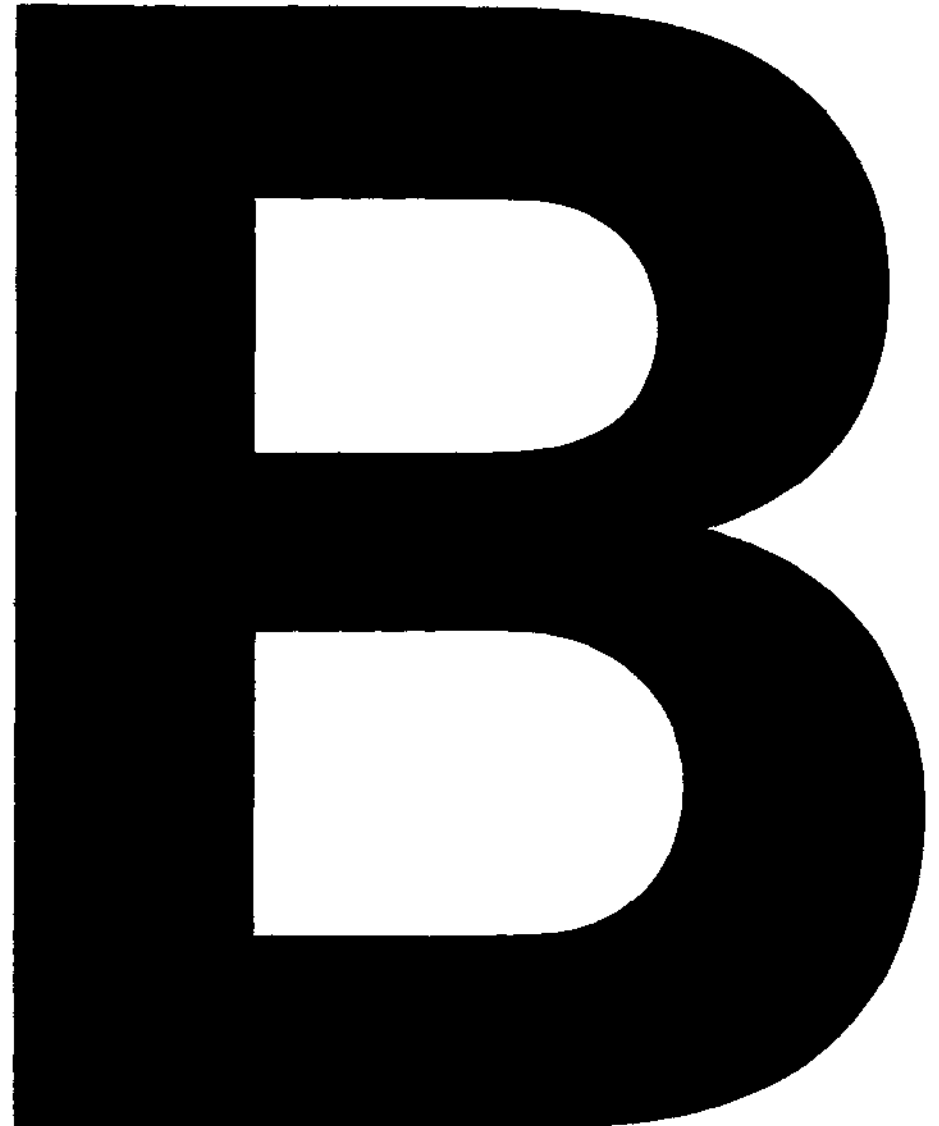




# APPENDIX

The Skagit River basin encompasses over 3,000 square miles in the northwest corner of Washington State, covering the area between Puget Sound and the Cascade Mountains.

While the study area itself has a low population density, it lies within 2 hour's drive of the Seattle metropolitan complex. It is paralleled by State Highway 20, the only highway crossing the Cascade Mountains in the northern portion of the state. Interstate Highway 5, a major north-south artery, borders the study area on the west.



# PHYSICAL AND NATURAL CHARACTERISTICS

## Climate

Air masses reaching the Skagit Basin originate over the Pacific Ocean, giving the area a mid-latitude, west coast, marine climate. The maritime air moderates both winter and summer seasons, producing a definite rainy season during the winter and a short, dry summer.

The Cascade and Rocky Mountains shield the basin from cold winter air masses, while the Olympics and the

Coast Range offer protection from the intense winter storms which buffet the coast.

Precipitation in the basin is light during the summer. It increases in the fall and peaks during the winter as moisture-laden maritime air is lifted and cooled as it moves inland, causing persistent cloudiness and frequent precipitation. Half the annual rainfall occurs in the four-month period of October through January, and another 20% falls in February

and March. About 5% falls in July and August. Annual average precipitation ranges from 29 inches at Olga, in the rain shadow of the Olympic Mountains, to 81 inches at Darrington. Average monthly and annual precipitation is summarized in Table III-1 at the end of this section.

Temperatures during the warm summer months average in the high 70's in the mid-afternoon, and around 50 at night. However, freezing temperatures are not unusual at all eleva-

**TABLE III-1 AVERAGE MONTHLY AND ANNUAL PRECIPITATION IN INCHES**

Station	Elevation Feet	Period of Record	Period												Annual
			Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
Olga	80	1931-60	4.04	2.94	2.51	1.65	1.35	1.51	.88	.95	1.61	3.04	3.91	4.39	28.78
Sedro Woolley	56	1931-60	5.57	4.33	4.65	3.30	2.56	2.78	1.33	1.38	3.01	4.91	5.87	6.38	46.07
Darrington	550	1931-60	11.79	9.37	8.13	5.30	3.43	3.20	1.36	1.50	3.92	8.33	11.14	13.14	80.51
Diablo Dam	891	1931-60	10.29	8.55	6.78	4.44	2.48	2.07	1.24	1.33	3.49	8.03	10.54	12.32	71.56

**TABLE III-2 AVERAGE MONTHLY HIGH AND LOW TEMPERATURES**

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Olga	High	44	47	51	57	63	67	70	70	66	58	50	46	57
	Low	34	35	37	40	44	47	49	49	48	44	39	36	42
Sedro Woolley	High	44	49	53	61	67	70	75	75	69	61	51	46	60
	Low	32	33	36	40	44	49	50	50	47	43	37	34	41
Darrington	High	41	46	51	61	68	71	78	77	71	61	49	43	60
	Low	29	30	32	37	42	47	49	49	46	40	33	31	39
Diablo Dam	High	37	42	48	57	66	70	78	77	71	58	45	40	57
	Low	27	29	32	37	43	48	52	52	48	41	34	31	40

tions over 5,000 feet. In winter, afternoon highs average in the low 40's, and evening lows in the high 20's. Infrequently, cold air masses from Canada's Fraser River Canyon distribute over the basin, causing the mercury to plummet to the zero mark or below. Average monthly and annual highs and lows are presented in Table III-2 at the end of this section.

The mean length of the growing season is 237 days at Olga in the San Juan Islands, 193 days at Sedro Woolley, and 151 days at Darrington.

Relative humidity in the basin is high. It ranges from 90% at night to 75% in the day during the winter, from 85% to 60% in the spring and 85% to 50% in the summer.

Cloudy days are most prevalent in the winter, when from 23 to 26 days a month are clouded. During the spring and fall 10 to 15 days a month are clear, rising to 20 or more in the summer.

Prevailing winds are from the south and southwest in winter, and from the west and northwest in summer. Extreme velocities 30 feet above the ground exceed 55 mph once in 2 years, 90 mph once in 50, and 100 mph once in 100 years.

### *Landforms*

The Skagit River drainage basin encompasses a wide range of mountainous topography. Western elevations range from 300 feet at Mount Vernon to approximately 3,500 feet on the nearby mountain tops. Eastward from Mount Vernon the relief increases and the terrain becomes extremely rugged. The crest of the Cascades forms the eastern boundary of the drainage basin, and altitudes there range from 5,000 to over 8,000 feet. However, the greatest altitudes are not along the Cascade crest but occur on Mt. Baker (10,778 feet) in the northwestern part of the basin. Mt. Baker, with its snowcapped peak, dominates the topography of northwestern Washington.

Characteristically, the mountains in the western portion are steep and timber covered. Extending eastward the mountains increase in elevation and become very steep and precipitous. Timber becomes concentrated on the lower slopes. On higher slopes the timber is frequently interspersed with rock outcrops and talus. Extending upward this in turn gives way to a world dominated by rock, meadows, talus and perpetual snow.

The upper basin country is unparalleled in its alpine beauty. Topographic differences are extreme with vertical distances often extending over 5,000 feet from the valley floor

to the adjacent peaks. Long steep slopes, containing timber intermingled with talus slopes, rock outcrops and meadows are common features. Serrated rocky ridges and slender rocky pinnacles form an impressive alpine topography that dominates the landscape. Above 7,000 feet snowfields and glaciers can be found throughout the year on many peaks. These, along with numerous meadows and small glacial lakes, constitute impressive alpine scenery.

### *Geology*

The Skagit River flows roughly east-west across the northern Cascade Mountains, dissecting mountains and regional geology which trend generally north-northwest and expose rock ranging from Paleozoic to Tertiary in age. Most of the rock is folded, faulted, and metamorphosed. The intensity of metamorphism and deformation generally increases eastward from Puget Sound.

Most mineral production from the Skagit River drainage has come from Paleozoic rocks. Talc-soapstone, asbestos, limestone, cement, silica and serpentine, as well as gold, silver, copper and lead, have been produced from the Paleozoic host rocks. The major geologic structure in the drainage is the Shuksan thrust. This thrust fault trends generally north-northwest and dips east. The fault has a displacement of over 30 miles.

Rocks in the northern Cascades and along the Skagit River drainage have been divided (Misch 1966) into seven major rock units.

1. Crystalline basement rocks (Yellow Aster complex) of pre-Middle Devonian age, occur in the core of the Cascade Range.

2. Overlying the Yellow Aster complex and forming the crystalline core of the Cascade Range are pre-Middle Devonian rocks of the Cascade Metamorphic Suite, which is subdivided into the Shuksan Metamorphic Suite and the Skagit Metamorphic Suite.

Rocks of the Shuksan Metamorphic Suite (Darrington phyllite and Shuksan green schist) have been thrust over rocks of the Chilliwack group. A half window (fenster) has been eroded in the thrust plate by the Baker River. Rocks of the Shuksan Metamorphic Suite consist of Darrington phyllite that is overlain by Shuksan green schist. Darrington phyllite is best exposed east of Marblemount and north of Sedro Woolley and Shuksan green schist is best exposed along Finney Creek south of Concrete. Two major rock types making up the Skagit Metamorphic Suite are Cascade River schist and Skagit gneiss. Cascade River schist is best exposed along the Cascade River. Skagit gneiss, including some magnetite, is best exposed along the Skagit River between Diablo and Newhalem.

3. Overlying rocks of the Cascade Metamorphic Suite are Middle Devonian to Middle Permian volcanic and sedimentary rocks of the Chilliwack group. These rocks are best exposed near Concrete, where fossils occur in the limestone beds.

4. Overlying the Paleozoic rocks are Mesozoic rocks of the Cultus Formation. These rocks are mainly marine deposited clastic sediments and mafic volcanics. Most are strongly deformed and moderately metamorphosed. Rocks of the Cultus Formation are best exposed north of Concrete.

5. Overlying the Cultus Formation are late Cretaceous to early Tertiary rocks of the Chuckanut Formation. These rocks are folded and faulted but are mostly unmetamorphosed. They consist predominantly of continentally deposited massively bedded, arkosic sandstone with interbeds of coal. The Chuckanut rocks contain coal beds and fossils. The fossils are best exposed at Minkler Lake, east of Sedro Woolley. Coal has been produced from Chuckanut beds east of Sedro Woolley.

6. During Mesozoic and Tertiary times the rocks of the North Cascades were intruded by basic as well as granitic rocks. Olivine is produced from a Tertiary dunite intrusive located just north of the Skagit River drainage in the Twin Sisters Mountains. Similar material occurs at Goat

Mountain northwest of Concrete, but is not now being mined.

7. Volcanism occurred along the drainage during middle to late Tertiary time. Volcanics from the Mount Baker eruptions can be seen along the Baker River. Ash deposits from Glacier Peak eruptions have been mined near Marblemount and Darrington. Pre-Tertiary and Recent volcanics are a source of much of the basalt and similar rock mined for ballast and riprap. Uplift, erosion, and dissection accompanied the volcanism. Towards the end of this volcanic activity, glacial erosion began and has subsequently been the dominant factor contributing to the present configuration of the North Cascades.

The period known as the "Ice Age" began about one million years ago and continued until recent time. Radiocarbon dating indicates that the last major advance of continental and alpine glaciers began about 25,000 years and reached its maximum about 14,500 years ago. During that time all but the highest peaks lay under a thick mantle of ice. Glacial erratics on the higher peaks indicate that the ice was as much as 6,000 feet thick in some areas. Since then the continental ice has disappeared and the alpine glaciers have receded to high elevations.

This glaciation has had a profound impact on the North Cascades, as glaciers are a very powerful agent of

erosion. The jagged peaks, cirque basins, lakes, truncated spurs, hanging valleys and broad U-shaped valleys are characteristic of glacially modified mountains.

Glaciation has exerted a major influence on the Skagit River Valley. The pre-glacial river was probably running in a narrow V-shaped valley and was rapidly downcutting through bedrock on a comparatively steep gradient. The valley glacier caused modification by steepening the sideslopes, widening and straightening the valley, and reducing the gradient. Upon melting, the glacier left deep deposits that resulted in a broad, relatively flat valley bottom. These valley glacier deposits joined with the continental glacier deposits in the lower river reaches and together changed the original stream from one that was flowing rapidly in a narrow valley to one that is flowing slower and meandering across a wide valley bottom.

### *Soils Within the Study Area*

The Soil Survey of Skagit County<sup>17</sup> shows a large number of soil types occurring within the Skagit River Study Area. Many of these soil types have similar characteristics and therefore have similar management applications.

For the purpose of the Skagit River Study, those soils with broadly similar features have been placed into one of

four soil groups. The generalized soil characteristics and management considerations are then discussed at the group level.

The groups are intended to be used in attaining a quick general understanding of the valley soils and their problems. For specific information on the distribution of soils and their properties, refer to the Soil Survey, Skagit County, Washington.

The soil groups along with some generalized interpretive information are described as follows:

#### *Soil Group 1*

Soil Group 1 includes soils of Everett, Greenwater, Klaus, Lynden, Pilchuck, Skykomish and Thornwood Series. In general these soils are medium to coarse textured, and are underlain by loose glacial drift and outwash material. The following key features contribute significantly to their management characteristics:

- (a) Soil textures are moderately coarse to coarse
- (b) Soils are somewhat excessively drained
- (c) Substrata is sandy and gravelly, and is often loose
- (d) Slopes range from 0 to 15 percent (most commonly 0-5 percent)

The soils in this group have limited suitability for most agricultural purposes. They are low in natural fertility and have a low water holding capacity. Soils rapidly dry out during the summer and become droughty. Because of this, crop production normally requires fertilization and summer irrigation. In their natural state these soils are most suited to forest production.

These soils have good suitability for many non-agricultural purposes. They are generally well suited for campgrounds as they are well drained and have minimal tendency to become muddy. Their desirable engineering characteristics make them well suited for most developments, such as buildings. The permeable, well-drained soils are well suited for septic tanks or drainfields. They are also well suited for roads as they generally have a high load carrying capacity. One minor road problem however, is that road cutbanks can be expected to ravel because of rather loose sandy and gravelly substrata. Also, these materials would erode severely if exposed to wave action in reservoirs.

One soil in this group is an exception to most of what has been discussed. That is the Pilchuck Series. Although this soil is coarse textured and well drained, it has severe flooding potential. This severely limits its use for most considerations.

### *Soil Group 2.*

Soil Group 2 includes soils primarily of the Alderwood and Skiyou Series. In general these soils are medium to moderately coarse textured, well drained, and are underlain by cemented glacial till. The following key features contribute significantly to their management characteristics:

- (a) Surface and subsoils are gravelly loams or gravelly sandy loams
- (b) Materials are well drained in the surface and subsoils
- (c) Substrata is cemented glacial till that restricts root and water movement
- (d) Slopes range from 0 to 15 percent

These soils are only moderately fertile, and therefore have some limitations for agriculture. The majority of these soils is in second growth timber. Most of what has been cleared is used for pasture. The soils are best suited for pasture and meadows but will produce other crops when properly managed.

The most limiting soil feature for non-agriculture purposes is the presence of the cemented till substrata. This severely limits the operations of septic tanks or drainfields that could be used with buildings or recreational

areas. The effluent is unable to disperse through the cemented till and may appear at the soil surface resulting in disagreeable odors and contamination. Other than this, the soils generally have good suitability for buildings and recreational developments. These soils generally have good engineering properties that make them well suited for buildings or roads.

### *Soil Group 3*

Soil Group 3 includes soils of Belfast, Giles, Gilligan, Puyallup, Sultan and Wickersham Series. In general these soils are medium to moderately coarse textured, well to moderately well drained, and are underlain by alluvium or glacial outwash. However, the soils within this group tend to be more variable than soils within the other groups. The following key features contribute significantly to their management characteristics:

- (a) Silt loam or loam surface textures
- (b) Well to moderately-well drained
- (c) Often stratified sandy and silty substrata materials
- (d) Some soils in group are subject to flooding because of low lying position

- (e) Slopes range from 0 to 15 percent (most commonly 0 to 3 percent)

These soils are generally well suited for agriculture. They generally have good natural fertility, good water holding capacity, and are easily tilled. Many crops are grown with good success. These include pasture, hay, small grains, strawberries, raspberries and other row crops. However, some of these soils; notably Belfast, Puyallup and Sultan, have a flooding hazard. Because of their very low lying positions, the water table is at or near the surface during parts of the wet season. This problem of flooding causes these soils to have severe limitations for most non-agriculture uses such as buildings, drainfields, sanitary landfills or recreation developments.

### *Soil Group 4*

Soil Group 4 includes soils of Bellingham, Bow, Cokedale, Puget, Samish, Sumas and Thornwood Series. In general these soils are moderately-fine to fine textured, and underlain by glacial till, alluvial or glacial lake materials. These soils are imperfectly to poorly drained. The following key features contribute significantly to their management characteristics:

- (a) Imperfectly or poorly drained soils

- (b) Silty clay or clay in the surface soils
- (c) Clay influence in subsoils
- (d) Slopes range from 0 to 15 percent (most commonly 0 to 3 percent)

These soils have limitations for agricultural purposes because of clayey textures, high water tables and flooding hazard. Many areas are subject to annual flooding because of their low lying position adjacent to streams. Even when not influenced by stream overflow, water often stands on the surface for parts of the year. Also, these soils are somewhat more difficult to till than the other soils in the valley because of the clayey textures. Because of these limitations, the soils are most suitable for summer pasture and hay. The agricultural suitability can be considerably improved by diking and drainage.

These soils have severe limitations for most non-agricultural purposes unless extensive diking and draining facilities are installed. They become very muddy in campgrounds and require surfacing in all use areas. The high water tables and flooding potential causes severe limitations for septic tanks, drainfields or sanitary landfills. The flooding potential combined with the moderately poor soil engineering properties causes severe limitations for buildings or industrial development. Roads require frequent

drainage and a very thick base course because of the wet clayey soils.

### *Soils Outside the Study Area*

These soils are within the Skagit River Drainage Basin but outside the study area boundary and therefore have fewer impacts on planning. While the soils within the study area are directly involved with proposed developments, such as drainfields or buildings; the soils outside are only involved to the extent that they affect water and aesthetics. How these soils handle water, and how this may be altered through logging and road construction activities, has a major influence on the Skagit River and its tributaries.

Soils affect water in several ways. By providing a source of sediment, they exert an influence on water quality. Some soils provide more sediment than others and soils differ in the kind of sediment they produce. On many soils the sediment discharged to streams can be significantly increased by faulty management. Also, since soils have different textures and depths, they have different capacities to store and release water. This combined with total precipitation, the amount of snowfall and temperature fluctuations, determines to a large extent the volume of water in the drainage basin at any given time.

Another way in which the drainage basin soils affect the study area is in the way they respond to management activities as these activities influence the aesthetic qualities of the area. For example, some soils are very unstable. Roads constructed on these soils result in large cutbank and fill failures that produce unsightly scars on the landscape.

The soils information for the drainage basin is presented in this report at a very broad level, sufficient to reflect gross external influences upon the study area. Soils are discussed as three broad soil-and-landscape groups. The soils and landscapes within each group have some gross similarities related to water quality and quantity, and visual impacts.

### *Soil Group 5*

This group is primarily comprised of rock outcrop, talus slopes, alpine meadows, and perpetual snow and ice. Landforms are the steep, rugged, rocky, high-elevation ridges and mountains. Soils are very intermittent and shallow. Where soils occur they are generally gravelly sandy loams. Timber is nonexistent or spotty and is primarily noncommercial.

Since this group occurs mostly at high elevations, most of the precipitation occurs as snow. Snowmelt during spring and summer months provides much of the summer flow in the

Skagit system. Also, the shallow intermittent soils in this area have little capacity to store water other than in the form of snow. Consequently, summer rain rapidly runs off and further contributes to summer flow.

Most of the sediment contributed from Group 5 is coarse material that does not remain in suspension. These materials are primarily sands, silts and gravels that are deposited into the drainage system through debris slides, soil creep and other forms of erosion. This type of sediment rapidly drops out of suspension and does not significantly impair water quality.

A notable exception occurs at the glacier headwaters of the Suiattle River. These glaciers have accumulated a very heavy load of glacial flour. Upon melting, this flour is discharged into the Suiattle River where it remains in suspension causing the water to become very turbid.

Another major influence that Group 5 exerts on the study area is that it provides very scenic background and is one of the primary contributors to the aesthetic qualities of the study area.

### Soil Group 6

This group occupies the timbered, steep, relatively stable sideslopes that are prevalent over much of the

drainage basin. The landscape is typified by long steep slopes, ridges and narrow valleys.

Because of the complex bedrock and glacial geology of the area, soil types occur in complex patterns and arrangements. Both shallow and deep soils occur and they are often intermingled. The deep soils are typically gravelly loams or gravelly sandy loams and are derived from glacial till, glacial drift or colluvium. They occur typically on midslopes and toeslopes.

The shallow soils typically consist of gravelly loams or gravelly sandy loams and are underlain by various types of hard or moderately hard metasedimentary, metamorphic, or granitic bedrock.

Group 6 is large and provides much of the watershed for the Skagit system. The precipitation occurs mostly as snow at higher elevations and as rain at lower elevations.

This group provides much of the water for river flow during the winter. While precipitation at higher elevations is in the form of snow that will contribute to spring flow, much of the precipitation at lower elevations falls either as rain or as snow that will periodically melt during warm winter periods.

Because these soils are moderately

deep on the average, they will store considerably more water than will the soils in Group 5. Some of this water is slowly released and contributes to river flow for some time after the precipitation ends.

The soils in Group 6 produce much of the sediment that ultimately reaches the Skagit River. This sediment is predominantly silts, sands, gravels and a minor amount of clays. Most contribute to the bedload with some remaining in suspension.

Water quantity and quality can both be significantly changed by management activities such as logging and road construction.

Road construction and timber harvest activities disturb soil and increase the stream sedimentation potential. This may not be especially significant over small areas, but when extended over large areas it can become quite significant. Also, as the road density increases, the negative aesthetic impact on the study area increases.

### Soil Group 7

Soil Group 7 occurs on timbered, steep *unstable* drainages and toeslopes. Soils are typically moderately deep to deep, gravelly sandy clay or gravelly silty clay loams overlying highly weathered metasedimentary or schist bedrock.



A comparatively small percentage of the drainage basin is occupied by Soil Group 7. However, because of the nature of the group it exerts an influence out of proportion to its size. Because these soils are comparatively deep and fine textured, they have a greater water holding capacity than other soils in the drainage basin. This water is slowly released and contributes to maintain summer base flow in the Skagit River.

These soils, although of comparatively small extent throughout the basin, contribute substantially to the suspended sediment load in the river system. The soils are unstable and contribute sediment from landslides, slough and other forms of mass wasting. The soils contain a high percentage of clays and silts that remain suspended in water for long periods.

These soil particles are significant contributors to water pollution, as bacteria tend to multiply in waters carrying clay particles. Clays are that portion of the soil which carry the nutrients essential to sustain plant life; since bacteria are plant life, they absorb the clay carrying nutrients and rapidly multiply.

These soils are unstable in their undisturbed state. Natural debris, slides and slumps occasionally occur that deposit sediment into the stream channels. The effects of road construction and timber harvest can

greatly increase the rate of slide activity. This affects the study area in two ways. First, there is a substantial increase of suspended sediment reaching the Skagit causing a decrease in water quality. Secondly, the large fillslope and cutslope failures occurring along roads considerably impair the scenic value of the area.

### *Water Resources*

As population increases and greater demands are placed upon a fixed resource base, society is often forced into choosing from a number of competing uses those which will be satisfied and those which will not. There are few areas in the nation which are so well endowed with any resource that they can base allocations on demand alone.

No resource has a greater demand placed upon it, or from as many different sources, as water. There are many possible uses which can be made of water. These uses can be grouped into two classes, withdrawal and in-stream uses. Withdrawals are made for domestic, commercial, industrial, and agricultural purposes. Instream uses are those which do not require water to be removed from the source, and include power generation, recreation, waste dilution, navigation, fish and wildlife. While not a use, flood control is increasingly exercised over water resources in order to prevent damage to lives and property. Thus many rivers are diked and

dammed to reduce the damages of flooding, representing still another type of demand.

The eastern portion of the Skagit basin (above Marblemount) is rugged, mountainous territory, famous for its wilderness values. There are over 270 permanent glaciers in this part of the basin. The terrain maintains its mountainous character between Marblemount and Sedro Woolley, but it is cut by broad, deep valleys, through which major rivers flow. Below Sedro Woolley the land levels out to a wide flood plain, leading to the fertile Skagit Flats, as the delta is locally known.

The northwestern, central, and western portions of the basin are drained by the Skagit River; the Cascade drains the east-central portion; the Sauk and Suiattle, the southeast portion; and the north-central portion is drained by the Baker River.

The Skagit basin is the most extensive in the Puget Sound area, and experiences a wide variation in climate. Precipitation occurs primarily as snowpack in the higher elevations. Mount Baker Lodge has an average recorded snowfall of 530" and an average rainfall of 108". Anacortes, at the tip of Fidalgo Island, which is essentially at sea level, receives an average of 5.9" of snow annually, and 26" of rain. Sedro Woolley, geographically in the middle, averages 46" of "liquid sunshine" each year. Small wonder that the Skagit basin

produces more runoff than any other drainage in Puget Sound.

During the period 1931-1960, the Skagit averaged an annual discharge of 11.8 million acre-feet into Skagit Bay. The significance of the Skagit's tributaries can be seen from the fact that, for the same period, its flow averaged 4,418 cfs at Newhalem (above all tributaries) and 16,250 cfs at Mount Vernon, below the discharge point of all the tributaries.

Within the basin, lakes, dams, and impoundments cover 40.9 square miles, 1.3% of the basin's total area. Natural lakes cover 9.1 square miles, the remaining 31.8 square miles being impounded by hydro-electric reservoirs. The total surface area of glaciers in the Basin is about 63 square miles. These glaciers represent a significant "reserve" water storage supply.

Approximately 120 miles of river in the basin are considered usable for boating. Literally hundreds of miles of unnavigable streams and creeks with intermittent flows meander through the basin.

From the roaring flow of the Skagit in flood stage to the melodious gurgling of a small mountain stream, the Skagit basin exhibits a vast potential for meeting the diverse water resource demands of people.

## Hydrology

The average unit discharge varies throughout the Skagit River basin. This is primarily a reflection of the topography and the direction of the prevailing moisture-laden storm winds. Unit discharges for various portions of the Skagit Basin are as follows:

Area	Discharge per Square Mile in cfs
Skagit River Watershed north of International Boundary	2.8
Skagit River at Newhalem	3.8
Skagit River near Marblemount	4.2
Cascade River Watershed	6.2
Sauk River Watershed above the Whitechuck	7.5
Entire Sauk-Suiattle River System	6.1
Baker River Watershed	8.7
Entire Skagit River Basin	5.2

The volume of flow of the Skagit and some of its major tributaries usually begins to increase in September or October with the advent of the

first storm of the winter. Peak flows occur primarily from October to March. Runoff generally decreases during December to March as a result of colder weather. Snow melt causes increased streamflow as temperatures begin to rise in April. Streamflow usually recedes to minimum flows by the end of August, as the snowpack is depleted. Discharge is sustained during the dry summer months by contributions from ground-water storage and melting glaciers.

Higher-than-natural flows occur during October through February because of regulation by the power-production reservoirs on the upper Skagit and the Baker River. Lower-than-natural flows occur during the spring months when the reservoirs are being filled. Minimum flows in the higher-elevation tributary streams usually occur in February or March while minimum flows in the lower-elevation tributary streams normally occur in September.

Major floods along the Skagit River and its tributaries occur predominately as a result of warm rain storms during the months of October through March. Rain-caused flood waters are often augmented by melted snow, particularly when the snow mantle extends to low elevations prior to a warm rainfall. Spring and summer floods are caused by snow melt. They usually are not severe and cause little damage.

The more productive groundwater aquifers occur in the lowland areas of the Skagit and Samish River basins. These lowland aquifers lie in the deep, coarser alluvial deposits beneath the river flood plains. Outwash deposits in upstream areas may also contain local high-yielding aquifers. Virtually all recharge to the lowland aquifers is by infiltration of precipitation. Much of this recharge infiltrates into and percolates through the water-bearing sediments where they thin out, at or near the mountain uplands, and lap onto older consolidated rocks. There is some recharge from small tributary streams where they intersect these sediments. Significant recharge of lowland aquifers from the adjacent Skagit and Samish Rivers is doubtful due to the impermeability of riverbed sediments.

Increased urbanization could affect the hydrology of the Skagit River basin. The major effects of urbanization include sealing off groundwater recharge areas and accelerating storm-water run-off. Disruption of natural drainage patterns by land management and road construction activities can also be of major significance. These and other soil-disturbing construction activities can cause both soil erosion and stream sedimentation.

### *River Morphology*

fluence on the Skagit River system. Melting glaciers left in their wake broad, relatively flat U-shaped valley bottoms. These valleys extend upstream to Newhalem on the Skagit and upstream on the Sauk River to Darrington. The Skagit River valley floor flattens into a broad delta near Sedro Woolley. Meanders and oxbows are characteristic of the river downstream from Hamilton. Pronounced meandering also occurs upstream between Hamilton and Van Horn, again from Rockport to Marblemount, and to river mile 4.0 on the Sauk River. The river reaches from Marblemount to Bacon Creek, and on the Sauk River from approximately river mile 4.5 to 8.0, are relatively broad and straight with deep fast-flowing water.

The Cascade and Suiattle Rivers, and the Sauk River upstream from river mile 8.0 to the study boundary are characterized by much deposition of bedload and woody debris. These deposits often cause braided channels. Channel scour and fill occurs seasonally and even daily during peak flow conditions. This often changes the position of riffles, flats and pools and their proportion, one to another. Straighter, deeper and narrower channel reaches are interspersed with these aggraded and braided channels. Relatively swift current and bouldery channel bottoms are characteristic of these reaches.

The streams beyond the study boundaries are characterized by many rapids and cascades in proportion to pools and flats. Streambed gradients increase rapidly upstream beyond the study boundaries. Channel scour and long-term degradation is characteristic of many of the steep tributary stream courses.

Glaciation has exerted a major in-

# HISTORY OF THE SKAGIT RIVER BASIN

## *Pre-Settlement Era*

The first recorded inhabitants of the Skagit River Basin were tribes belonging to the Salish group of Indians. These early citizens lived in small permanent villages of cedar plank houses, built in favorable locations along the principal rivers in the basin. There were several different tribes in the Skagit basin. They shared a common language and customs, but each tribe occupied its own territory.

The Skagit River Indians were never populous; best estimates place their total number at about 2,000.

The tribes were peaceful, living off the bounty of the land. Fish was the staple of their diet. Coastal tribes augmented their food supply with clams, crabs, oysters, edible bulbs and berries. Upriver tribes had fewer such easily acquired natural foods, and consequently hunted for wild meat. None of the tribes did any farming. They were loosely allied with the Noo-wha-ah Indians of the Samish River valley for defense against raiding tribes from the British Columbia coast, but otherwise led an isolated existence.

Their chief mode of transportation was the river, over which they traveled in cedar canoes, fashioned from a single log. A few of these canoes still exist, mostly in local museums.

Contact between the Skagit River Indians and white men was almost nil until 1855, when the Indian Treaty was signed at Point Elliott. The settlement era was generally peaceful. Only once, in 1880, were troops sent up the Skagit River, and that incident ended with no serious encounters. Once settlement began, the white man's diseases, against which the Salish had no natural resistance, quickly decimated their numbers. The last remnants were finally crowded into a shack village far up the swift Suiattle River. A few of the Indians were granted land allotments there, but the village eventually disappeared.

Today, about 800 Salish remain, many of them of mixed blood. Not all of that number live in the basin; of those who do, most live on reservations.

## *Development Period*

The process of white settlement in the Skagit River basin began about 1855, concurrent with the signing of the Indian Treaty.

The initial thrust of settlers moved up the forks of the Skagit in canoes and small boats. Homesteads were staked on the river's banks, with open, untimbered land claimed first. The early settlers raised subsistence crops for their own consumption. As their efforts at land clearing, ditching and diking began to show results,

they turned to cash crops, and in 1864, the first of many phenomenal grain harvests was taken from the tidal mud flats.

News of the Skagit grain harvests caused an influx of land-seekers. Soon, all the open land was gone; late arrivals had to clear wooded land, and construct many dikes and ditches to protect their fields. Although the work was hard, these early settlers persevered and grain became the principal crop in the Skagit delta. Granaries were built along the sloughs, where shallow draft steamers picked up the crop for export.

Settlement of the lower reaches forced late arrivals farther upstream to seek land. Since there were no roads or trails, upriver transit was accomplished by Indian dugout canoes. Upstream progress was blocked by a series of giant natural log jams, beginning near the site of present-day Mount Vernon, and extending upstream for a mile and-a-half.

The "Big Jam," as it was called, posed a formidable obstacle to upstream development. The portage around the Big Jam was long and arduous. Passage directly over the Jam was dangerous, since in some spots the surface had sprouted new vegetation, deceptively masquerading as solid land while the river currents

ran underneath, ready to sweep away anyone unfortunate enough to fall through a hole.

Pressure for the Jam's removal grew as the downstream population increased. By 1873, citizens of Skagit City, the center of a booming logging industry on the South Fork, began to organize for the removal of the Big Jam. Stating that the Big Jam was the key to development of the upper valley, they petitioned Congress, in 1874, for funds to finance its removal.

A government agent estimated the cost of clearing the Big Jam at \$100,000. Congress apparently did not consider the money a good investment, since it ignored the settler's petition. Finally, in 1876, the settlers decided to clear the Big Jam themselves. It was a monumental undertaking; particularly since only hand tools—axes, saws and peavies—were available. The work took three years. Those who cleared the Big Jam received little pay. Most of the timber was too rotten to have any commercial value; the only real compensation the workers received was the satisfaction of doing the nearly impossible.

Once the Big Jam was cleared, many shallow draft steamboats moved in to carry settlers, loggers and miners upstream. Under most conditions, the river boats were able to steam upriver to Marblemount which, during this period, boasted a hotel and res-

taurant as well as a saloon. Navigation occasionally reached farther upstream as in 1903 when the Black Prince reached a point one mile above Bacon Creek.

As new farmers poured into the Basin, a change took place in farming practices. Although cereal grains were still a major crop (so much so that Skagit County once boasted the heaviest oats yield per acre of any county in the United States) many farmers began raising garden seed. They proved so successful at this new kind of farming that Skagit County soon produced 95% of the nation's cabbage seed. Another new crop was Hops, used in brewing beer. This crop was quite prevalent until about 1906. As the once-rich soils became depleted from constant one-crop production, and as horses were being replaced by tractors and "tin lizzies," basin farmers were forced to turn to crop rotation and dairy farming.

Delta farms are protected by an extensive dike system, started in the 1860's. The last major dike construction job on the lower Skagit ended in 1946, but the structures are constantly being repaired, improved and modified. There is a movement currently afoot to raise the existing dikes in the event federal funds ever become available. It is doubtful, therefore, that the diking system will ever be "finished"; protecting, as it does, the rich agricultural lands which, over the long haul, have produced more

true wealth than the once-crowded gold fields upriver.

Gold was first reported on the Skagit in 1858 by prospectors returning from the abortive Fraser River gold rush. Traveling upstream as far as Baker River, the men reportedly found gold on gravel bars, although not in sufficient quantities to hold them.

Prospecting next occurred in 1872, when a miner found a ruby on Ruby Creek, at a point now inundated by Ross Lake. In 1875, four settlers from the Skagit delta prospected near Marblemount, and one of them took up a claim near the junction of the Baker River and the Skagit.

Two years later, a party of five set up sluice boxes in Ruby Creek. By 1879, their luck was good enough to trigger the first gold rush in the North Cascades. By late 1879, it was reported that 5,000 men were at work in the Skagit gold fields.

A great fever of development and exploration seized the basin. Towns such as Ruby City—which was platted while the ground was covered with 20 feet of snow—were planned, and mining companies with stock issues up to a million dollars were formed. Then came the bust.

Within a year, it was conceded that gold simply did not exist in profitable quantities in the Skagit Basin. The

*Puget Sound Mail* announced frankly on October 30, 1880, that "the Ruby gold rush was over, and that it had been a failure."

Some miners stayed behind and continued to work out a few dollars of gold dust, but on the average, few men had come out with more than a thousand dollars in dust. Those who showed the most profits were miners who sold their claims at the height of the fever.

Hard-rock miners came to the basin in the 1890's; big companies with plenty of capital to invest. But even these long-term investments failed to uncover any significant deposits, and in 1897-98, the basin was abandoned for the richer promises of the Klondike.

Only one success story was reported during this period; the Cokedale Mine. This coal mine was located four miles northeast of Sedro Woolley. It started operations in 1891, producing enough coal at one time to keep 50 coke ovens busy. The mine closed in 1921, ending, with a few exceptions, the story of mining in the Skagit River Basin.

Some limited mining occurs in the basin today. Among this small group is the Silver Queen Mine on the South Fork of the Cascade River. This mine, operated by the Washington Natural Resources Development Corporation,

is said by its owner, Rocky Wilson, to contain deposits of gold, silver, zinc, lead and tin.

Aside from a few such surviving operations, the mining era served more to open the basin to settlement than to line its pockets with gold. Mingling with the rush of prospectors were the farmers and the loggers, whose steadier vocations ultimately formed the economic base for Skagit County.

Loggers and farmers rode the river steamers part way up the Skagit, then disembarked to reap the abundant resources of the land. This wave of immigration, coupled with the influx of gold seekers, proved so great that in 1889, railroads were brought to the basin. In that year three lines were built into the Skagit River valley. These lines later merged into the Great Northern and Northern Pacific lines, which in turn became the Burlington Northern in 1970. By 1901, the rails had reached Rockport. The railroads spurred development in the valley, and for years, every incoming train had its load of new settlers.

Logging was the principal industry in the Skagit River valley during this era (1890-1930), and, despite a decline, is significant yet today. During the early settlement period, oxen and horses were used to skid the logs. They were replaced in the 1890's by steam donkeys, which gave way to

internal combustion engines in the 1920's. Logs were dragged with cables slung along the ground until 1915, when the more efficient high lead (spar tree) system was introduced. Although logs were rafted down the river as late as 1959, larger companies developed a system of logging railroads to transport the logs either from the woods to the rafting point, or directly to the mill. In the early 1920's, logging trucks, moving over rough, narrow roads, began to replace the railroads, and by virtue of the lower cost of trucks and truck roads, had replaced rail haul by 1940.

Trucks, which phased out the old logging railroads, also had their impact on steamboat traffic on the Skagit. Steamboats, which once carried freight and passengers on a regular schedule between Mount Vernon, Sedro Woolley, and points upstream, as well as from rail's end at Hamilton to the now-vanished Sauk City, were discontinued in 1928; railroads, highways, trucks and automobiles had replaced the river as a travel route, although there was still boat service between Mount Vernon and Seattle until 1960.

As steamboat traffic vanished and roads moved farther inland, the river underwent other changes—principally, the harnessing of its current to electric turbines.

In 1918, the City of Seattle secured

## SOCIO-ECONOMIC CHARACTERISTICS

a permit for hydropower development on the Skagit, and the following year began construction of a 25-mile railroad to supply the construction of the Gorge Dam. The first generator at the Gorge plant was installed in 1924, the fourth and final one in 1951. Diablo Dam, which is a short distance upstream from Gorge Dam, was completed in 1930, and Ross Dam in 1949. Road construction done in conjunction with the dam construction made feasible the North Cascades Highway, opened in September 1972. This highway makes possible, for the first time, direct access from the Skagit River Valley to the lands lying east of the Cascade Mountains.

The North Cascades Highway will have more than a regional impact, however. Thousands of tourists annually pass over this scenic new road, presaging yet another boom in the beautiful Skagit River Valley.

### Population

Population in the five-county area has experienced a sporadic, though always increasing growth. Over the last 70 years, population has climbed from 67,100 in 1900, to 430,400 in 1970, an increase of 641%. This compares to 658% for the state as a whole during the same period. A population of 610,300 is forecast for the area in 1985.

However, growth rate has not been consistent in all counties. Island and Snohomish counties have experienced the most spectacular growth rates. Island County's population jumped from 1,800 in 1900 to 27,000 in 1970, a fifteenfold increase. Snohomish County, the industrial center of the five-county zone, has increased from 24,000 people in 1900, to 265,000

in 1970, nearly equaling Island's growth with an elevenfold rate.

At the other extreme is San Juan County, which had 2,900 residents in 1900 and 3,800 in 1970.

Both Whatcom and Skagit counties have tripled their population during the 70-year period, illustrating the less spectacular growth of agriculture-forestry dominated economics.

Population projections indicate that the established growth patterns will continue for each county; spectacular population increase in Island and Snohomish counties, a small but regular growth in Whatcom and Skagit, and very little change in San Juan.

**TABLE III-3 POPULATION STATISTICS**

	1900	1910	1920	1930	1940	1950	1960	1970	1980*	1985*
Island	1,870	4,704	5,489	5,369	6,098	11,079	19,638	27,011	35,818	40,865
San Juan	2,928	3,603	3,605	3,097	3,157	3,245	2,872	3,856	4,105	4,234
SKAGIT	14,272	29,241	33,373	35,142	37,650	43,273	51,350	52,381	61,731	67,022
Snohomish	23,950	59,209	67,690	78,861	88,754	111,580	172,199	265,231	349,286	398,667
Whatcom	24,116	49,511	50,600	59,128	60,355	66,733	70,317	81,950	93,296	99,593
Five-County										
Total	67,136	126,268	160,757	181,597	196,014	235,910	316,176	430,434	544,236	610,381
State	518,103	1,141,990	1,356,621	1,563,396	1,736,191	2,378,963	2,853,214	3,409,161	4,113,764	4,519,021
Nation						152,271,000	180,684,000	207,959,714	235,212,000	—

Source: 1900-1960 from Schmid, Calvin F., et al., *Population Forecasts, State of Washington, 1965-1985*, Olympia, Department of Commerce and Economic Development, 1966.

1970 from U. S. Bureau of the Census, *1970 Census of Population, Advance Report, PC (V2)-49*, Washington, GPO, 1971.

National statistics (except 1970) from Water Resources Council, "Proposed Principles and Standards for Planning Water and Related Land Resources," Federal Register, Vol. 36, No. 245, Tuesday, Dec. 21, 1971.

\*1980 and 1985 are based upon the estimates in Schmid, et al., but revised based upon discrepancies between the actual and projected 1970 figures (McGuire).

The Puget Sound and Adjacent Waters Study predicts the Skagit-Samish basin population will increase by roughly 30% between 1953 and 1985, to 69,800. It foresees 86,500 people in the basin by 2000, and 118,200 by 2020. The Washington State Census Board roughly correlates this prediction with a predicted 1985 maximum of 610,000 for the five-county area, a 158% increase, most of which would be felt in Island and Snohomish counties.

The concensus of predictions is that Skagit County, the heart of the study area, can anticipate a 30% population increase by 1985, with regular growth thereafter. Table III-3 summarizes the population statistics and projections formulated by the State of Washington, upon which this discussion is based.

The rural-urban proportion is presented in Table III-4. Most of Washington's population lives in urban areas, and the five counties generally reflect this urban centralization. It should be noted, however, that within the study area proper, the only urbanization is taking place north of Mount Vernon. Study area residents live in a rural or rural village setting. Large urban concentrations lie outside the Skagit basin and the study area, and represent a significant departure from the life style of area residents.

### *Economic Base*

During the settlement era, the economy of the five-county area was predominantly based on basic industries—agriculture, forestry, fishing and mining.

By 1940, the first year for which employment data is available, these industries had begun to decline in importance. In that year basic industry employed 13,419 out of a total labor force of 60,065. By November of 1970, the labor force had increased to 135,180, while the number of per-

sons employed in basic industry had declined to 6,930.

Within the five-county area, Snohomish County—with the industrial city of Everett—constitutes the major employment center. Over half the total labor force in the five counties is employed in Snohomish County. Whatcom County is the second largest employment center, with Bellingham providing most jobs. However, Whatcom County's percentage of total employment has steadily declined as indicated in Table III-5.

**TABLE III-4 PER CENT URBAN POPULATION BY COUNTY<sup>1,2</sup>**

	1900	1910	1930	1950	1960	1970 <sup>3</sup>
Island	0.0	0.0	0.0	0.0	20.1	33.9
San Juan	0.0	0.0	0.0	0.0	0.0	0.0
SKAGIT	0.0	14.3	36.9	35.7	44.8	46.4
Snohomish	32.7	47.4	42.2	33.1	41.6	71.7
Whatcom	45.9	49.1	52.1	51.1	52.9	48.6
State	40.8	53.0	56.6	53.6	54.2	72.6

<sup>1</sup>Schmid, Calvin F., and Schmid, Stanton E. *Growth of Cities and Towns: State of Washington*. Olympia: Washington State Planning and Community Affairs Agency, 1969.

<sup>2</sup>Pre-1950 definition of "urban" and "rural" was used to allow comparability of data.

<sup>3</sup>Table 43. General Social and Economic Characteristics, Washington. U.S. Census of Population, 1970. Bureau of the Census.



**TABLE III-5  
TOTAL EMPLOYMENT AND PROJECTIONS  
FIVE COUNTY AREA, 1940-2020**

County	Employment (Thousands)							Per Cent of Total						
	1940	1950	1960	1970	1980	2000	2020	1940	1950	1960	1970	1980	2000	2020
Island	1.8	4.3	7.4	*	11.5	17.1	24.6	3.0	5.2	6.8	*	8.3	8.3	7.0
San Juan	1.1	1.2	.9	*	.9	1.3	1.7	1.8	1.5	.8	*	.7	.6	.6
SKAGIT	11.4	14.0	17.4	16.1	19.4	25.7	34.4	18.9	17.4	16.0	12.8	14.1	12.5	11.1
Snohomish	26.9	37.8	58.6	78.9	80.1	125.9	202.6	45.0	47.3	54.2	62.9	58.0	61.5	65.3
Whatcom	18.9	23.0	24.1	30.5	26.2	34.9	46.9	31.3	28.6	22.0	24.3	18.9	17.1	15.1
TOTAL	60.1	80.3	108.5	125.5	138.1	204.8	310.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: App. IV, PS&AW: Employment Security Department Statistics, State of Washington.

\*Included in Skagit and Snohomish statistics

**TABLE III-6  
EMPLOYMENT COMPOSITION AND PROJECTIONS  
FIVE COUNTY AREA, 1940-2020**

Category	Employment (Thousands)							Per Cent of Total						
	1940	1950	1960	1970	1980	2000	2020	1940	1950	1960	1970	1980	2000	2020
Agric., For., Fish, Mining	13.4	13.1	8.6	6.9	8.3	6.8	5.8	22.3	16.3	7.9	7.0	6.0	3.3	1.9
Manufacturing	15.9	18.2	25.8	34.1	39.5	64.8	113.4	26.8	22.9	24.0	34.8	28.6	31.6	36.5
Construction	2.8	5.8	8.6	6.4	9.9	12.9	15.9	4.6	7.2	7.9	6.5	7.2	6.3	5.1
Trans., Comm., PU	3.8	5.8	7.1	5.7	5.9	4.9	3.8	6.3	7.1	6.5	5.8	4.3	2.4	1.2
Trade	9.8	15.0	20.5	23.2	30.7	44.3	61.0	16.4	18.7	18.8	23.7	22.2	21.6	19.6
Services	11.4	15.4	25.9	N/A	23.2	39.3	63.4	19.0	19.2	24.1	N/A	16.8	19.2	20.5
Government	1.8	5.9	9.8	21.5	20.6	31.9	47.0	2.9	7.2	8.9	21.9	14.9	15.6	15.2

Source: App. IV, PS&AW: Employment Security Department Statistics, State of Washington.

## LAND USE PATTERNS

Skagit County, the heart of the study area, employs about fifteen percent of the total five-county work force. Employment in the county is concentrated in Anacortes and in the Mount Vernon-Sedro Woolley complex. Since the closing of the cement plant at Concrete, the upriver area provides only a few hundred jobs, mostly in the forestry and forest products industry.

Island and San Juan Counties together provide employment for less than ten percent of the area work force.

Projections are for Snohomish County to employ an ever-increasing percentage of the five-county work force, while the remaining four counties provide a smaller and smaller percentage of available jobs.

Median family income for the area rose from \$3,058 in 1950 to \$9,300 in 1970. This represents an increase of 204 percent, above the national average of 199 percent. This figure is below the \$10,037 family income for the West in the same year, however.

Composition of the employment market for the area is displayed in Table III-6. It can be readily seen from this Table that manufacturing, trade and government are the only employment fields in which the trend is continuing upward. Construction is in decline due to the present econom-

ic conditions in the Puget Sound area. Extractive industrial employment is down due to mechanization and a general decline in mining and commercial fishing.

It appears that, within the five-county area employment is following the national trend; more work in industry and trade, less in the extractive industries.

### *Ownership*

Land ownership within the study area falls into five general categories: federal, state, county, forest industry and private holdings.

The U. S. Forest Service administers the largest acreage under federal stewardship. Shorelines totaling 17,526 acres of the study area lie within the Mt. Baker-Snoqualmie National Forest. These lands lie in the upper reaches of the Sauk, Suiattle and Cascade Rivers. There is no Forest Service administered land along the Skagit River within the study area. In addition to the Forest Service, the Bureau of Land Management administers 36 small tracts totaling 450.12 acres within the study area. These lands vary in size from 1/3-acre to 80 acres and are primarily located on islands in the rivers. The Bureau also administers 23 tracts, totaling 316.72 acres in size, lying within one mile of the study rivers.

The State of Washington owns 1,870 acres of forest land within the study area, administered by its Department of Natural Resources. The State Department of Game controls a 50-foot railroad right-of-way on the north bank of the Skagit between Concrete and Rockport. This 11-mile strip of land is significant in terms of public access. The Department controls 12 additional sites, totaling 56.18 acres, through use agreements. It

owns 500 acres in the area of Barnaby Slough, with over 2 miles of river frontage. The Department of Fisheries owns approximately 90 acres of land administered in conjunction with the operation of the Skagit River and Samish River fish hatcheries. Holdings by private forest industries within the study area total 10,870 acres of land. These lands are managed for commercial timber harvest, and are generally open to the public.

The balance of the 53,000 acre study area—some 22,000 acres—is in private ownership and varies from productive agricultural lands to quarter-acre recreational lots. Ownership within the study area is summarized below.

	Ownership	
	Acres	%
U.S. Government	17,970	33.9
State of Washington	2,460	4.7
Forest Industry	10,870	20.5
Private	21,700	40.9
TOTAL	53,000	100.0

### *Transportation and Utility Routes*

The Cascade Mountains run north-south at the eastern extremity of the study area. These mountains constitute a massive natural barrier to east-west traffic. Consequently, traffic patterns in the coastal strip of Washington state are most intensively developed for north-south travel, paralleling the mountains.

Interstate Highway 5 is the main artery on the west side of the mountains. This road will ultimately provide four and six-lane freeway travel from Canada to Mexico. In Washington, it is already near completion; one-way non-stop travel is a reality from Vancouver, B. C., to Vancouver, Washington. I-5 crosses the study area at its western edge; its Skagit River bridge marks the lower limit of the study. The presence of this road makes the study area readily available to interstate traffic year-around.

Four paved roads lead into the eastern portion of the study area. Highway 92 leaves I-5 at Marysville and connects with Forest Road 322 on the South Fork of the Sauk near Monte Cristo, just outside the study area. Highway 530 exits from I-5 near Arlington and follows the North Fork of the Stillaguamish River to Darrington, which lies within the study area. The South Skagit Highway, a County road, follows the Skagit River on its south bank from Clear Lake to a point across the river from Van Horn as a paved road, and on up to Marblemount with an all-weather gravel surface. Highway 20 parallels the Skagit on the north bank, from Mount Vernon to the old road's end at Thunder Creek, near Ross Dam, and now across the Cascades to Winthrop.

The Sauk River is paralleled on its east bank by a paved road from Rockport to the mouth of the Suiattle, where the road crosses the river and

follows the west bank to Darrington. A gravel road follows the west bank from Rockport to Government Bridge, six miles upstream. Beyond Government Bridge the only west side travel is over a powerline maintenance jeep trail which rejoins the highway near Darrington. Upstream from Darrington, Forest Service Road 322 follows the east bank of the Sauk to the South Fork, and then up the east bank of the South Fork to Highway 92 mentioned above. The west bank of the Sauk has a road from Darrington to the White Chuck River; this road, number 3211, is scheduled for upgrading to two-lane paved status. Beyond the White Chuck, Road 3113, a logging road, follows the west bank of the Sauk for two miles before turning up-country.

The North Fork of the Sauk is paralleled by only one road, Number 308, which leads to the Glacier Peak Wilderness and managed timber stands in the Sloan Creek drainage.

The Suiattle River is bracketed by roads number 345 and 325. Road 345 follows the north bank from the mouth to the Wilderness; 325 from the Forest boundary to the Wilderness. There is a system of unimproved private logging roads reaching the south bank of the Suiattle at several points near its mouth in Sauk Prairie.

The Cascade River is paralleled on the north by Road 3528 from its mouth to Mineral Park. Road 3404 then continues up the South Fork to the trail-

head near the junction of the South Fork and Middle Fork. The south bank of the Cascade has a network of private logging roads which extends nearly to the Forest boundary.

The Cascade is crossed by four bridges, the Sauk by eight, the Suiattle by two, and the Skagit by two gas pipelines, two railroad bridges and by six highway bridges.

One point must be clarified concerning the relationship between roads and rivers. Although all of the rivers are paralleled by roads, the roads very seldom lie immediately adjacent to the river. In all cases, there are long stretches where the road and river diverge both horizontally and vertically. Within these stretches the two entities are visually blocked from each other by distance, grade, or vegetation. At other points the two are visually linked, although the physical distance separating them measures several hundred feet. Points where rivers and roads converge and lie adjacent to each other are, in fact, rare except for Highway 20 above Marblemount, where the two lie within a hundred feet of each other for most of the distance.

Two current road construction plans will have significant impact on the study rivers.

The first is the North Cascades Highway, opened in September 1972.

This extension of Highway 20, for the first time, connects the east and west slopes of the Cascades by a road. Marblemount on the west slope is linked to Winthrop on the east. The highway traverses some of the most scenic mountain terrain on the North American continent. Vast numbers of travelers are expected to use this new facility each year; as an east-west travel route, as a recreational experience in itself, and for access to the heretofore "closed" mountain region. It is impossible to predict the demands and stresses which will be placed on the study area by this new route. Even the most conservative analysts, however, acknowledge that the North Cascades Highway will swamp the scanty facilities presently available for food, lodging and recreation.

The second road plan nearing completion is the Mountain Loop Highway. This scenic route is designed as a day-outing for motorists from the Seattle metropolitan area. Leaving I-5 at Marysville, travelers will proceed east on Highway 92 up the South Fork of the Stillaguamish River to Forest Road 322 near Monte Cristo. They will follow 322 (paved two-lane) down the South Fork of the Sauk to the White Chuck Bridge, cross over and go on to Darrington over Road 3211 (paved two-lane) and return to I-5 on Highway 530, which follows the North Fork of the Stillaguamish. The scheduled completion date of this road is not firm, since location and design standards

have yet to be agreed upon by the Forest Service, State of Washington and Federal Highway Administration. Hopefully, this project will be well set back from any system rivers, and will be designed for low speed pleasure driving rather than as a high speed transportation facility.

Figure III-A shows the existing transportation utilities system.

### *Agriculture*

Of the 1,776,000 surface acres in the Skagit River basin, approximately 53,000 acres are devoted to rangeland and crops. Farmlands are primarily located in the river flood plain. The majority of agricultural activity is found in the low, flat, fertile delta of the Skagit River, well outside the study area. Some good cropland does lie in the study area, however, since a narrow belt extends up the river along the north bank to Cape Horn, about six miles downstream from Concrete.

During the development period, farmlands were generally worked for family consumption crops, with oats raised as a cash crop. Skagit County still claims to hold the world record for oats production per acre, earned during this period. As horses were replaced by machines, production in the basin shifted from cereal grains to dairy farming and to growing vegetables, berries and vegetable seeds

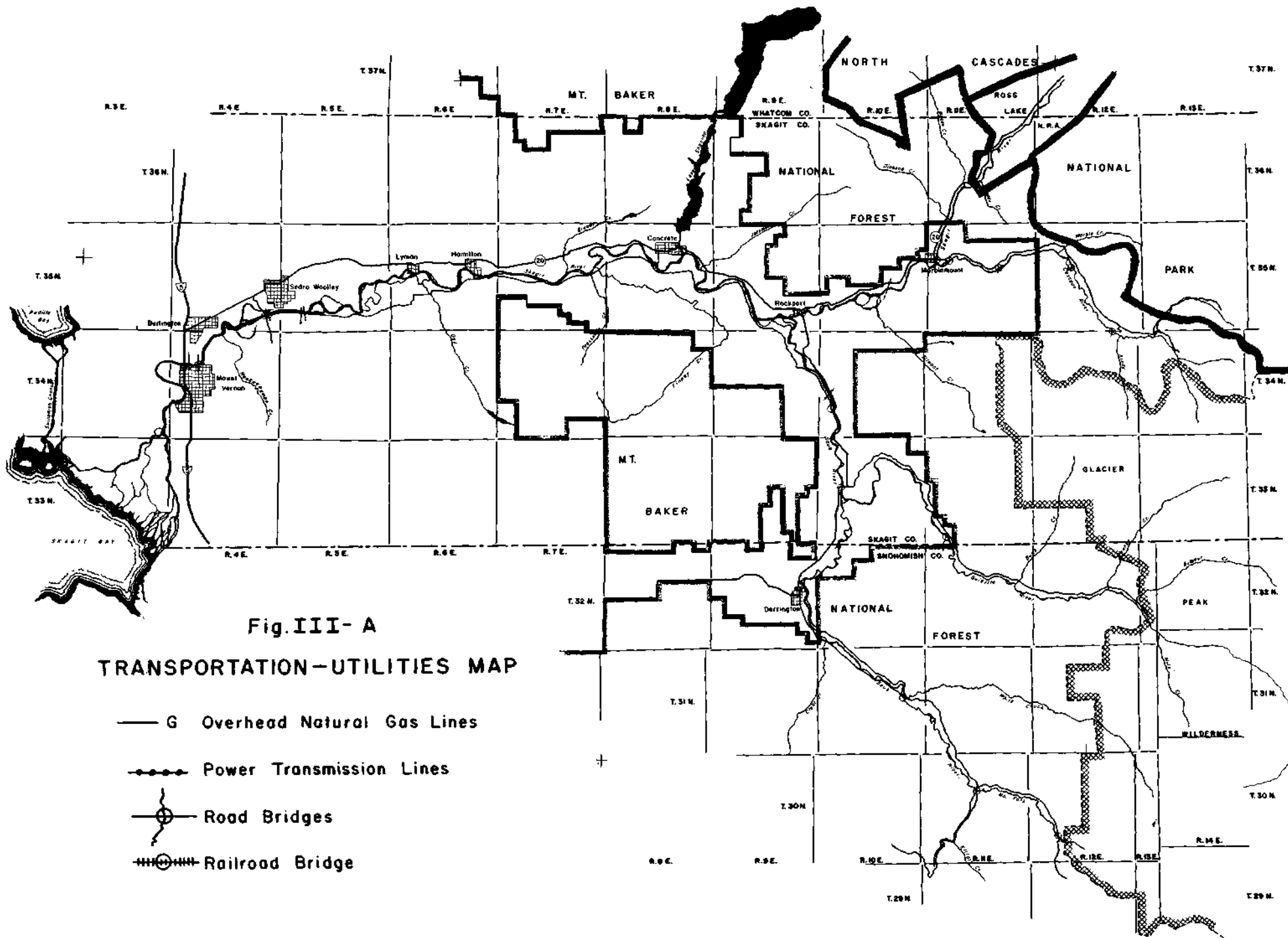


Fig.III- A

TRANSPORTATION-UTILITIES MAP

- G Overhead Natural Gas Lines
- Power Transmission Lines
- ⊕— Road Bridges
- ⊕— Railroad Bridge

for the commercial market. The basin produces 90% of the United States' supply of cabbage seed and half the garden beet seed supply. Large volumes of turnip and rutabaga seeds are also produced. Yet most of the cropland in the basin is devoted to raising forage in support of dairy cattle. Table III-7 shows general farm statistics for 1964 and 1969.

The acreage of farmland is expected to increase by 15% in the basin by 2020 (PS & AW). Basic to this projection is the assumption that future population growth will be confined to existing urban areas, and to lands unsuited for agricultural production. The validity of this assumption is questionable, since flat, agricultural land is amazingly easy to convert to high-density housing areas, and has rapidly undergone such conversion in recent years.

Skagit County's Comprehensive Plan, 1968, offers the following observation on land use changes in the county. "The pressure to cover prime agricultural land in this county with residential subdivisions will tend to increase. If permitted, schools, service stations, and shopping centers will follow the new homes on into the suburbs and areas that are now farmlands. In addition to being best suited to agricultural uses, these areas, because of flood hazard, high water table, and surface drainage problems should remain in agricultural use. It will be necessary to judiciously

**TABLE III-7 FARMS, LAND IN FARMS, AND LAND USE:  
1969 and 1964, SKAGIT COUNTY**

		1969	1964
All farms	number	1,050	1,540
Land in farms	acres	116,925	136,425
Average size of farm	acres	111.3	88.6
Approximate land area	acres	1,110,144	1,110,450
Proportion in farms	percent	10.5	12.2
Value of land and buildings	dollars	103,608,642	(NA)
Average per farm	dollars	98,674	51,000
Average per acre	dollars	886.11	605.23
<b>Land in Farms According to Use</b>			
Total cropland	farms	966	1,390
	acres	87,536	86,205
Harvested cropland	farms	725	1,122
	acres	62,217	58,767
Number of farms by acres harvested:			
1 to 9 acres		154	358
10 to 19 acres		102	239
20 to 29 acres		74	103
30 to 49 acres		90	128
50 to 99 acres		122	141
100 to 199 acres		100	95
200 to 499 acres		66	47
500 to 999 acres		14	9
1,000 acres and over		3	2
Cropland used only for pasture or grazing	farms	599	943
	acres	21,735	24,738
All other cropland	farms	93	(NA)
	acres	3,584	2,700
Woodland including woodland pasture	farms	400	707
	acres	17,635	32,208
All other land	farms	616	(NA)
	acres	11,754	17,994
Irrigated land	farms	80	57
	acres	6,108	4,000

Source: 1969 Census of Agriculture — County Data

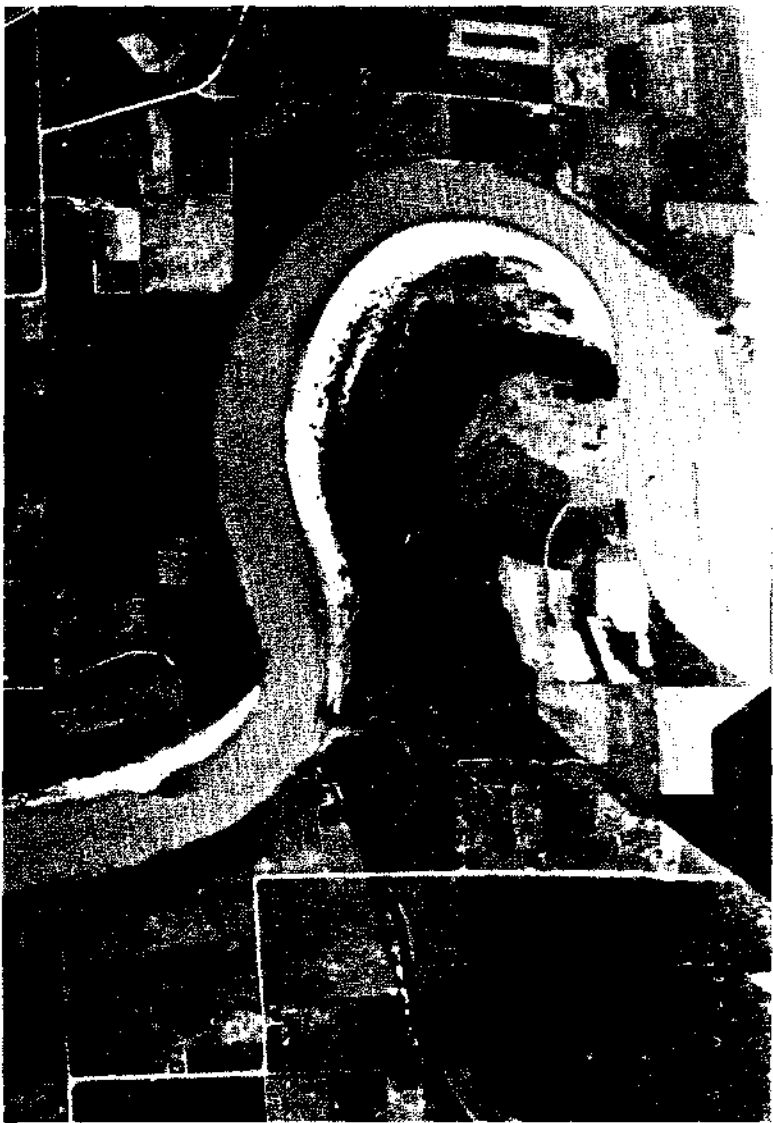


Photo 1 - An oxbow on the Skagit River near Nookachamps Creek. This picture was taken in 1941. Note the agricultural land on the east (right) side of the peninsula.



Photo 2 - The same oxbow thirty years later. In this 1971 picture the agricultural land has been totally eroded away. Note the new main channel, gravel bar and backwater created.

*control future land uses so that prime soil in the agricultural sections is not needlessly taken out of agricultural production. If permitted, urban sprawl can take a tragic toll of a substantial portion of Skagit County's land and economy."*

Because the combined effects of soil suitability and geography confine farms to the low, flat flood plains, farms in the basin are seriously affected by the two annual flood seasons. Floods occur in late fall and winter, due to the precipitation falling during those months, and again in the late spring as the snowpack rapidly melts in the mountains.

In the Skagit-Samish basin, a total of 155,353 acres is subject to flood damage. Of those acres, 90,439 are either cropland or potential cropland. The extent of existing flood control structures, and various proposals for more effective flood control are thoroughly discussed in the flood control section, and can be reviewed there.

In addition to periodic flood damage, farmers adjacent to the river suffer losses of agricultural land as the river erodes banks or changes channels. Photos 1 and 2 illustrate this problem. Photo 1 is an aerial photo of an oxbow near Nookachamps Creek taken in 1941; note the farmland on the east (right) side. Photo 2 is an aerial of the same piece of land, taken in 1971. The farm land has been totally eroded away by the

river. The timbered land, however, has thus far withstood the eroding currents. Many other such examples could be cited, to illustrate the problem of bank erosion.

### Forestry

Within the Skagit-Samish River basins, 75% of the land — 1,754,000 acres — is forested. Of that land, 69%, or 976,080 acres, is classified as available timber land. An additional 375,000 acres of forest land is in permanent reserve, either as National Parks or as Wilderness.

But even with these significant withdrawals, the basin is abundantly endowed with forest resources. Within the basin there are 834,730 acres of commercial forest land capable of producing forest products on a continuing basis. These lands have a current timber inventory of 23.6 billion board feet. The basin has 17% of the commercial forest land in the Puget Sound area, and 23% of its saw timber by volume. Within the study area there are 38,510 acres of forested land, with 550 million board feet of conifer and hardwood timber.

At present, the basin contains 12 sawmills, 2 plywood plants and a paper mill. These industries have a total daily demand of 600 MBF, peaking to about 1,000 MBF. In addition, the existing transportation system

facilitates the economical export of basin timber to plants outside the basin, i.e., Bellingham, Everett, *et al.*

Recent studies (PS & AW) indicate that 17% of the commercial forest land within the basin will be converted to uses other than timber-producing by the year 2020, if current trends continue unchecked.

This conversion roughly parallels the anticipated conversion rate of commercial forest land elsewhere in the Puget Sound basin. Consequently, the basin will still contain about 17% of Puget Sound's commercial forest land in 2020; however, the total acreage will be reduced in size. This reduction will necessitate the intensive management of all remaining commercial forest lands to meet a consumption demand amounting to 187% of the 1965 level (See Table III-8).

Material imported to Puget Sound comes predominantly from two sources: other areas of Washington State, and British Columbia. The competition for timber in both of these areas is on the increase, making it more expensive for the area to import its wood material. As a result, the predictions are for a decrease in importation, from 38% of the total sawtimber requirements in 1962, to 25% by 2020.



This loss of raw material will be met, in part, by a 260% increase in the utilizations of plant residues, increasing from 130 million cubic feet in 1965, to 335 million by 2020.

The balance of wood consumption must be met by timber production within the Puget Sound area. To predict whether the demand will be satisfied is speculative at best. Table III-9, extracted from Appendix V of the Puget Sound and Adjacent Waters Study, probably makes the speculation as accurately as is possible. It predicts, based on a projection of the existing conditions in the Puget Sound area, that the demand for timber in 2020 will exceed the supply (both local and import) by some 39 million cubic feet.

Timber harvest within the study area, and future trends, is fully discussed in the Forestry portion of the Resource Use Section, which appears later in this Chapter.

### Public Recreation

About 70% of the total land area of the Skagit basin is federally administered. Another 5% is managed by the State.

These lands are famous for their varied recreation opportunities. Mountains, wilderness, forest, streams, lakes, saltwater, islands and beaches

all occur within the basin.

The Skagit River steelhead fishing, the beauty of Ross, Diablo and Baker Lakes, and the many splendid views of nearby mountains are all prime attractions to tourists.

There are 124 publicly-administered recreation sites in the basin. Seventy-eight of that number are federally administered, 34 are State operated, and 12 are owned by cities.

**TABLE III-8 CURRENT AND PROJECTED COMMERCIAL FOREST AREA IN THE SKAGIT-SAMISH BASINS 1968-2020**

Period	Ownership (In Thousand Acres)						Total
	Private				Public		
	Large	Medium	Small	NF	Other Federal	Other	
1965	101.6	9.1	187.3	386.5	63.1	87.1	834.7
1980	106.9	9.1	172.8	322.1	61.3	85.6	757.8
2000	117.9	9.0	145.8	318.5	60.4	83.8	735.4
2020	121.8	8.8	122.9	314.1	59.6	81.8	709.0

**TABLE III-9  
SUMMARY OF TIMBER SUPPLY AND  
DEMAND FOR THE PUGET SOUND AREA, 1980-2020  
(Million Cubic Feet)**

Period	Total Timber Demand	Imports	TIMBER SUPPLY		Yield From Projection of Existing Condition
			Local Produc- tion (Goals)	Theo- retical Yield	
1980	606	212	394	453	345
2000	655	197	458	448	386
2020	596	149	447	434	408

A total of 1,487,345 acres of land are open to the public — 900,888 acres of which are administered by the U. S. Forest Service.

On these 1.4 million acres of public land, 542 camp units, 250 picnic units, 1,621 parking spaces, 25 boat launch ramps and 7 acres of swimming beaches are provided. In 1964, over 1,400,000 people used these various facilities.

Recreational developments within the study area, and future trends, are fully discussed in the Recreation portion of the Resource Use section; which appears later in this Chapter.

A significant portion of the federal lands in the basin are reserved from future development. There are 350,000 acres of dedicated Wilderness within the Pasayten and Glacier Peak Wildernesses, 483,000 acres in the North Cascades National Park, and 107,000 acres in the Ross Lake National Recreation Area. In total, some 940,000 acres are under permanent federal protection, nearly 48% of all lands within the basin.

### *Recreational Subdivisions*

One of the most significant land use trends in the area immediately adjacent to the river (within 100 yards or so) is the growth of private recreational residences. Often called "recreational subdivisions", these may occur as a number of residences in an established development unit within a small area, or they may occur as single dwellings spaced irregularly along the river. The quality of construction varies tremendously. Some have electricity, running water, a lawn, etc., and are hardly distinguishable from urban residences. Others have few improvements and are little more than a shelter from the elements. The majority of these recreational dwellings are "second homes" and are used only during certain periods of the year. Many, however, are permanent residences.

The Washington State Interagency Committee for Outdoor Recreation (IAC) has recently conducted a study of second homes (vacation homes) in the State, which provides information on the nature of this industry. An interesting fact reported by this study is how recent the growth of second homes has been. In the period 1945-1959, there were no recreational subdivisions in Skagit County. During 1960-1965, 270 acres were converted to recreational developments.

During the next five-year period (1966-1971), this climbed to 1,380 acres, an increase of 511 percent. Of all the developments responding to the IAC survey, 50 percent were established within the last two years. A second fact brought out by the IAC study was the importance of water in the location of the developments.

Results of the survey indicate that 85 percent of the developments are water-oriented. It is obvious that if present trends continue, Washington can expect an increasing number of recreational subdivisions. The IAC reported that 57 percent of the developers indicated they intended to develop new subdivisions in the future, while 7 percent said they were uncertain.

There are several recreational developments on the Skagit River and its tributaries. As of August 1972, 22 developments had been identified. In addition to these platted developments there are others where individuals are constructing a single residence for which plats do not exist.

The location of platted developments are indicated in Figure III-B. There are developments on the Skagit River and on each of the major tributaries in the study area. There is considerable variation in the size of the plats. At least two of the developments have platted less than 10 lots, while the largest is approaching 600. Most of the plats are of fairly recent origin. Lot values within these developments vary from \$30-60 per frontage foot. At present, there are 2,215 platted subdivision lots within the study area.

It is very probable that the completion of the North Cascades Highway will provide the impetus for a

number of new developments. The highway parallels the Skagit River for many miles and opens up recreational areas heretofore overlooked by developers. This, coupled with the burgeoning demand for outdoor recreation and the increasingly crowded public facilities, will create increased demand for recreational land development by the private sector.

The effects of development are both good and bad. On the positive side, the growth of recreational developments will partially meet the demand for recreation and serve to reduce the pressure on public facilities. If the developers see fit, services provided to the development residents can even be made available to the public.

But there are a number of disadvantages associated with the proliferation of recreational subdivisions. The most obvious is the irreparable damage done to the natural landscape. Because of the incessant desire to be close to water, developments invariably take place immediately next to the river, where they are clearly visible to all recreationists. The rivers can only stand so much development before they no longer possess the criteria for river classification. Photos 3 through 8 show typical recreational subdivisions along the river. However tastefully done, they still can present an adverse visual impact, as well as a restriction on public access.

A deterioration of water quality is likely if recreational subdivisions are permitted to grow unchecked. The majority of them are not on public sewer systems, but utilize septic tanks and drain fields. If properly constructed and maintained, and if set back far enough from the river's edge, septic tanks can be utilized safely. However, most subdivisions are constructed close to the river, and often too concentrated, allowing seepage from the drain fields to enter the river. Unusual geological conditions may speed this process considerably. Because of the very large volume of flow in the rivers it is doubtful if the present developments are seriously damaging water quality.

A less apparent consequence of development is the future river modification which may be necessary to protect the lives and property of those living along the river. Levees, riprapping, drainage, and other similar measures have all been used to prevent damage. These measures represent an adverse impact on river classification, however, and carried to extremes could preclude classification.

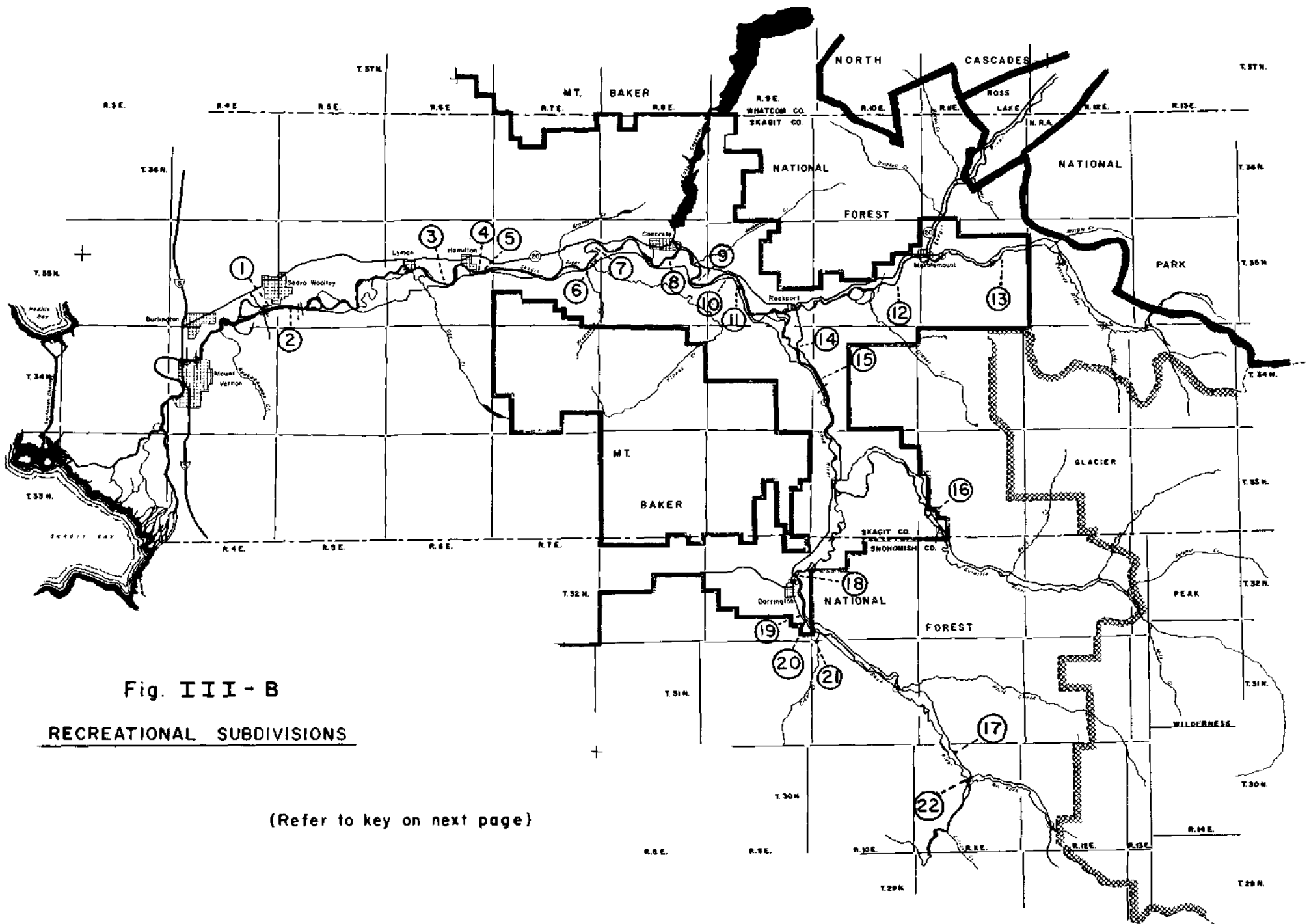


Fig. III - B

RECREATIONAL SUBDIVISIONS

(Refer to key on next page)

## KEY

Map No.	Name	Legal Description	No. Lots	Year Platted
1	Janicki Cove	S.25, T.35N., R.4E.	40	1971
2	Rod & Reel Tracts	S.13, T.35N., R.5E.	18	1962
3	Heart O' the Skagit	S.21, T.35N., R.6E.	37	1965
4	Smith Skagit Hideaway	S.13, T.35N., R.6E.	7	1965
5	Shangri-La	S.13, T.35N., R.6E.	59	1964
6	Skagit Wilde	S.13, T.35N., R.7E.	23	1961
7	Cape Horn	S. 7, T.35N., R.8E.	593	1965
8	Cedargrove	S.14&15, T.35N., R.8E.	220	1966
9	Thunderbird Lane	S.24, T.35N., R.8E.	104	1964
10	Skagit River Colony	S.20, T.35N., R.9E.	58	1964
11	Skagit Steelhead Tracts	S.28, T.35N., R.9E.	44	1960
12	Carefree Acres	S.23&26, T.35N., R.10E.	78	1963
13	Cascade River Park	S.11,14&15, T.35N., R.11E.	449	1963
14	White Falls Estates	S.12, T.34N., R.9E.	26	1964
15	Sauk River Estates	S.18, T.34N., R.10E.	140	1961
16	Suiattle River Forest Sites	S.32, T.33N., R.11E.	34	1962
17	Forgotten Mountain	S. 5, T.30N., R.11E.	102	
18	Armstead River Tracts	S.13, T.32N., R.9E.	9	1962
19	Begis Sauk River Tracts	S.25, T.32N., R.9E.	36	1964
20	Darrington River Front Tracts	S.25, T.32N., R.9E.	40	1962
21	Timber Bow River Tracts	S.25&26, T.32N., R.9E.	56	1961
22	Reece's South Fork Hideout	S. 9, T.36N., R.11E.	42	1963
<b>TOTAL</b>			<b>2,215</b>	



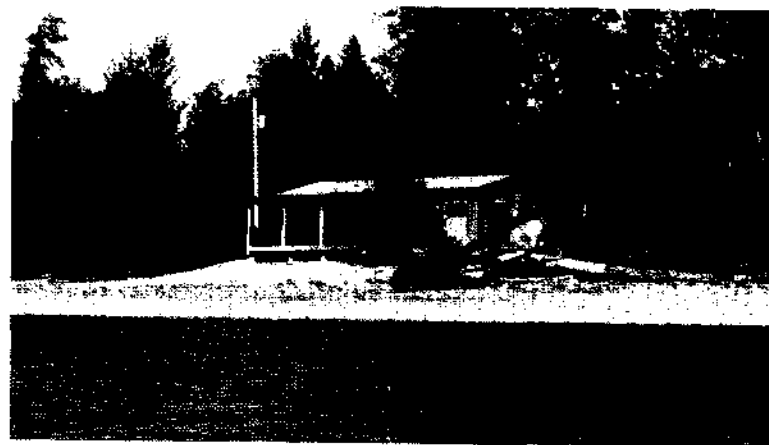
Cape Horn. This unique peninsula formed by a meander of the Skagit River near Concrete was undeveloped forest land in 1941 when this picture was taken. (Courtesy SCS)



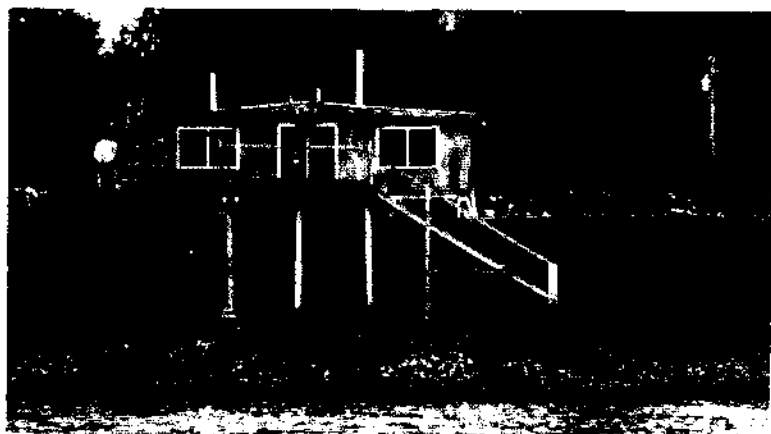
Cape Horn thirty years later. This land is now high-density residential property. It was sub-divided in 1965 and contains 593 lots. By mid-summer of 1972, 504 lots had been sold. Permanent structures have been erected on 73 lots, another 128 are used as campsites.



A recreational subdivision near Concrete. Many lots are first used as campsites, then fitted with a house trailer. Trailers are sometimes used as interim residences until a permanent recreation home can be built; they are also used as the final stage of development.



A fishing cabin built on uplatted private property above Rockport. A thick concrete foundation secures this cabin against high water. The structure has galvanized metal siding.



Location of a permanent structure in a subdivision near Concrete.



An older trailer site on the Skagit near Marblemount.

## RESOURCE USES

### *Municipal-Industrial Water Supply*

The adequacy of a water supply is dependent not only upon the quantity and quality of available water, but also upon the demands made on the supply by increases in population and industrial development.

The 1965 population of the Skagit River basin was 56,900. Extensive projections forecast that this number will increase to 64,200 by 1980; 86,500 by 2000, and to a total of 118,000 people by the year 2020. The majority of the predicted population increase is expected to settle around Anacortes, due to anticipated industrial development there.

Although Anacortes lies well outside the study area, its water supply comes from two wells on the east bank of the Skagit River, north of Mount Vernon but outside the study area. During dry periods, the wells' output is augmented by water pumped directly from the Skagit. This system has the capacity to provide 20.8 million gallons per day (mgd) at average river flow. This is barely adequate to meet peak demands. Plans are to develop a series of river intake and treatment plant expansions with an optimum capacity of 69 mgd by 2020. This water would all come from the Skagit River. However, this withdrawal represents only 3.9% of the Skagit's recorded low flow, and

0.65% of its mean flow of 16,250 cfs (10,530,000,000 gallons/day).

The other significant water-consuming system in the Skagit Basin is the Skagit County Public Utility District No. 1 (PUD No. 1). This system supplies water to municipal and industrial consumers around Mount Vernon, Burlington, and Sedro Woolley. Along with Anacortes, this tri-city area is expected to significantly increase its population by 2020. PUD No. 1 provides water for 23,500 people at an average rate of 8.9 mgd (1965). The water is supplied mainly by five small streams in the Cultus Mountain watershed. The system may, at some future time, look to the Skagit River for a maximum of 60 mgd through river intake and treatment facilities.

In addition to the surface water supply in the Skagit basin—which is capable of exceeding all demands to 2020—a sizable ground water reservoir exists.

Over large areas, ground water of varying quality is available at shallow depths. Wells yielding up to 600 gpm have been drilled in the basin, such results occurring in major sand and gravel aquifers. Recharge to delta aquifers is estimated to be at least 50,000 acre-feet (16.3 billion gallons) per year. Small communities and individual dwellings in the basin rely on ground water for their water supply, which promises to exceed all future demands.

### *Water Quality*

#### *Characteristics*

Systematic measurement of water quality characteristics began in the Skagit River basin in June 1959 by the U. S. Geological Survey and the Washington State Department of Ecology. Additional water quality data is collected periodically by the U. S. Forest Service, the Washington State Department of Fisheries, Skagit County Health Department and Skagit Valley College. Collected data is designed to maintain a continuing inventory of the basic quality of the water resource of the Skagit basin, to provide the basis for study of specific water quality problems, to serve as a planning guide for resource and industrial development, and to detect quality changes in time to initiate control and preventive programs before pollution problems become acute.

#### *Physical*

Relatively cool stream temperatures occur in the Skagit River basin. Maximum recorded and mean stream temperatures for four stations are as follows:



### Stream Temperatures (°F.)

Station	Maximum Recorded	Mean
Skagit River near Mount Vernon	64.0	48.7
Baker River at Concrete	62.0	48.9
Skagit River at Marblemount	59.4	46.9
Sauk River at Darrington	55.4	45.3

Summer time stream temperatures are moderated by melting snow and glacier ice in the upper reaches of the Cascade, Suiattle and Sauk River Watersheds.

Upstream hydropower reservoirs presently have little impact on the temperature downstream. Studies indicate that the reservoir created behind the proposed High Ross Dam could have a severe impact on downstream temperatures, lowering them to such an extent that salmonoid reproduction would be delayed or precluded.

Dissolved oxygen concentrations throughout the length of the Skagit River are generally near saturation. Dissolved oxygen (D.O.) concentrations at Mount Vernon have ranged from a low recorded value of 9.3 mg/l to a high of 13.7 mg/l. The recorded low D.O. concentration on the

Sauk River above the Whitechuck River is 10.2 mg/l.

Analysis of sediment data obtained in 1965 and 1966 indicates that the Skagit River can be expected to transport a sediment load of ten million tons during a year of normal streamflow. Much of this sediment is of glacial origin. Finely-ground rock flour, originating in the melting glaciers, is carried in suspension far downstream. This material gives a pronounced milky appearance to the Suiattle and Whitechuck Rivers and a greenish cast to the lower Sauk River, lower Baker River and the Skagit River below Rockport. Coloration is most pronounced during periods of warm, clear summer weather. Turbidities are highest near the glacier source and decrease downstream as sediment concentrations are diluted by relatively clear water from non-glacial streams.

Non-glacial streams normally transport little sediment except during fall and winter storm runoff. Stream turbidities may be much higher during these periods than during the glacial melt period, however. This can be attributed to a natural soil and streambank sediment source with a greater proportion of colloidal particles. Poor logging practices can also contribute significantly to sedimentation, even during periods of low runoff. Turbidities subside to low levels as high water recedes.

### Chemical

The concentration of dissolved solids in the Skagit and its tributaries is low. Mineralization, determined by a specific conductance measurement, increases only slightly downstream. Some upstream tributaries are more highly mineralized than others.

Hardness values are less than 60 mg/l at Mount Vernon, resulting in a "soft" water classification for the Skagit River upstream from the Interstate Highway (I-5) bridge. Phosphate values are very low while the maximum recorded nitrate level is 0.34 mg/l. High iron concentrations are common, especially in ground water in the vicinity of the Skagit River. With the exception of the high iron concentrations, chemical water quality in all sections of the study river meet 1962 U. S. Public Health Service Drinking Water Standards.

### Bacteriological

The Skagit River shows a general trend of decreasing quality downstream from Marblemount. Bacteriological quality, although variable, generally reflects the urban, industrial and agricultural buildup downstream from Concrete.

The most probable number (MPN) of coliform organisms per 100 ml ranges from a low of 0 to a high of

230 at Marblemount, but is usually less than 50. This low average is typical of the upstream reaches of the Skagit River system. Near the I-5 bridge, the MPN has ranged from 0 to 24,000. The normal range for this location is from 91 to 4,600. The maximum recorded MPN on the Sauk River near Darrington is 2,400 and on the Baker River 930.

Both point and non-point pollution sources could cause higher coliform counts than those measured. Possible point pollution sources are streams draining through small upstream communities and recreational subdivisions (a small stream draining through a portion of Rockport had a measured coliform count of 70 and a specific conductance of 240 on September 14, 1971, in comparison to a coliform count of 1 and a specific conductance of 50 in the Skagit River just upstream from the mouth of this stream). Runoff from stored farm animal wastes downstream from Concrete, and effluent from marinas and pleasure craft may also be significant non-point bacterial pollution sources. The tremendous volume of water in the Skagit River dilutes these contaminants to insignificant quantities in a short distance, however.

Other significant point pollution sources that contribute to bacterial pollution are raw sewage discharges from the larger incorporated towns, and food processing and metals plants along the lower Skagit River.

Waste Treatment and control requirements are now in effect to reduce this pollution.

### *Toxic or Deleterious Material Concentrations and Aesthetics*

Toxic or deleterious materials are those which may affect public health, the natural aquatic environment or the desirability of the water for any usage. Aesthetic values involve these materials or their effects (excluding those of natural origin) which offend the senses of sight, smell, touch or taste. Factors affecting water quality and its associated aesthetic values on the Skagit River System may include: (1) sewage, garbage, refuse and petroleum products from marinas, commercial vessels and pleasure craft, (2) silt, organic wastes, litter, and waste oil in storm runoff from urbanized areas, (3) silt, pesticides, fertilizer salts and organic animal wastes in agricultural waste water, (4) bark, debris and other organic material from log storage or dump areas, (5) high turbidities, woody debris and rock bedload as a result of soil erosion and land development, (6) high turbidities during glacier melt periods, (7) possible downstream nitrogen supersaturation and algal blooms caused by upstream impoundments and reservoirs, and (8) nutrients and toxic materials in sanitary landfill drainage water.

Municipal and industrial waste

sources along the Skagit appear to contribute most toxic materials and aesthetic impact. Waste treatment and control requirements have been specified to control these waste sources.

### *Biological*

The aquatic environment of the Skagit River system is highly conducive to the migration, rearing and spawning of both anadromous and resident fish. A great diversity of fish species use the Skagit River system, which indicates high-quality water. Other factors indicating high-quality water include high dissolved oxygen contents, relatively low nutrient levels, and a low bacterial content, particularly in the upstream tributaries. In general, streams of the Skagit system are all relatively clear and odorless and the stream bottoms are clear and free of deposits.

Stream temperatures remain relatively cold in upstream tributaries throughout much of the year. Nutrient levels are also low. These factors may limit the productivity of aquatic organisms. Unchecked domestic, municipal, industrial and agricultural waste discharges along the lower Skagit could degrade water quality to the detriment of aquatic life.

### *Standards*

Water quality standards were established for the Skagit River on December 4, 1967 by the Washington State Pollution Control Commission (superseded by the Department of Ecology). This regulation was promulgated to comply with Section 10 of the Federal Water Pollution Control Act of August 9, 1956, (Public Law 84-660) as amended.

The Skagit River from its mouth to Burlington was assigned a Class A, *Excellent*. Water quality of this class exceeds or meets the requirements for all or substantially all uses. From Burlington to the Canadian Border, the Skagit was assigned Class AA, *Extraordinary*. Water quality of this class markedly and uniformly exceeds the requirements for all uses.

Water quality standards were established for the Cascade, Sauk and Suiattle Rivers on January 8, 1970. These intrastate rivers have been assigned Class AA, *Extraordinary*. Water quality of this class markedly and uniformly exceeds the requirements for all uses.

No water quality data was available when assigning the AA, *Extraordinary*, class to the Cascade and Suiattle Rivers. All intrastate surface waters lying within the mountainous regions of the State, (i.e., within national parks, national forests, and/or wilderness areas) were automatically designated Class AA unless water qual-

ity information to the contrary was available. There was no reason to doubt anything but AA Class for the Cascade and Suiattle Rivers. Water quality data collected in 1971 by the Mt. Baker National Forest as a part of this study substantiates this classification.

Water quality criteria for the Skagit River is very similar to the criteria for the Cascade, Sauk and Suiattle Rivers, with the exception of turbidity standards. Intrastate AA standards and Interstate A standards (i.e., mouth of Skagit River to Burlington) specify that turbidity shall not exceed 5 Jackson Turbidity Units (JTU) *over natural conditions*, while Interstate AA standards specify that turbidity *shall not exceed* 5 JTU. Turbidity data collected on the Skagit during the summer of 1971 indicates that natural turbidities exceed 5 JTU on the Skagit River between Burlington and the Cascade River during summer glacial ice melt periods.

### Controls

Generally, water quality control is adequate on the mainstem of the Skagit. Bacterial and toxic or deleterious standards are not being met between the Interstate 5 highway bridge and Burlington. Bacterial standards are also not being met in the reach between Burlington and Bacon Creek. High concentrations of coliform organisms and toxic or

deleterious material are most probably due to domestic and industrial waste discharges. Wastes produced by livestock and certain recreational subdivisions and small communities may also be significant contributors to the total bacterial count. At times, silt from private gravel washing operations has been destructive to fish, and harmful to other water uses.

Domestic, commercial and industrial waste discharges along the Skagit have had treatment and collection system improvements mandated by the Washington State Department of Ecology. A time schedule for completion of the improvements has been established.

Future water quality of the Skagit will be affected most by the growth in population, industry, agricultural production and recreation. Increased numbers of cattle concentrated onto smaller areas poses the most serious future agricultural threat to water quality. Raw waste production from recreational activities is also projected to increase significantly by 1980.

Control of most miscellaneous waste discharges and non-point pollution can be accomplished through specific regulatory directives from the Department of Ecology. Other "built-in" water quality controls may be effected through (1) an April 1967 State law prohibiting permanent structures within the 15-year flood frequency zone, (2) a newly-enacted State Shorelines Management Bill to limit or prohibit major developments within 200 feet of shorelines and streams, and (3) State and local health regulations concerning sewage disposal and sanitary landfills. In addition, the provisions of the Federal Water Pollution Control Act Amendments of 1972 (33 USC 1314, 86 Stat. 816-904) apply to the basin.

Wastes from commercial vessels, pleasure craft, and marinas along the Skagit are to be controlled by the Federal Government, under the terms of Public Law 91-224. As provided in this law, performance standards for marine sanitation devices are to be developed by the Environmental Protection Agency and promulgated as regulations. The Department of Ecology will prepare similar legislation applying to intrastate waters.

Forest land management practices guidelines were developed by the Department of Ecology in 1971 to comply with inter- and intra-state water quality standards and regulations. The Mt. Baker-Snoqualmie National Forest has instituted practices

to reduce and control soil erosion and stream sedimentation on National Forest lands.

From these indicators, it appears that water quality on the Skagit may be upgraded to a point at which it meets all interstate requirements except for the natural turbidity caused by glacial flour.

### *Irrigation*

Irrigation in the Skagit basin varies from year to year, depending upon the amount of rainfall during the growing season. In 1965 about 6,200 acres were irrigated, probably an average figure.

Most irrigated lands lie along the Skagit River from Concrete down to the river's mouth, and on Skagit Flats, the 68,000 acre fan-shaped delta laid down by the Skagit.

Water for irrigation is supplied mostly from wells, although some small diversions occur on the Skagit and smaller rivers. Nearly 70% of the present irrigation water supply comes from the wells; the balance from surface water.

Surface water quality is good. No serious sediment problems are encountered except for glacial flour, which has no effect on the value of the water for irrigation.

Most of the ground water wells are found in the central and eastern parts of the alluvial plain. Ground water is found at fairly shallow depths and wells may produce up to 600 gallons per minute.

Although the ground water has a higher mineral content than surface water, its quality is still high enough for irrigation needs. Salinity increases in ground water seaward (west) of Sedro Woolley.

Only 3% of the 1,540 farms in the basin in 1964 had irrigated croplands. These farms used their irrigation systems to enhance production of potatoes, forage, vegetables and berries. Of the 95,800 arable acres in the Skagit basin, 89,600 with irrigation potential remain unirrigated. Expectations are that 45,000 of these acres will be under irrigation by 2020.

At the total anticipated irrigation development, a net depletion of 37,200 acre-feet of surface water—primarily from the Skagit—will occur. This figure represents 0.32% of the Skagit's 11.8 million acre-feet mean annual flow. Ground water sources will be depleted by 9,300 acre-feet annually, nearly 20% of the estimated 50,000 acre-feet annual recharge to the lowland aquifers.

Present indications are that no irrigation diversions or other structures will be called for within the Skagit

River study area, hence no conflicts are anticipated.

### Flood Control

On August 31, 1960, the Governor of Washington requested that the Corps of Engineers, under the authority of Section 206, Public Law 86-645, conduct a survey of floods and flood potential in the Skagit River Basin. The resulting report, "Flood Plain Information Study, Skagit River Basin, Washington," published in April 1967, delineates the 50-year flood plain. Appendix XII, Flood Control of the Puget Sound and Adjacent Waters Study, published in March 1970, was also a source of information for this section.

In the context of flood control, the Skagit River basin and the Samish River basin become one, since floods on the Skagit overflow into the Samish flood plain.

Although the valley floor begins to lose its narrow, incised profile at Bacon Creek—the upper limit of the study area—the flattening of the valley floor is gradual. The potential for flood damage begins at Marblemount and continues downstream. Once past Sedro Woolley, the valley floor flattens into a broad valley of 90,000 acres. The valley, which supports most of the basin's agricultural activity, as well as a large portion of Skagit County's population, industry,

**TABLE III-10 PROTECTION BY DIKING DISTRICT LEVEES**

Location	Protection		
	Miles of Levee	To Flow (cfs)	Recurrence Interval (years)
Skagit River			
North bank — Burlington to the mouth of the North Fork (River Mile 2-21)	16.1	108,000	5
South bank — Burlington to Mount Vernon (River Mile 21 to 13)	7.5	143,000	14
South bank — Mount Vernon to mouth of the South Fork (River Mile 13 to 2)	14.4	101,000	4
South bank of the North Fork	5.5	91,000	3
North bank of the South Fork	6.0	91,000	3
<b>TOTAL</b>	<b>49.5 miles</b>		

SOURCE: Appendix XII, PS&AW

and transportation routes, is highly susceptible to flooding. Under 1966 prices and conditions the average annual flood damages are estimated to be \$3,020,000.

The greatest problem with flooding occurs on those lands west (seaward) of Sedro Woolley. This area contains 75% of the total flood plain, and has a history of periodic inundation. Despite regular flooding, the development of farms and residential areas has continued, increasing the demands for more flood control structures.

Existing flood control structures total 55.8 miles of levees and 39 miles of sea dikes, protecting 45,000 acres of land. The levee system is summarized in Table III-10. These dikes are not adequate, however, since the lowest ones offer protection only from a peak flow of 91,000 cfs, which constitutes a three-year interval flood. Maintenance of the dikes is the responsibility of various local diking districts. The diking districts have been aided by the Corps of Engineers in rebuilding flood-damaged dikes and in placing bank protection devices, with a to-date cost of \$373,300.

Two of the upriver dams offer limited storage space for flood control. Ross Dam, which provides the only significant effect on flooding, is required by the FPC to maintain 120,000 acre-feet of winter flood storage. This capacity is always used during flood stage. The Upper Baker Dam provides 16,000 acre-feet of storage to replace the natural channel storage lost by construction of the dam. In addition, the Corps of Engineers can request an additional 84,000 acre-feet of storage space during the winter flood season, provided that suitable arrangements are made for compensating Puget Sound Power for the power losses incurred. This alternative has not been adopted, but is under investigation.

To augment the existing flood control program, Skagit County has recently proposed a new flood plain zoning ordinance. If adopted, this ordinance would preclude the construction of any permanent structure with a finished floor elevation lower than the 50-year interval flood level. The ordinance allows new structures which meet set-back and floodproofing standards.

A 50-year flood would have a discharge of 205,000 cfs at Sedro Woolley. The flood would flow over into the Samish River basin and inundate the entire Samish delta. Water over the dike above Burlington would flow through the town and flood the entire area between Bayview and Plea-

sant Ridge. The sea dikes which protect the Skagit and Samish deltas from saltwater intrusion would impound the floodwater. Ponding would occur to a height of eight feet. Levees above and below Mount Vernon would probably fail, flooding the lower sections of the city. A crossdike near Milltown would impound water to a depth of 13 feet, at which point the levee would fail and the waters would flow south, inundating Stanwood on the Stillaguamish River. See Figure III-C.

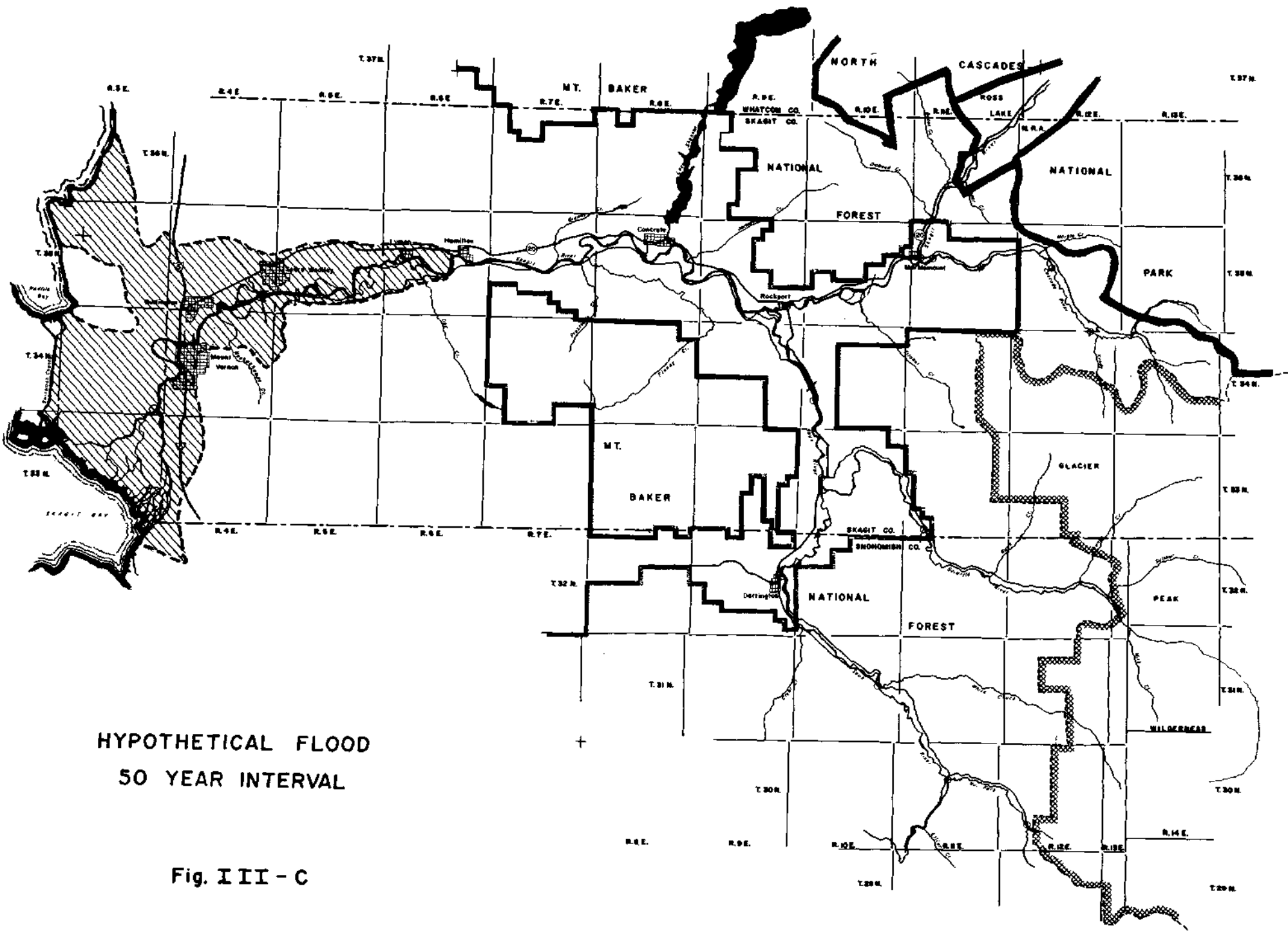
A hundred-year flood, with a flow of 240,000 cfs at Sedro Woolley would fill roughly the same area to greater depths.

The Corps of Engineers recommends instituting several procedures to reduce flood damage and prevent improper development within the flood plain. These include flood plain zoning, the conversion of flood-susceptible land to open space uses such as parks and parking lots, the preparation of a master levee plan, a program to mark the geographical limits of previous floods and water height at points inside past flood areas, and the use of floodproofing for developments built within the floodway. Other controls, they say, could be exercised by government loan-insuring agencies, floodway building codes and subdivision regulations.

A coordinated levee improvement program could protect the area down stream from Burlington from floods of less than 120,000 cfs magnitude, or once in eight-year frequency. The current level of protection is once in three years.

The Avon Bypass would divert 60,000 cfs of the Skagit's flood stage from a point between Burlington and Mount Vernon, to Padilla Bay. Although the bypass was authorized in 1936, it was deactivated because local interests could not meet sponsorship requirements. In 1960, at Skagit County's request, the study was resumed. A viable plan now exists for the bypass. Despite the fact that the Avon Bypass, in conjunction with the levee improvement program noted above, would increase flood protection for the basin to a 100-year interval frequency, the project has been opposed, both because of its high (\$5-6 million) local costs for necessary rights-of-way, bridge modifications, and utility relocations, and for its potential adverse environmental effects.

Upstream storage sites have been identified on the Skagit, Sauk, Suiattle and Cascade Rivers and on Thunder Creek. The principal site, having the best potential for development as a multiple-purpose hydroelectric project, is located on the lower Sauk River at about river mile 5. To date, the Corps of Engineers has only undertaken preliminary



HYPOTHETICAL FLOOD  
50 YEAR INTERVAL

Fig. III - C

studies of these dam sites, with no study being given to these potential projects at this time.

The Puget Sound and Adjacent Waters Study presented two options for flood control structures. Plan A which assumed no river classification under the Wild and Scenic Rivers Act, and, Plan B which assumed total river classification.

Plan A allows full use of storage opportunities to obtain maximum flood control in the Skagit River Basin. The assumption is made under this option that no part of the Skagit River or its tributaries would be included in the National Rivers System.

Plan B is based on the assumption that the entire river complex cited in the Act would be designated in the National Wild and Scenic Rivers System. Also, the assumption was made that the entire complex would be given a "Recreational river" classification and that nonstorage developments would be compatible with this classification. This assumption has not proven to be correct as contained in the findings of the report, although the Corps of Engineers maintains that the Avon Bypass is compatible with classification.

The elements of these two plans are the same for all features except for flood control, hydro-power and recreation. Our concern here is the

water resource projects dealing with flood control. These two different plans have been devised to achieve protection against the 100-year flood for urban areas of the flood plain. They are summarized as follows:

#### Plan A — Maximize Flood Control

- a. Purchase additional storage at upper Baker Dam
- b. Improve existing levees
- c. Build new levees
- d. Construct Avon Bypass for 60,000 cfs capacity
- e. Construct Lower Sauk Dam

#### Plan B — Recognize Wild and Scenic River Values

- a. Purchase additional storage at Upper Baker Dam
- b. Improve existing levees
- c. Build new levees
- d. Construct Avon Bypass for 100,000 cfs capacity.

The conflict of either plan to Wild and Scenic Rivers is the accommodation of the large diversion (Avon Bypass) and with the large impoundment (Lower Sauk Dam) of Plan A. Based on the area's resistance to dams and bypasses, it seems likely that future flood control will have to be accomplished by increased storage capacity at existing reservoirs, levee improvements, flood plain zoning, flood-proofing requirements and administrative controls discouraging further development in the flood plain.

## Hydroelectric Power

No hydroelectric developments exist within the study area. Eight separate generating facilities do exist upstream from the study rivers.

Three of the generating facilities are small (200 kW or less). The NEW-HALEM plant, on Newhalem Creek, was the first public generating plant in the Skagit basin. Built by Seattle City Light in 1921, this 2000 kW plant was designed to provide energy for driving the power tunnel for Gorge Dam. Water for the plant comes from Newhalem Creek, a tributary of the Skagit. Water passing the plant flows a half-mile downstream, where it joins the Skagit. A timber dam diverts the water into a 2,689-foot tunnel. A 905-foot penstock carries the water to the powerhouse, where it turns a double-overhung Pelton turbine which powers the generator. The 2000 kW plant is fed into the Seattle City Light System.

The other two small plants are known simply as BEAR CREEK NO. 1 and NO. 2. These plants are owned by the Lone Star Cement Corporation, and are located on Bear Creek, a tributary of the Baker River. Built in 1908, Bear Creek No. 1 has an installed capacity of 1800 kW of power. Bear Creek No. 2 is downstream from No. 1 and has an installed capacity of 200 kW. The output of these two plants was used to



power the Lone Star Cement plant in Concrete. Lone Star Cement ceased their operations in Concrete during 1968. Although the generating facilities at the two Bear Creek plants have been left in place, the transmission lines have been removed, effectively eliminating these two minor power sources from the power generating inventory.

The LOWER BAKER Dam, a development of Puget Sound Power and Light, began operation in 1925. The generating plant, which originally housed two 19,750 kW generators, had a third 64,000 kW generator installed in 1960. This powerhouse was destroyed by a mud slide in 1965 and was rebuilt with a 64,000 kW capacity. The 285-foot high dam is 530 feet long and inundates 2,218 acres, backing water up 9.5 miles to the Upper Baker Dam, forming Lake Shannon.

UPPER BAKER Dam, another Puget Sound Power and Light facility, was completed in 1959. The concrete dam is 330 feet high, 1,235 feet long, and is 12 feet wide on top. The dam has a generating capacity of 94,400 kW. Baker Lake, which is formed by the dam, covers 4,985 acres and backs up nine miles from the dam. The FPC required the dam to provide 16,000 acre-feet of flood storage. An additional 84,000 acre-feet of flood control storage is available through Corps of Engineers negotiations to compensate the

licensee. This project provides facilities for fishery protection, including ladders, rearing ponds, traps, and a "fish taxi" which traps migrating anadromous fish below the Lower Baker Dam and releases them into Baker Lake, where they find suitable spawning areas.

GORGE Dam was the first hydroelectric power development on the Skagit. The power plant began operations in 1924 with two 24,000 kW generators. A 26,400 kW generator was added in 1929 and a 60,000 kW unit in 1951, giving a total capacity of 134,000 kW. A two-mile tunnel, 20.5 feet in diameter, carries the water from the dam to the generator plant. This installation, along with the upstream dams on the Skagit, is operated by Seattle City Light.

DIABLO, the second unit on the Skagit River, was completed in 1929. The dam is 389 feet high, 1,180 feet long, and 146 feet thick at the base. Water is carried from the dam to the powerhouse at Reflector Bar by two 15-foot diameter penstocks 290 feet long, and by a 19.5-foot diameter tunnel 2000 feet long. Two 60,000 kW generators give this dam a total output of 120,000 kW.

ROSS Dam is the largest hydroelectric development in Puget Sound. Ross Dam was built in two stages. Stage one, completed in 1940, raised a dam 305 feet high. Stage two was

begun in 1943 and completed in 1949, bringing the dam to its present size of 540 feet high and 1,300 feet long. Provision was made during the first two stages of construction for the erection of a third stage, raising the dam another 122.5 feet. The Seattle City Council authorized Seattle City Light to proceed with the application for a license amendment on December 14, 1970, seeking authority to raise the dam. At present, this proposed addition to the dam is a highly controversial issue in the Skagit basin, Puget Sound, and even in Canada, since Ross Lake already extends 1.5 miles into that country. "High Ross" as it is called locally, would increase the area of impoundment in Canada. The present reservoir has a gross storage capacity of 1,405,000 acre-feet, distributed over an area of 11,820 acres, which constitutes Ross Lake. This popular impoundment, along with the waters behind Gorge and Diablo Dams, as well as the Skagit River itself down to Bacon Creek (the upper limit of the study area) are contained in the Ross Lake National Recreation Area. The Ross Lake powerhouse is located on the south bank of the Skagit River, just downstream from the dam. Four generators are installed in the powerhouse, each rated at 90,000 kW; total installed capacity for the plant is 360,000 kW.

Ignoring the two Bear Creek plants, whose generating capacity

has never been available for public consumption, the six generating plants on the Skagit and its Baker River and Newhalem Creek tributaries have a total generating capacity of 774,800 kW and an average annual output of 3,106 gigawatt-hours (millions of kWh). This output represents 17.8 percent of the total 1965 power demands for the Puget Sound area—17.407 gWH. This statistic becomes more significant when it is discovered that, in that same year, the Puget Sound area produced a total of 5,324 gWH, and had to import the balance, 12,083 gWH, from sources outside the area.

In terms of Puget Sound area production, then, the Skagit basin produced 58.3 percent of the "home grown" electric power.

The Puget Sound area still has a large number of potential hydroelectric sites suitable for development. Several such sites are under active consideration at the present time. Four are located in the Skagit River basin.

The Copper Creek Dam, for which Seattle City Light has been ordered to seek approval, is located outside the study area, at Copper Creek on the Skagit River. It would have an installed capacity of 83,000 kW which would be fed into Seattle City Light's system. Proponents of the dam claim that it would effectively regulate the

diurnal fluctuation from the upstream dams, aiding the Skagit fishery by stabilizing flow. If this allegation is true, the dam probably would not be incompatible with the classification of the Skagit River as a component of the National Wild and Scenic Rivers System, assuming no other adverse impacts.

Thunder Creek is a proposed project of Seattle City Light to divert the flow of Thunder Creek from Diablo Lake to Ross Lake, increasing the output of the Ross plant by about fifteen percent. Application was made to the FPC on August 14, 1967. This proposal is completely outside the study area and would have no effect on classification potential.

The Cascade Dam is under investigation by Seattle City Light. The dam would divert water from the Cascade River to the proposed Copper Creek powerhouse generating 60,000 kW of power. Classification of the Cascade River as wild, scenic or recreational would preclude this project.

A multiple-purpose storage project on the lower Sauk River has been given preliminary study by the Corps of Engineers. However, detailed feasibility investigations required for project authorization have not been conducted. The project, defined in preliminary studies, would have an installed capacity of 96,000 kW of electric power and would contribute

significantly to flood control in the lower Sauk and Skagit River valleys. Classification of the Sauk River as wild, scenic or recreational would preclude the construction of this dam and thereby forego the best opportunity for achieving substantial flood hazard reductions and increased hydroelectric power production in the Skagit Basin.

There are six other hydroelectric sites in the Puget Sound area which are under active consideration. The six projects would produce a total of 194,000 kW of power. Completion of these projects would in no way interfere with the potential of the Skagit system for inclusion in the National Rivers System.

There are nine proposals in the Puget Sound area for additions to existing hydroelectric installations. These proposals would have an installed capacity of 407,520 kW. Three of the proposed projects are within the Skagit River basin, but none fall within the study area. All three proposals appear compatible with the terms of the Wild and Scenic Rivers Act, and none of them would affect the Skagit's eligibility for inclusion in the system.

In addition to the foregoing potential structures, one hydroelectric site with a potential average annual output of 9,350 kW, and nine sites with a potential average annual output in excess of 10,000 kW would be pre-

cluded by inclusion of the entire study area in the Wild and Scenic Rivers System.

Puget Sound Power and Light has recently announced plans to install a nuclear generating facility north-east of Sedro Woolley near Minkler Lake. While outside the study area, this facility would withdraw 50 cfs of water from the Skagit for cooling. A preliminary review of the project's Environmental Statement indicates that no adverse effects to the Skagit would occur. The facility would generate 1,000 megawatts (million watts) of electricity.

### Navigation

The Corps of Engineers lists the Skagit River as navigable from its mouth to Marblemount—a distance of 78 miles. This gives the Corps authority over any change affecting the river channel.

As discussed in the history portion, the Skagit was opened to steamboat navigation above the town of Mount Vernon in 1879, coincidental with the Skagit gold rush. Although the gold rush was unproductive, steamer traffic flourished. The head of navigation under normal flow was Marblemount, but in 1903 the river steamer *Black Prince* recorded in its log a journey upstream to a point one mile above Bacon Creek, where it delivered a load of machinery to the Old Talc

Mine. Several unsubstantiated reports of other stern wheelers moving this far upstream exist. Consequently, the entire Skagit River within the study area boundary has been successfully navigated by commercial vessels.

Once the first wave of settlement had subsided, and a series of roads and railroads was constructed, river traffic dropped sharply. Rafts of logs formed the majority of commercial traffic on the river, and even this commodity decreased in volume each year. By 1964, residents of Mount Vernon and Sedro Woolley reported to the Northwest Regional Task Group that no barge or raft traffic had occurred "for several years."

For all practical purposes, commercial traffic on the Skagit has ceased. There is no history of commercial navigation on the Sauk, Suiattle or Cascade Rivers.

Virtually all river traffic within the study area presently consists of pleasure craft. There is a wide variety of such craft in use, ranging from the blunt-nosed, flat-bottomed, broad-beamed guide boats which are powered by outboard motors in the 30 to 50 h.p. class, down to fragile canoes and kayaks. The majority of craft plying these waters are guide boats and conventional runabouts. There seems to be a slow-but-regular growth in the number of canoes, kayaks and even inflatables on the

river, however.

There are no marinas or boat liveries within the study area. All traffic on the river is either personally owned and operated, or rented—along with the services of a fishing guide—for the day. All craft must be trailered or car-topped to the river, dumped in, and removed again at the end of the excursion.

Three pleasure boat docking facilities lie outside the study area. The first is located in the town of Mount Vernon, where several boats are moored to a floating dock built in the Skagit. Farther downstream, about two miles above the Skagit's mouth, Phil's Boat House and Al's Landing provide private moorage and launching facilities. Here and there in the portion of the Skagit downstream from the study area, individual boats are moored to pilings in the river; however, these personal facilities are unavailable to the general public.

Within the study area, a small number of personal docks have been built either for moorage or as launching/fishing platforms. Nearly all of these have been constructed without securing the necessary permit from the Corps of Engineers required for those facilities constructed on the navigable portion of the Skagit River, i.e., from its mouth to Marblemount. Technically, these structures are illegal and their removal could be required.

## Fisheries

The Skagit, Sauk, Suiattle, and Cascade Rivers comprise the largest drainage basin in the Puget Sound area. Within these study rivers, a wide variety of fish abound. The anadromous fish population includes five species of Pacific salmon (Chinook, Coho, Pink, Chum, and Sockeye) plus summer and winter steelhead, sea-run cutthroat, and sea-run Dolly Varden trout. The more important resident (non-migrating) fish are rainbow trout, cutthroat trout, Dolly Varden, brook trout, and whitefish. Lesser-known species include stickleback, shiners, sculpin, and squawfish.

A large commercial fishery is dependent on anadromous fish spawned in the study area. This commercial fishery is centered in Puget Sound. Pacific salmon species are the most important component of this fishery. Commercial fishing contributes the primary income for many people residing in central Puget Sound.

Sport fishing is another important aspect of study area fisheries. Anadromous and resident fish alike are sought by sport fishermen. Fishing success is high because, in addition to the resident fish population, there is always some species of anadromous fish in the waters. The majority of the sport fishing activities on the Skagit and its tributaries occur within the study area.

The Skagit River is the single most productive steelhead river in the State. During the 1967-71 winter seasons the Skagit produced an average of 20,000 "Ironheads." The other study rivers produced 1,500 for a Skagit basin total of 21,500 fish.

The economic value of the Skagit basin steelhead run is significant. A 1963-64 study conducted by the State Game Department found that the cost of an artificially propagated steelhead was \$4.00 in the angler's creel. That same steelhead, however, was found by a 1969 survey to have a total value of \$60.00 to the State's economy, representing the angler's investment in equipment, food, lodging, licenses, transportation and associated fishing expenses.

The steelhead production of the Skagit basin can, then, be credited with contributing \$1,290,000 to the economic well-being of Washington State during an average season.

Other anadromous fish represent a much greater economic return to the State, since they (salmon) are subject to commercial harvest and sale. The Washington Department of Fisheries estimates the annual production of salmon from the Skagit River to have a total value (both commercial and sport) of \$7,842,034 in even-numbered years when the pink salmon runs do not occur, and a value of \$16,945,394 in the odd-numbered years when the pink sal-

mon run. The Department stresses that these values are attributed solely to fish produced naturally in the river; that is, the value of fish produced in state-operated hatcheries is not included in this figure.

Fish enter and spawn in the river throughout the year. Two species are divided into distinct "runs," spring and fall Chinook salmon, winter and summer steelhead. The other species enter the river during a distinct annual season. Once the fish enter the Skagit, practically the entire length of the study area is used for spawning.

Although fish from the study area have been taken as far south as central California and as far north as Alaska, study area rivers contribute principally to the commercial fishery on Puget Sound and the Washington coast. Coastal commercial fishing is conducted from troll boats using hook and line. This method is quite expensive. In 1965 Washington licensed over 1,800 troll boats. In Puget Sound most of the commercial harvest is taken by purse seine and gillnet boats. In 1965 there were 400 purse seine and 906 gillnet boats licensed in Puget Sound. Table III-11 shows the average yearly commercial salmon harvest between 1935 and 1965. In addition, an unlicensed Indian fishery takes a large number of fish in Puget Sound. In the Skagit River fishery the Swinomish Indians use a variety of fishing gear to con-

duct their fishing operations. They net all five species of Pacific salmon, and also harvest a sizeable steelhead catch. The Indian fisheries, under a recent court ruling, are allowed 50% of the salmon run each year.

In addition to the winter steelhead runs, the Washington Department of Game has initiated a large restocking program aimed at establishing a summer run. Initial returns have been good, suggesting that a healthy new fishery is close to establishment.

Near the mouth of the Skagit River, there is a moderate commercial fishery. Gillnet vessels are used almost exclusively. The most heavily fished areas are in northern Skagit Bay, Rosario Strait, and the southern half of Samish Bay. A few purse seiners fish near William Point in Samish Bay.

**TABLE III-11 AVERAGE ANNUAL<sup>1</sup> COMMERCIAL SALMON CATCH, 1935-1965**

Management Area	Numbers of Fish					Totals <sup>3</sup> (1000- Rounded)
	Chinook	Coho	Pink <sup>2</sup>	Chum	Sockeye	
Strait of Juan de Fuca	3,571	107,983	352,357	1,111	18,759	483.8
San Juan Islands	6,175	80,292	2,002,466	23,777	746,527	2,859.2
Point Roberts	13,971	49,227	1,073,817	22,971	548,098	1,708.1
Bellingham Bay	6,283	22,900	26,844	28,100	—	84.1
West Beach	3,012	26,857	317,154	50,265	50,310	447.6
Skagit Bay	22,751	31,333	157,814	53,976	1,132	320.8
Port Susan — Port Gardner	4,227	49,551	284,129	39,493	—	377.4
Seattle	302	22,259	—	31,912	—	54.5
Port Discovery to Kingston	1,599	40,102	181,749	164,328	—	387.8
South Sound	977	11,054	—	41,187	—	53.2

<sup>1</sup>Excludes landings of less than 100 fish.

<sup>2</sup>Includes Indian commercial landings, but not tribal personal use landings.

<sup>3</sup>Odd-year average only.

SOURCE: Appendix XI, PS&AW

The sport salmon fishery supported by the Skagit is the largest in Puget Sound. Spring and fall Chinook, Coho and Pink salmon contribute to this fishery. Many fish in excess of 50 pounds are caught each year. The Skagit fishery is exceptional not only because of the size of the runs, but also because they are of long duration, and in a river system well-suited to both boat and shore fishing.

Although the life cycles of the various salmon and trout species vary somewhat, they are similar enough to be discussed in one generalization, as can certain threats and limits to their successful propagation.

Whether in the spring or fall, the female constructs a depression in coarse gravel agitated by the current. She digs the depression by rolling on her side and flexing her tail three to ten times; the suction of each flexion draws gravel upward where the current moves it downstream. After the eggs are deposited in the nest and fertilized by the male, they are covered with gravel and left to develop. Incubation takes from three to seven months, depending upon the species involved and the water temperature.

Some species—pink salmon and chum salmon—migrate downstream to the sea as fry, returning again only to spawn and die. Coho and Sockeye salmon spend one or two years in the stream before migrating, and Chinook

three months to a year. Trout may spend their entire lives in the stream, or may migrate to the sea after one to three years of growth.

Whatever the migratory habits of the species involved, streams must meet the same criteria in order to provide suitable spawning grounds. First of all, spawning areas must be accessible to adult fish moving upstream. Then, the stream must have a relatively constant flow curve, particularly during the summer. Clean, stable gravel from one-half inch to six inches in diameter must be exposed on the streambed. Cover, in the form of logs, undercut banks, rubble, turbulence, substrate, deep pools, and overhanging vegetation, must be present. Water temperature should run in the fifties, and not exceed 77° F., with a dissolved oxygen content no lower than 7 mg/l and ideally near the saturation point. The stream should be free enough of suspended sediment to allow photosynthesis in the substrate. In view of these many limiting factors, it is obvious that a great number of external stimuli can adversely affect spawning beds.

Changes in the current flow can wash away old spawning areas. Deteriorating organic debris drastically reduces the available levels of dissolved oxygen in the water by the actions of fiber-consuming bacteria, and by the chemical oxygen demand of wood sugars leached from the wood. Decomposing debris also stim-

ulates algae growth, which increases oxygen consumption.

Another deterrent to fisheries is streamflow fluctuation. All of the study rivers are subject to seasonal floods and low water flows. These two conditions are particularly damaging to spawning areas. During high water, unhatched eggs are washed out of their beds or covered by rubble. High water also kills young fish by excessive siltation and by stranding them on gravel bars. Low water causes the loss of incubating and rearing habitat. Sometimes the high-low flow combination results in starvation, predation, and higher disease rates.

The diurnal fluctuation caused by upriver dams creates problems which are very similar to those experienced during seasonal high and low water conditions. These fluctuations occur twice daily. They are caused by the demand for more electrical power during daylight hours, when most of the population is active. To provide this power, the upstream dams must run more water through their turbines. The extra water causes a substantial rise in the downstream water level on the Skagit. As the demand for peak power subsides and the upstream dams cut their flow, downstream water levels fall rapidly. These fluctuations probably have more impact on the Skagit River fishery than do the greater, but more gradual fluctuations caused by seasonal floods and droughts. Diurnal fluctuation has at least two adverse impacts on all fish

propagating and rearing areas. Peak water flows cause siltation and flushing. Siltation is dangerous since it can bury incubating eggs under mud and suffocate them. Flushing can wash away gravel on the stream bottom, eradicating a suitable incubation site. The rapid decrease in water flow strands millions of salmon fry in tiny shallow water pools, or on gravel bars, where they are consumed by fish-eating birds which thrive along the river. River residents have reported observing mergansers in particular, flocking to the river as the peak flow subsides. The birds gorge themselves on the salmon fry left flopping on sand bars, or trapped helplessly in shallow pools.

Although water quality throughout the study area is generally good, there is some domestic and industrial pollution of the Skagit and Sauk rivers. All of these conditions have a limiting effect on fish production.

Physical barriers also have an impact on fish production. Barriers block access to large areas of good spawning habitat, which, could they be used, would increase the fish population considerably. Barriers may also block the passage of smolts (young fish bound for the sea), reducing the magnitude of the fishery despite available spawning grounds. These barriers are both man-made, such as the dams on the Baker and Skagit rivers, and natural, as are log jams or the falls on the North Fork of the Sauk River.

Water removal from the rivers for municipal, industrial, or agricultural purposes poses a potential threat to the fishery. Drastic increases in such withdrawals could conceivably decrease the water flow to the point of damaging fish habitat.

Shoreline development frequently results in demands for channeling and diking the river. Channelization and diking cause the loss of spawning habitat by straightening and narrowing the river, which means destroyed gravel beds. The removal of gravel from streams for construction purposes also destroys productive spawning sites.

The demand for fish continues to rise in the Pacific Northwest. If properly controlled and developed, the Skagit River can play an increasingly greater role in meeting that demand.

### *Wildlife*

A wide variety of wildlife inhabits the Skagit River basin. The wildlife population is divided into five categories: big game, upland game, fur bearers, waterfowl, and unique species. Black-tailed deer, bear, mountain goats, and mountain lions are included in the big game category, while pheasants, quail, partridge, rabbits, pigeons, and grouse constitute upland game. Fur bearers which inhabit the area include beavers, muskrats, minks, river otters, marten,

mountainous regions. Marten and lynx are found in the high rugged headwaters of the Sauk and Skagit rivers. As with all species these habitats are not definite areas but vary with season and food supply.

Most fur-bearers require a water oriented, marsh-type habitat. This habitat occurs most often along the flood plain in lowland waterways, where man's activity is most obvious. Drainage and diking projects have destroyed prime habitat, and constitute the number one limiting factor.

Ducks are divided into two subgroups: Dabbling ducks (mallard, teal, pintail, widgeon), and diving ducks (scaup, bufflehead, and scoters). Dabbling ducks use the tidal zone near the mouth of the Skagit for resting, and do their feeding inland. The diving ducks spend their time on the Sound or on larger inland lakes where they find an adequate food supply. Species which commonly nest along the Skagit and its tributaries include mallards, wood ducks, western harlequins, hooded mergansers, American mergansers and an occasional Barrow's goldeneye.

Snow geese and Western Canada geese spend their resting periods in open salt-water bays and feed in the tidal zone. Brant geese spend their entire lives on salt water. They depend heavily on submerged eel-grass beds for survival.

The Skagit-Samish delta, including Skagit, Samish and Padilla Bays, is the most important waterfowl wintering site on the West Coast of the United States. It is the only place in Washington where snow geese winter.

Since large salt-water bay resting areas are available, waterfowl populations are primarily controlled by the amount of food present. Recently, in Skagit Valley, the trend has been away from cereal grain production. This condition, plus diking and drainage of marsh lands, has decreased the food available to water fowl. Present farm crops are peas, and sweet corn, which leave very little waste.

Hunting is concentrated in Skagit, Padilla, and Samish Bay. Later in the season much hunting takes place on the Skagit River itself.

The limiting factors for big game are loss of habitat and weather conditions. Unlike fisheries, artificial propagation programs cannot be successfully applied to big game management—any increase in numbers must be generated by a corresponding increase in available forage.

The two most numerous upland game birds in the basin belong to the grouse family. The ruffed grouse frequents the woods along streams and lakes, as well as woodlots near agri-

cultural areas. The blue grouse, on the other hand, prefers open ridges and sparsely timbered areas.

The ring-necked pheasant was introduced to the basin to fill the need for an open space game bird. The pheasant inhabits fence rows and edge areas near agricultural lands. Except for a small acreage on the Sauk River near Darrington, all pheasant range within the basin occurs along the Skagit River.

California quail, which inhabit Pleasant Ridge on the North Fork of the Skagit, were introduced to fill the same needs as the pheasant; they provide good, but limited, hunting.

Two species of rabbits utilize every type of vegetative cover in the basin. The cottontail is abundant on and near agricultural lands, while the snowshoe inhabits upper elevation forests.

Upland game birds are greatly affected by changes in agricultural practices. Conversion in recent years from cereal crops to specialty crops, and an increasing use of insecticides, has lowered these populations. Reduced damage from forest fires and a curtailed slash burning program has reduced the habitat for most upland game. The general encroachment of man on the natural habitat of upland game has reduced the land's total carrying capacity for

wildlife.

Since much of the upper Skagit basin is still in a near-natural condition, fur animals of all types abound. Beavers, muskrats, mink, raccoons, and river otters live along water courses throughout the study area. Lowland varieties include skunks, opossums and red foxes. Bobcats and coyotes inhabit the foothills and weasels, skunks, raccoons, opossums, bobcats, lynx, red foxes, and coyotes. Waterfowl include dabbling ducks (mallard, teal, pintail, and widgeon), diving ducks (scaup, bufflehead), snow geese, Western Canada geese, lesser Canada geese, and Brant geese.

There are three unique species; whistling swans, trumpeter swans, and bald eagles.

The black-tailed deer is the most populous big game animal in the basin. Brush and forest lands are the primary zones of deer concentration. As a result, the entire basin, except for urban and intensively farmed areas, provides deer habitat. Shrubs and small plants, the principal deer food, need sunlight to grow; consequently, logging is an important factor in maintaining the population. Snow depth has the greatest effect on the availability of winter forage. Because of extensive snow pack at high elevations, most deer winter below the 2,000-foot level. Since 63%



of the Skagit basin is below the 2,000-foot mark, it is well suited for deer production. The majority of low elevation winter range is located adjacent to the study rivers.

Black bear, like deer, inhabit woodland areas. Their ability to hibernate makes their winter food supply less critical. Still, the highest concentration of bears occurs at lower elevations where the weather is mild and food more abundant. Logging plays an important role in bear production, as it increases the ground vegetation so vital to a substantial bear population. Again, prime habitat is found along the study rivers.

Mountain goats require steep rocky slopes producing year-long forage. Because of their specific habitat demands, mountain goats are not widespread. Areas inhabited by goats in the Skagit basin include the headwaters of the Sauk, Suiattle, and Cascade rivers.

Elk are seldom found in the basin. A small resident herd is located on the south slopes of Mt. Josephine, near the town of Hamilton.

Mountain lions require large areas to roam for food. The high, remote areas of the basin provide the seclusion they need. A stable population of 15-20 of these rare creatures is estimated for the entire basin.

The Trumpeter Swan winters in the marshy, fresh water areas near Nookachamps Creek. The Whistling Swan makes its home near the brackish sloughs around Skagit Bay. Bald Eagles are found most often in the middle flood plain of the Skagit River. The eagles prefer secluded nest sites, but they must be near areas of ample fish production.

The most important limiting factor for these birds is loss of habitat. These species are, ecologically, very fragile, and their relationship with nature is balanced to such a fine degree that any outside influence can have very dire consequences on their odds of survival. Draining marshes, logging, and the general encroachment of man have thinned the ranks of these species. In recent years, because of an increased awareness on the part of the general public, the birds are making a comeback. However, their habitat in the basin is far from secure. Through encroachment, pollution, or physical intrusion, man could easily decimate the small flocks which still populate the basin.

### *Timber Management*

To determine the effect of classification on forestry practices adjacent to study rivers, it was first necessary to establish a specific area within which the effects would most likely be contained. This area was determined to be the same as the overall

study area. Boundaries of the study area were laid out by legal description; paralleling study rivers at a distance of roughly one quarter-mile. Silvicultural data was then gathered for the lands lying within the study area boundary.

Within the nearly 53,000 acres of the study area, almost two-thirds—38,510 acres—is classified as operable commercial forest land. The balance—13,280 acres—is inoperable due to topography, unsuitability as a growing site, or existing developments (roads, buildings) which preclude any silviculture.

Operable forest land has been placed into four different ownership categories: The U. S. Forest Service, the State of Washington, private timber companies and other (small tract holders). Total acreage in each category is:

Forest Service	13,840
Forest Industry	10,110
Washington State	590
Small Tract Holders	13,970

In their April 1972 Forestry Interest Report, the Industrial Forestry Association makes the following projections about the non-Federal operable forest lands within the study area:

- a. Average annual yield per acre is 700 b.f. for conifer lands, 1,000 b.f. for cottonwood stands and 500 b.f. for alder lands.

b. Only one-fourth to one-half the land owned by small tract holders will be kept in timber production through the year 2020.

c. Annual timber harvest for the period 1972-2020 will average 12 million board feet; 3.5 million of conifer and 8.5 million of hardwood, from non-Federal lands.

d. After 2020, annual harvest will drop to an average 10.5 million board feet; 5.5 of conifer and 5.0 of hardwood, due to the conversion of suitable sites to conifer production and to the conversion of timberland to other uses.

The greatest danger involved in attempting to place realistic limits on timber harvest within the study area is the possibility that one factor, which, if isolated, seems negligible, could prove to be the breaking point: the practicalities of cost accounting are already forcing the subdivision and sale of some high-quality forest lands within the study area. Care should be taken to design limits or guidelines which protect the river environment without unduly raising the cost of timber harvest in the study area.

Properly controlled, forestry—including timber harvest—is one of the most compatible resource uses within the study area. Management guidelines, and restrictions included in scenic easements, should be de-

signed to encourage the practice of silviculture within the study area to the greatest permissible extent. The occasional harvest of a tree crop is eminently more desirable than the conversion of forest land to high-density recreation cabin tracts.

### *Recreation*

In the 20-odd years since the end of World War II, the demand for outdoor recreation in the nation has continually increased, normally at a rate in excess of the increase in population. With its unique combination of mountains, ocean beaches, sparkling trout streams, and such outstanding salmon and steelhead fisheries as the Skagit River, the Pacific Northwest has had to provide outdoor recreation areas, not only for its own outdoor oriented population, but for the annual influx of tourists from all over the nation.

The State of Washington has borne its proportionate share in this erupting recreation demand. Despite an aggressive facilities development program, a 1968 State study determined that the State needs to more than triple its existing facilities to meet demands of the year 2000. Around Puget Sound—one of the most heavily used areas for outdoor recreation—a Federal study projects that demands will increase by 100 percent of the 1960 facilities level every decade.

The Skagit River Basin has not been insulated from the burgeoning outdoor recreation demand. Available figures indicate that the growth of recreation facilities and recreation demand have roughly paralleled these entities on a State-wide basis. Estimates by the State of Washington indicate that recreation demand within the basin will increase by approximately 100 percent of the 1960 level each decade. The State predicts a basin recreation day demand for the year 2020 of 27,500,000. It should be noted that this demand will be increased by recent activities of the National Park Service in the North Cascades National Park, which should significantly increase the number of Park visitors by the year 1975; the completion of the North Cascades Highway, which will put an as-yet-unpredicted number of additional tourists directly into the Skagit River Basin every summer; completion of the Mountain Loop Highway, which will induce one-day and weekend traffic from the Seattle metropolitan area to travel through the basin; and the possible classification of the Skagit River system under the Wild and Scenic Rivers Act, which would tend to draw visitors to the river itself. For the Skagit River basin, then, this 100 percent increase in demand per decade may be conservative.

In their recent State-wide Comprehensive Outdoor Recreation and Open Space Plan, the State of Washington identified 25 different kinds of

recreation activities for which persons go outdoors. All 25 of these activities are available in Skagit and Snohomish Counties. Seventeen of the 25 are available within the narrow corridors of the Skagit River study area.\* This fact clearly underlines the recreation potential of the Skagit River system and shows how effectively the Skagit could be used to meet total recreation demand of the two counties.

The existing recreational development along the study area is surprisingly low. There are 16 campgrounds on National Forest lands with a total persons-at-one-time capacity of 1080; these augmented by numerous campgrounds further away from the river which may either be located on some tributary of the study rivers or in a non-water oriented spot. There are seven State of Washington boat launch and fishing sites within the study area in addition to Rockport State Park, which is 447 acres size and has 20 camp units. In addition, the county has a small park at Rockport, appropriately named Steelhead Park since its principal function seems to be as a campsite for winter steelheaders, although it is frequently used in the summer too.

\*Bicycling for pleasure, driving for pleasure, swimming, walking for pleasure, visiting local parks, fishing, boating (power), boating (other), horseback riding for pleasure, picnicking, sightseeing, camping, water skiing, hunting, hiking, rock bounding, other

Commercial recreational development is strangely absent within the study area. With the exception of a small tackle and bait shop at Rockport, no one in the basin seems to have, as yet, viewed the river as a commercial resource. There are no boats or canoes for rent, no resorts, no regularly scheduled tours—nothing but the Skagit River guides who, for about \$75.00 a day will take a boatload of sportsmen out to sample the Skagit's fantastic winter steelhead fishing. Thus far, the only commercial development on the Skagit has been the wholesale development of recreational subdivisions along rivers; these have been abundantly active, particularly in the past decade. There are 22 subdivisions within the study area. Most of these have at least some cabins built, and some, like Cape Horn, are extensively developed. By and large, the developments are within the 15, 25 or 50-year flood plain.

Luckily there are still a great number of potential recreation sites within the study area. Any piece of land which is as yet undeveloped and lies within the 25-year flood plain usually is suitable for development as a picnic ground, campground, boat launch site, or other facility. Along the upper reaches of the river, where the banks are steep and permanently located, land is more suitable for the development of permanent facilities such as cabins, homes and resorts.

Both county and state planners have verbally confirmed that the planned control of recreational subdivision expansion within the study area is a desirable goal. Whether or not classification under the Act is able to control this activity, it should serve to encourage commercial investment in other recreational facilities, which presently are non-existent.

The commercial development of the Skagit River and its tributaries has a highly profitable potential. The scenery, which is above average even for the outstandingly beautiful Pacific Northwest, approaches the "fantastic" level for flatland easterners. The upper reaches of the Cascade, Sauk, and Suiattle rivers are fast flowing white water rivers in the boulder zone, and provide numerous opportunities for miniature scenic adventures and audio-visual water contact. Further downstream, as the rivers begin to level out, they provide the opportunity for white water kayaking and canoeing, as well as for some excellent trout fishing during the warm summer months. From where the three rivers join the Skagit, and on the Skagit all the way from Bacon Creek down, the waters are wide and deep. The scenery is still outstanding, yet along here even a novice can navigate a canoe or small rowboat with no great danger of overturning, provided customary river safety rules are observed.

During the Memorial Day-Labor Day vacation period, campgrounds in the basin are busy and normally full to overflowing. These facilities are mostly located on ocean beaches and slack-water impoundments. Consequently, one can canoe down the Skagit during the summer, as members of this study team have done, and rarely see another craft on the water.

A small number of white water enthusiasts such as kayakers, and canoeists utilize the rivers of the area as a site for floating recreation. Certainly, as greater numbers of the public "discover" this sport and as commercial support facilities become available, more people will be spending more time floating down a river.

### *Mining*

Despite the glittering promises of the 1879 gold rush, mining—that is, the extraction of metallic minerals contained in a crude ore—has never been a significant factor in the economy of the Skagit basin. This is not to say that gold, silver and the other glamorous metals do not exist in the basin, but rather that no technology has yet evolved which can profitably produce them.

There are three main factors which combine to discourage utilization of the basin's metallic mineral deposits.

First, the metals are contained in complex quartz ores which present severe extraction problems. Second, most metallic ores are found in the high Cascades, a remote, rugged terrain with a short working season and no roads. Finally, the same minerals are present in more profitable quantities elsewhere in the nation; this holds the price below the profit margin for any modern mining operation which could be developed.

One recent exception to the above is gold, whose recent price climb may revive interest in some of the abandoned gold mines in the basin.

The Bureau of Mines, U. S. Department of Interior, classifies most of the metals in the Skagit basin as "potential future sources," meaning that their successful utilization must await increased prices, improved technology or better access. Among these "future sources" are estimated deposits of 4.8 million ounces of gold, 149 million ounces of silver, 609,000 tons of copper, 1.1 million tons of lead, 320,000 tons of zinc, 9,000 tons of cobalt, 70,000 tons of molybdenum, 510,300 tons of nickel, 190,000 tons of iron and 5.8 million tons of arsenic.

Despite these sizable deposits of metals, it is the unglamorous non-metals which have been the backbone of mining activities in the Skagit basin. Since the first "boom" in the 1870's, only \$2.5 million of

metals have been produced, while non-metals totalling over \$130 million have been removed during the same period.

Unlike the metals, which are mostly located in the rugged headwaters of the basin, the non-metals are found in the more accessible lower valley. Foremost among these deposits is limestone. The quarry at Concrete produced cement for 61 years, and while presently out of operation due to economic pressures, the quarry still boasts a reserve of 20 million tons of top quality limestone. Total limestone reserves for the basin are estimated at over 1 billion tons.

Since the closure of the limestone quarry in 1968, sand, gravel and stone have become the principal minerals in the basin. Talc-soapstone is also mined, but on a smaller scale. Other minerals removed in small quantity include silica, asbestos, travertine, pumicite and serpentine.

Sand and gravel valued at over \$9 million has been mined near the Skagit River around Mount Vernon, Burlington and Sedro Woolley. These operations continue today and, while they may occur close to the river channel, little if any withdrawal is made from the streambed.

Another significant non-metallic mineral mined in the basin is stone.

Over 9 million tons of basalt and related rock, valued at some \$15 million, have been quarried for use as ballast and riprap.

Other non-metals are mined on a part-time basis, or during peaks in the market. As a whole, their contribution to economic activity in the basin is minor.

Under PL 90-542, the Bureau of Mines made a preliminary study of mineral resources in the Skagit River drainage. The purpose of the report was to determine whether classification of the Skagit and its tributaries would affect mining activity in the basin. Their report finds that the Skagit basin is an area with mineral potential, but that "No mineral deposit presently being mined, with the exception of sand and gravel deposits along the upper drainage, would be affected by the inclusion of the Skagit River in the Wild and Scenic Rivers System. However, any classification which has the effect of limiting access would stop the development of new deposits, and mining would cease with the working out of accessible deposits."



**APPENDIX**

**C**

## VISUAL RESOURCE

The *Visual Resource* is the world we see around us—water, land, sky, plants, animals, and artificial objects, like buildings, fences, roads, towns and cities. What we “see” is colored by what we have seen in the past, what we see now, and what we expect to see in the future. It is a collection of our visual impressions from infinite points of view.

How can we begin to realize the value of seemingly unlimited reserves of natural beauty? If we are able to interpret what we see, if we can understand what we see, then we can identify the many different values which combine to make up the visual resource. And understanding should naturally lead to protection, since, as we shall see, the visual resource in the Skagit basin is a treasure.







Moving through the scenery within the river basin one can sense an apparent harmony among all the natural elements, ground forms, rock formations, vegetation and even animal life. The river basin has a naturally produced landscape character. Replenished by the eternal snows of the North Cascades, high above the Puget Sound lowlands, it carries the trickles and torrents from hundreds of glaciers, from rain-laden clouds, on down through magnificent forests of Western redcedar and Douglas-fir; down into alder, cottonwood, willow and big leaf maple stands, into the valley floors spreading, moving, changing, flowing with the seasons, seaward.



Eagles, osprey and heron, salmon and steelhead, marmot and mountain goat, mallard and merganser are part of the scene; and man as well, who lives among these and depends upon the intricacies of this complex and infinite natural scene. There is a feeling of dynamic, continuing completeness to it, a delicately implicit harmony. This is its landscape character.

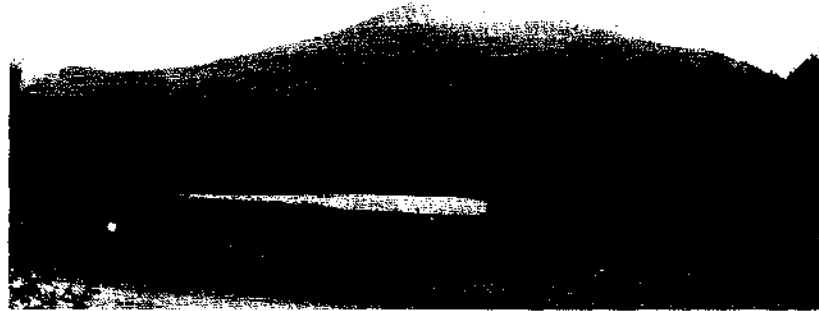




And it is of many kinds, from the broad scale sweep of the entire basin panorama to the close-up scrutiny of the fern shadow hiding a fawn track. It is the cottonwood canopied islands, the sloughs and backwaters teeming with tiny animal life, lush with spring greens, burnished warm in the golden tones of autumn, stark, grayed and silent in winter.



The river channels today are a distinctive landscape type as they were in the yesterdays that we can read in the river morphology—the terraces, the oxbows, the braided meanders, the youthful valleys, V-shaped and steep-gorged, hollowed, carved by the waters in constant obedience to gravity.



The channels have variety, like the wide, quiet "drifts" along the flood plain (drifts — meaning long, easy stretches of relatively calm, but constantly flowing current), like the fast waters, rolling and boiling with rapids and riffles, like the plunging, roaring falls, down deep inside the high country, gushing with foam and spray, roaring like diesel locomotives on a fast idle, squelching all other sound except maybe afternoon thunder.





This river is an experience. The compelling vertical scale of the mountain enclosure dominates all visual variety. From the broad sweep of the flat, level, grand expanse of the lower flood plain to the deep V-trenched bottom of the high country, the vertical enclosure is dramatically present. Whether from the river or the highway, the glimpses out "looking around" are always controlled by this vertical backdrop—either nearby (foreground), or far away (background). The visual frame of reference is always seemingly upward from the base plane, the valley floor. Emotionally we experience a sense of awe, respect for the majesty of the wild lands on the skyline.



"The finest coniferous forests in the world occur in this region of the Cascade Mountains" wrote geologists Don Easterbrook and Don Rahm. "Here, incredible peaks thrust skyward in such savage profusion as to provide a lifetime of challenges to the mountaineer."

Discussing the wonder of this region, naturalist Wolf Bauer wrote "Nowhere outside of Alaska is there a region within a state in which climate, topography and soil have produced river landscapes that are more esthetically and recreationally suited to the citizen's varied needs than those of the Puget Sound drainage basin. Not only are many of these streams scenic and environmental miniatures of the great wilderness rivers of the north country, but they form some of the most pristine landscaped ready-made park lands within commuting reach of millions.

Here, amidst these "incredible peaks," in this area of "ready-made park lands," flows the Skagit River.

The river setting is in two characteristic landscapes; the Northwestern Cascades type and the Puget Sound Basin type.

The character of the Northwestern Cascade type is one of sharp, jagged peaks and deep, steep-sloped valleys resulting from alpine glaciation. A striking topographic feature is the

uniform elevation of the main ridge-tops. Towering above this relatively even crest are two dormant volcanoes; Mt. Baker and Glacier Peak. There are several granite peaks of exceptional height. Glacial features are common, with hundreds of cirques; some peaks, ringed by cirques, have eroded to matterhorns. The vegetation is characterized by thick stands of Western hemlock, Douglas-fir, grand fir and subalpine fir.

The Puget Sound basin type reflects massive continental glaciation, which forms an area of low relief broken by low moraine ridge systems and rounded hummocks and many lakes. The typical vegetation includes Douglas-fir, Western hemlock, Western redcedar and grand fir. Some stands of lodgepole pine are found on moraine remnants.

These two broad landscape types are further subdivided into easily recognizable environments—Urban, Rural, Pastoral, Primitive and Wild. The five terms are natural; they fit the different levels of development within the Skagit basin. The transition is gradual and easily recognized—from the highly developed and heavily modified urban areas in the lower flood plain out into rural areas intensively managed for domestic crops, then merging into a pastoral sort of world which seems to be apart from anything else. Penetrating deeper into the upriver country there

is a more primitive atmosphere. Beyond this primitive threshold lies the wild country just beyond—upriver and on the skyline, deep in the North Cascades.

So now it is possible to define the five landscape environments.

Urban	Characteristic of a city
Rural	Open country, stripped of the forest cover, used for intensive farming
Pastoral	Mixed forest and farmland which feels simple, peaceful and "rustic"
Primitive	Land at an early stage of development, the forest predominates
Wild	Sparsely inhabited uncultivated lands still largely in a natural state

Although these five landscape environments occur throughout the river basin, future discussion about them will be limited to their occurrence within the "seen area"—that portion of the landscape which is visible from the travel corridor along the Skagit and its tributaries. The seen area is a visual corridor, perceived from any number of points along the bottom of the river valley which, for some viewers will be the road, for others the river. Because the individual's perception depends upon whether he views the landscape from the road or from the river, it is important to consider the presence of a dual visual perception corridor.

Driving in a car, on the road, a recreation traveler passes through varying landscapes as he moves up-river. From the lower floodplain, which is intensively-developed, he passes through an environment which shows less and less evidence of the works of man. His gradation of perceptual experience is preconditioned by the landscape environments he passes through on his way to any given point on the river.

The river traveler is in a different world, perceptually. Although the mountain backdrop is still present and still very important visually, the vegetation along the river channel confines vision to such a limited degree that travel on the river is perceived as mostly a back-country kind of experience. Much of the landscape modification which is apparent from the road is obscured from the low vantage point of the river. Some clearings, roads, cabins, farms and towns are obvious, but only at a limited number of points.

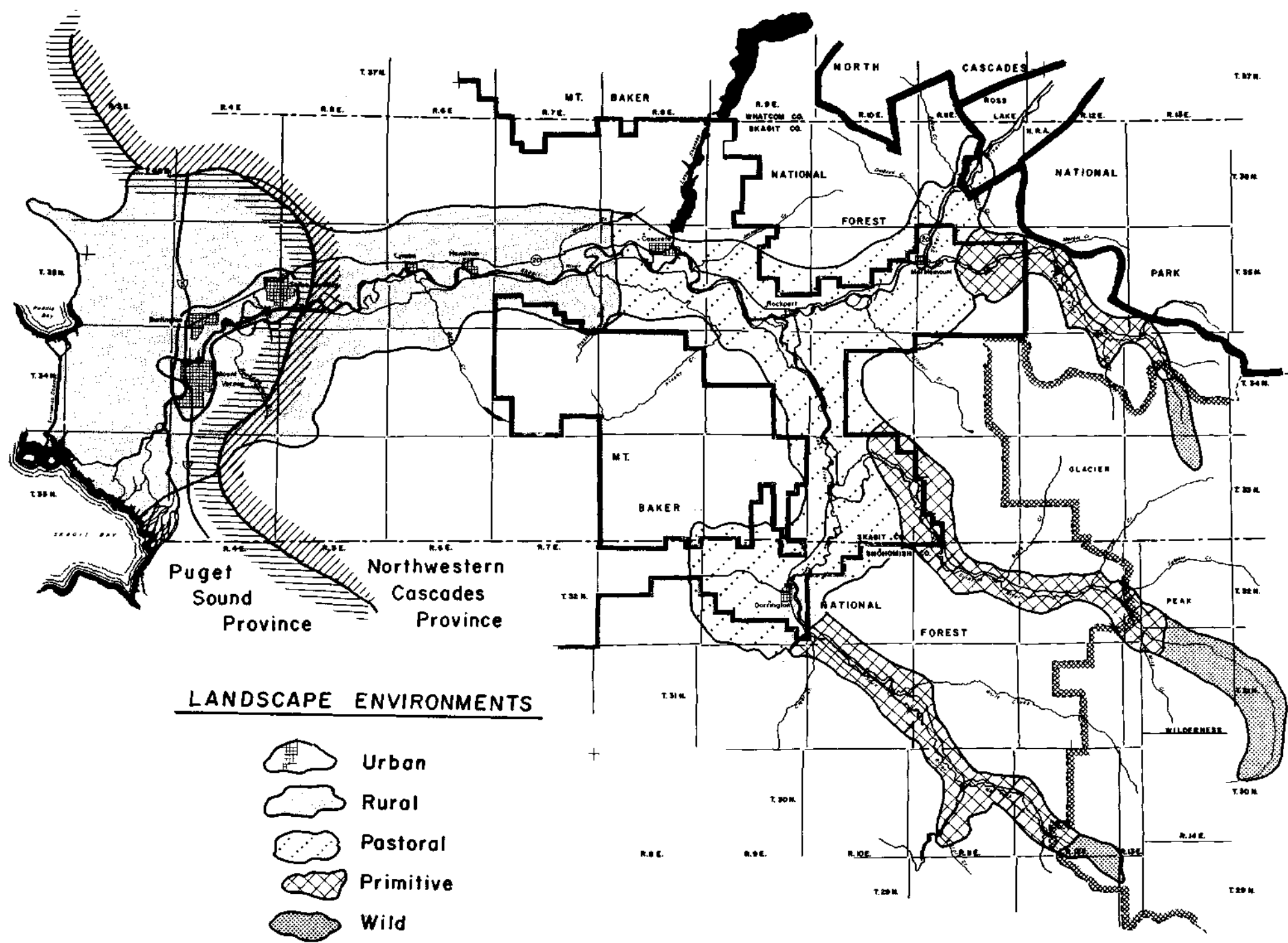
The river experience, then, is one of seclusion, as opposed to the urban-rural-pastoral-primitive-wild transition found along the road.

Because both modes of travel (river and road) can be experienced by the traveler, they are both important to identify and understand. The visual resource is perceived under one set of conditions from the river, under another set from the road. Both modes of experience are important to the total experience. Each experience has value—separate and distinct, yet interrelated.

To study these experiences it is necessary to go beyond the narrow limits of the Skagit River Study corridor— $\frac{1}{4}$ -mile on each side of the river. The visual resource must be considered on the basis of the seen area. The seen area is there, and it is visible; it cannot be made invisible. The following sectional sketches of the river environments will help display the realm of the seen area or visual corridor. They show the close-up and the distant views, the foreground, middle and background. They show both the man-made and the natural environments. The intensive use area is on the valley floor. The extensive use area is along the slopes of the hills and mountains which form the wall-like enclosure of the visual corridor.






The map shows the visual corridor, the characteristic landscape provinces and the five landscape environments.





Puget Sound Province Northwest Cascades Province

**LANDSCAPE ENVIRONMENTS**

-  Urban
-  Rural
-  Pastoral
-  Primitive
-  Wild

## URBAN ENVIRONMENT

The Urban Environment includes the cities of Burlington, Mount Vernon and Sedro Woolley, and the suburban areas that interconnect the three towns. The urban environ is an enclave within the larger rural settings. Since it is urban, it presents visually those things one would expect to see in a city; intensive, dense use of available land and air space in a built-up environment. The natural landscape is entirely subdued or modified beyond recognition, except that the base plane—the valley floor—is relatively unchanged. The river is rigidly contained between levees. Vision is dominated by buildings, streets, utilities, traffic, busy industrial activity and movement; here man is the master, in control, industrious, refined, useful, gregarious. The resultant psychological effect is one of a controlled landscape; one that is highly organized for human use and benefit, to the virtual exclusion of consideration for other natural processes.

The urban environment occupies a very small segment of the total study area—about 10 river miles.

There is a distinct high-density clustering of its visual elements, which contrast sharply with the rural setting from which they spring. This enclave is seemingly independent of, or developed in spite of, the natural landscape in which it lies. It bears no visual relationship to the natural landforms around it.

In the urban environment, natural elements are usually disregarded, or considered as nuisances or menaces. The river is a menace in this regard, since it will flood unless controlled.

The aerial photo on the next page illustrates some of the incongruities of the urban environment as it lies against the river, the mountains, and the adjacent rural environment.



**THE URBAN ENVIRONMENT  
SEDRO WOOLLEY  
LOOKING UPSTREAM**

## RURAL ENVIRONMENT

As the definition suggests, open country and farming typify this landscape environment. It occupies the entire lower floodplain to saltwater. The land is heavily modified and intensively used for agriculture. Structures, low in density, are associated with this kind of land use; farm and ranch buildings and homes. Residential units independent of agricultural uses appear amidst this farming backdrop. River frontage is occasionally occupied with residential units. But the valley floor is typically farmland; fields, fence rows, groves and woodlots, interspersed with a well-developed transportation network. The rural environment occupies about 30 miles of the study area.

The border of the rural environment is easily recognized on the ground—it is where the "open" country begins. Fields surround the urban environment. The visual elements are those we expect in a rural setting; fields of crops and forage, contained by fence rows and punctuated by barns, sheds and farm houses. Other visual elements include neighborhood milling, marketing and supply centers, roads, railroads, roadside stands and an occasional residential unit or, in some instances a residential subdivision. The dominant characteristic of the rural space is that the land is cleared of trees. Groves exist only around houses or in terrain which is unsuitable for cultivation. The land is worked hard—pushed for an annual crop.

Here the river is less significant, even hard to find.

The lower floodplain portion of this rural environment is typical of the Puget Sound province—low round hills on level glaciated plains. Moving upriver into the beginning of the North Cascades province, the foothills gain dominance, even though the valley floor is quite broad. Foot-

hills like Haystack Mountain and Mount Josephine act as visible portals to the North Cascades on the distant skyline.

No single photograph can present all of the visual elements of the rural environment. Some of these elements are presented in the following picture. Others will be shown later in this discussion.



THE RURAL ENVIRONMENT  
LYMAN VICINITY  
LOOKING UPSTREAM

## PASTORAL ENVIRONMENT

The word "pastoral" defines a feeling of idealized simplicity, peacefulness and apartness from the rest of the world. In the Skagit basin this emotional sensation begins in the general vicinity of Finney Creek - Cape Horn. The occurrence of cleared and cultivated land gradually gives way to uncleared tracts of woods and forest, with a consequent decrease in structural modifications of landscape. This sort of countryside evokes reactions of simplicity, peace, and oneness-with-nature. Man is still present, to be sure, but the density of production farmland decreases and is replaced with large tracts of forest and open lands; agriculture no longer dominates the valley floor as it does farther downstream.

The important visual feature of this landscape is the dominant presence of uncleared land intermingling with farmland and buildings. As noted above, this begins to become visible in the area of Finney Creek and holds true to varying degrees up the Skagit to beyond Marblemount, and up the Sauk to Darrington.

Another important visual factor is the increasing proximity of the mountain walls on both sides of the valley. They are closing in, tightening up the valley floor, making the river more frequently apparent. The middle and upper floodplains are narrower, hence the river is more dominant. This becomes obvious by studying the river-bottom vegetation

—cottonwoods—contrasted against the dark conifer background. Where communities exist in this realm they are subordinate to the overall visual tranquility of the environment.

Some of the emotional qualities of this environment are visible in the following picture, which shows the

Sauk River looking upstream from Sauk Prairie.

There are about 90 miles of river in the Pastoral Environment, presenting a rich variety of spectacular scenery contrasted against the exquisite variety and detail of the river foreground.



PASTORAL ENVIRONMENT  
SAUK PRAIRIE  
LOOKING UPSTREAM

## PRIMITIVE ENVIRONMENT

The natural-appearing landscape of the primitive environment is dominant along some 70 miles of study rivers. Except for a few settlements, vacation cabins and public recreation sites, this environment is only sparsely modified along the valley floor. Logging roads, heavily trafficked by fishermen, hunters, campers and other outdoorsmen, represent the chief modification of the landscape. Without these roads, this country could easily be perceived as wilderness — with or without any administrative designation.

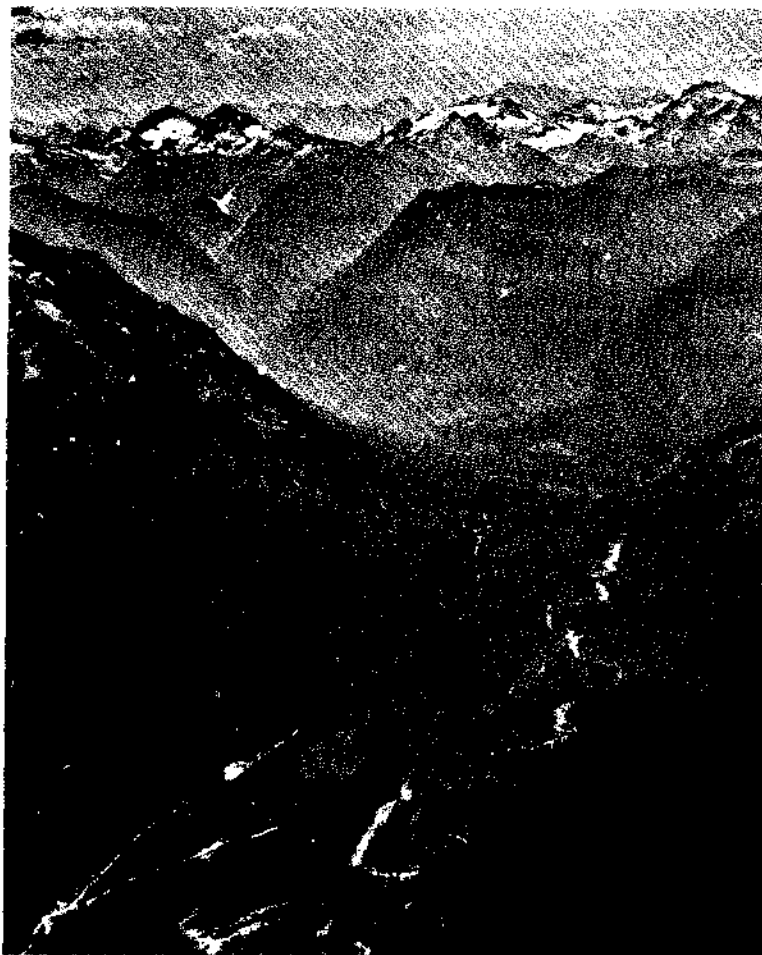
There is the overwhelming presence of steeply sloping mountains closing down on the riverbed. The strong vertical scale and upward orientation that the observer experiences is the significant element in the perception of this landscape. The narrow V-shaped valleys are intercepted by even steeper side canyons.

The roads are generally found up on sidehills, above the river. The rugged Cascadian skyline focuses the view up and down canyons to distant glaciers and peaks. Somewhere below in the dense conglomerate of trees and thickets rumbles the modulated sound of white water. It is vividly wild scenery, a threshold to the wilderness farther upstream.

Once again the border is easily distinguishable as one enters the

precipitous canyons of the Cascade, Suiattle and Sauk (above Darrington) Rivers. The river valleys are narrow, with steep, heavily forested side slopes. Cross-canyon views reveal great stands of fir, cedar and hemlock.

The rugged grandeur of this environment is vividly presented in the following photograph, taken in the Cascade River valley.



PRIMITIVE ENVIRONMENT  
CASCADE RIVER • HARD CREEK VICINITY  
LOOKING UPSTREAM

## WILD ENVIRONMENT

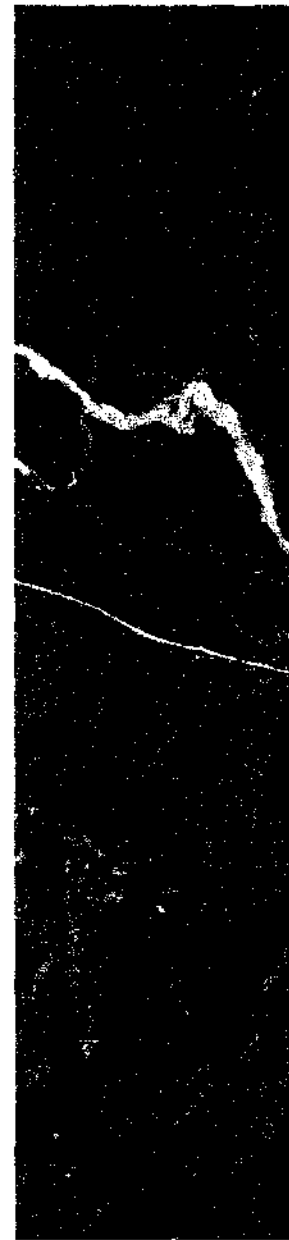
Although it lies beyond the boundary of this study, the wild environment should be recognized as it relates to the visual context of the classification of landscape environments. The upper study termini of the Cascade, Sulattle and North Fork Sauk Rivers end at the Glacier Peak Wilderness boundary. The South Fork of the Sauk study terminus is at Elliott Creek, three miles below Barlow Pass along the Mountain Loop Highway. Were it not for this road, this last stretch of river could also be considered as lying in the Wild Environment.

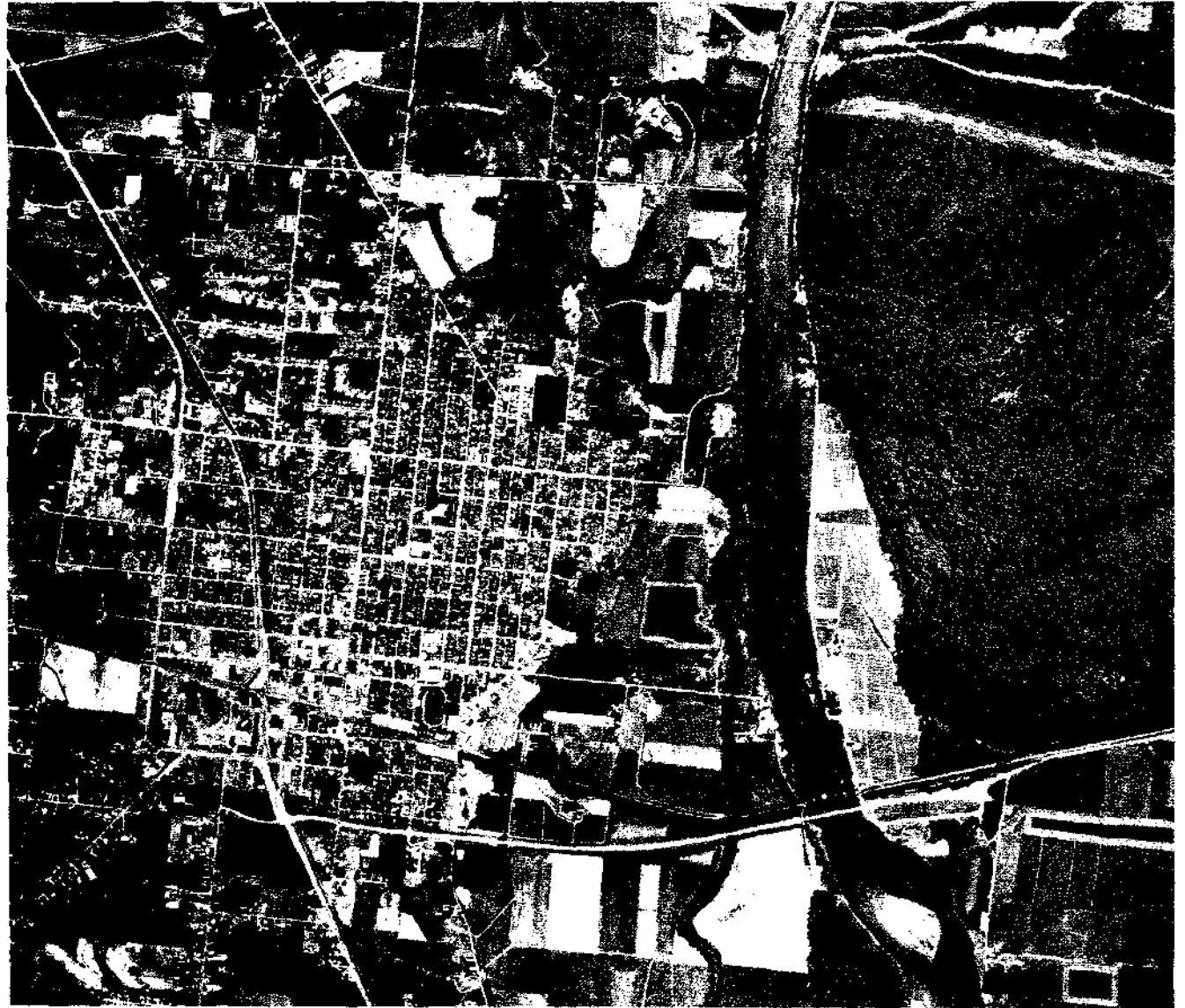
Here the rivers and the lands adjoining them are totally unaltered by the hand of man. Rugged peaks, virgin timber, scattered alpine vegetation and pure wilderness setting typify this environment. Man is a visitor in this land which so logically culminates the progression upriver, from dense urbanization to the unrestricted dominion of nature.

## *The Evaluation Phase*

*Evaluation Phase* — Of the five landscape environments just discussed, four occur within the study area: urban, rural, pastoral and primitive. Existing land uses within these four environments can best be summarized by the photographs on the following page. As the four "slices" show, there are distinct differences between each of the four environments. After only a cursory review of the four slices, it is possible to predict what land uses, landscapes, vegetation and structures are liable to be found within each environment. But understanding the present situation in each of the four environments is only part of the whole; it is also necessary to consider their ability to withstand change while still retaining their present character.

## COMPARISON OF DEVELOPMENT IN THE FOUR ENVIRONMENTS

URBAN  
SEDRO WOOLLEYRURAL  
LYMANPASTORAL  
SAUK PRAIRIEPRIMITIVE  
CASCADE: Mi 13.5



UPSTREAM

THE URBAN ENVIRONMENT SEDRO WOOLLEY



## *The Urban Environment*

This sketch and the photograph on the preceding page show two different aspects of the urban environment; a vertical "bird's eye view," and a cross-section. Together, these two views depict the relationship between the urban environment and the mountain backdrop, the river, and the surrounding rural landscape. The gradual sprawl of the urban environment into both the rural and riverine environs is especially apparent in the vertical photo.

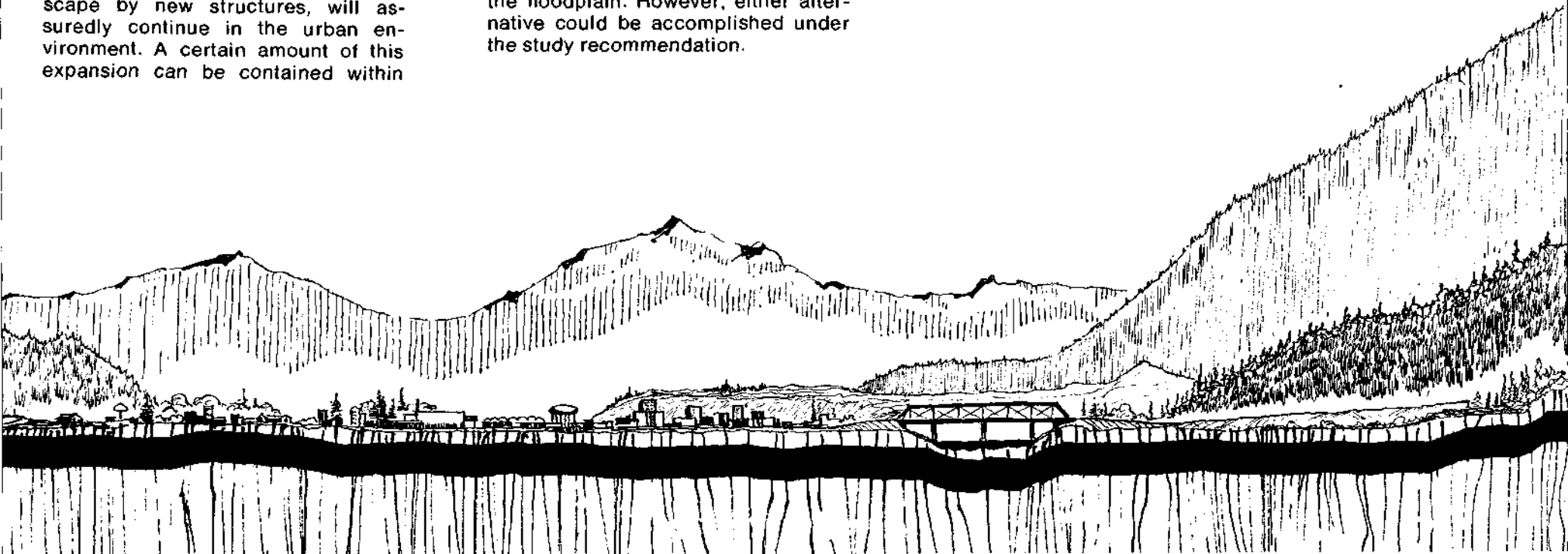
Change, represented by further modification of the existing landscape by new structures, will assuredly continue in the urban environment. A certain amount of this expansion can be contained within

the boundaries of the existing urban environment; structural densities are still low enough to allow substantial amounts of new work before the saturation point is reached. Beyond this point, the urban environment must slop over into the rural for additional space.

But in this case, the existing urban environment lies totally within an existing hundred-year floodplain. Because of its flood liabilities, one of two alternatives may be adopted for future expansion; either extensive flood control devices will be constructed, or expansion will take place on the surrounding foothills, outside the floodplain. However, either alternative could be accomplished under the study recommendation.

It should be recognized that, within the study area (that quarter-mile corridor on either side of the river) the infiltration of urban densities and structures on the rural, pastoral or primitive environments should be vigorously resisted.

Within the existing boundaries of the urban environment additional development is generally acceptable, so long as it does not slop over into the other, less developed and more fragile environments.





UPSTREAM

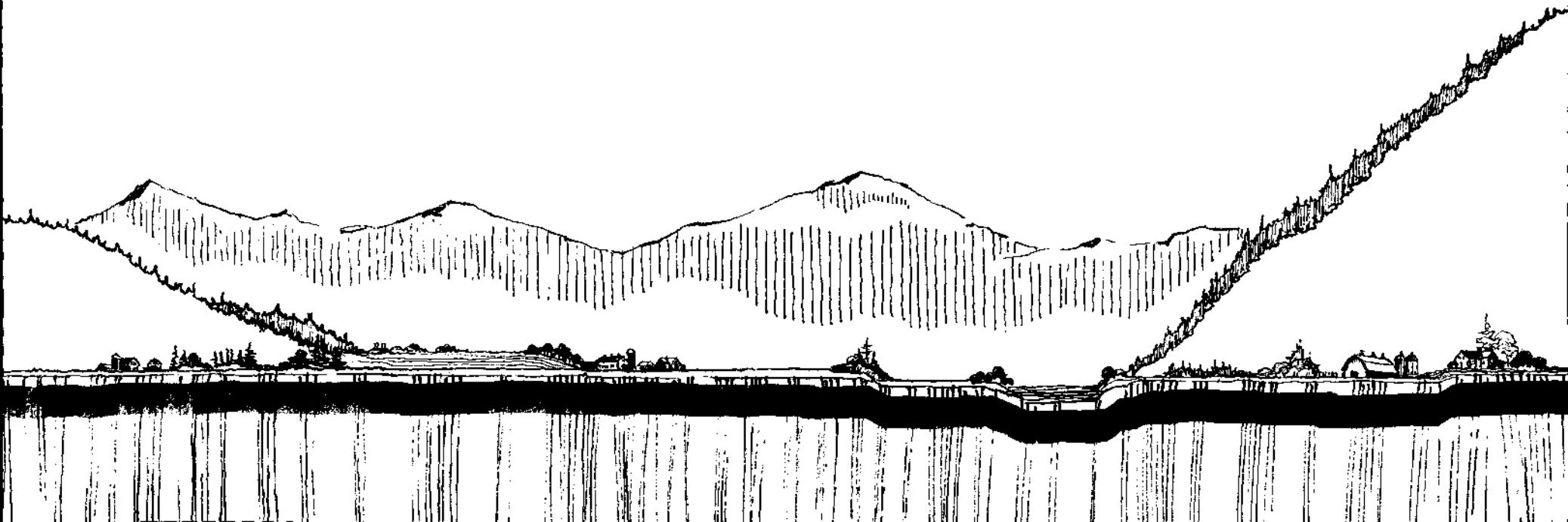
THE RURAL ENVIRONMENT LYMAN VICINITY

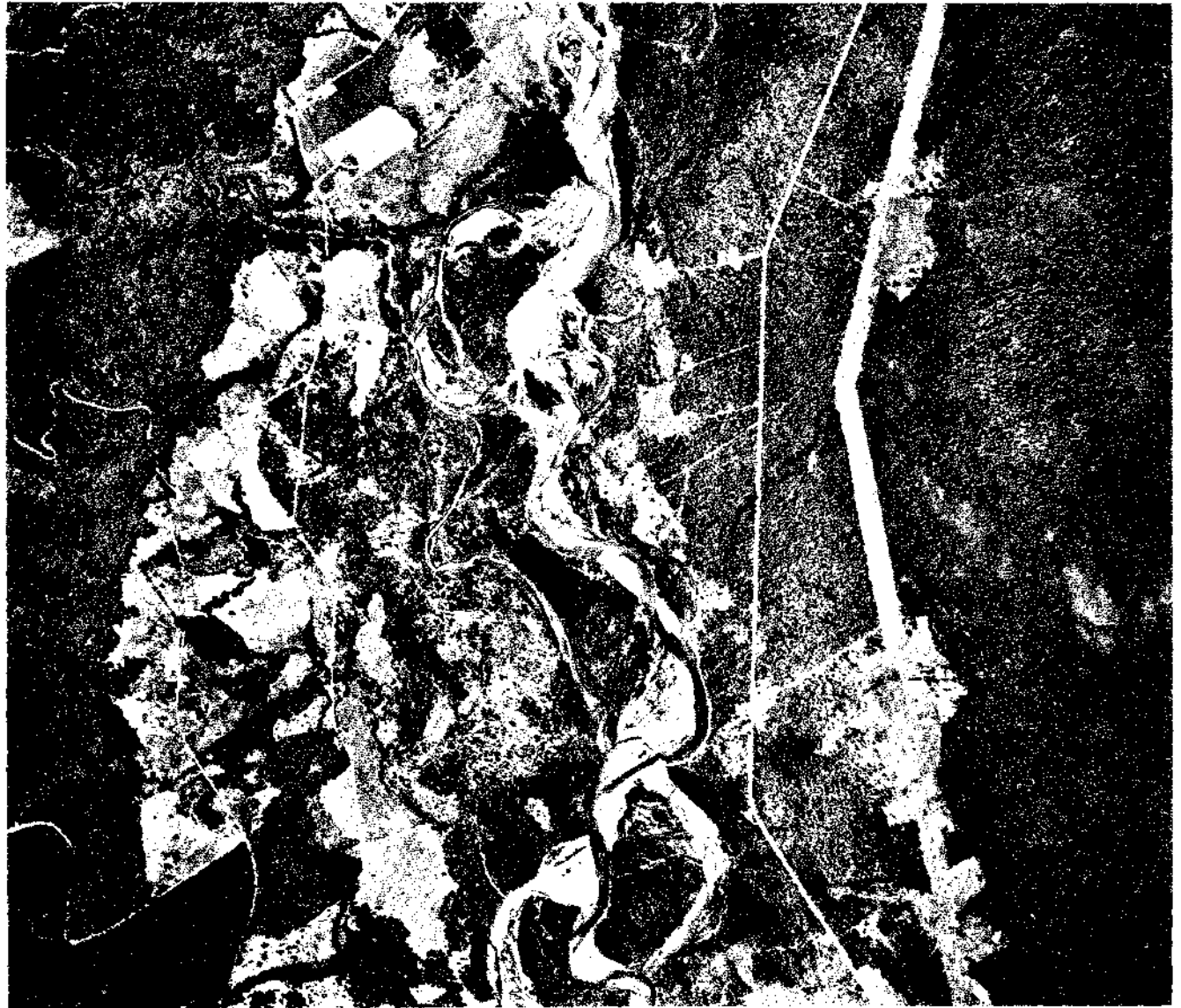
### *The Rural Environment*

As shown in this sketch and the foregoing photograph, the rural environment is also greatly modified, but by fields and fences more than by homes and businesses.

The rural environment has a limited capacity to accept change. Its flat, open character cannot visually absorb encroachment or development without destroying the visual elements which comprise its open, agricultural aspect. Billboards, subdivisions, hot dog stands and ticky-tacky would destroy its openness and

convert it to a visual extension of the urban environment. The floodplain and agricultural lands above it in this environment are in limited supply. Visually and economically they are under constant attack from urban sprawl. They have little capacity to accommodate this sprawl and still retain their rural character.





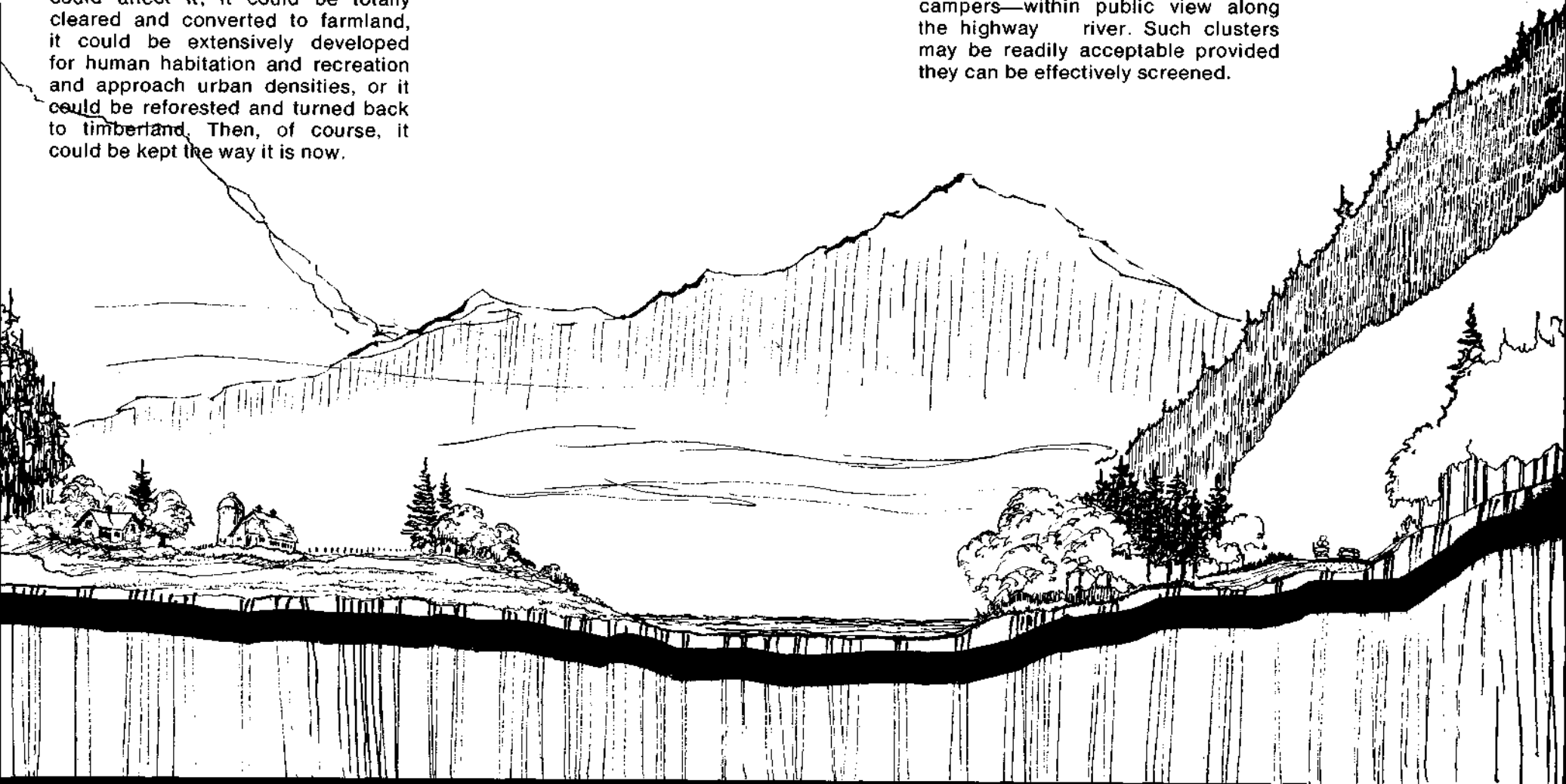
THE PASTORAL ENVIRONMENT SAUK PRAIRIE

### *The Pastoral Environment*

As illustrated in this sketch and the preceding photograph, the pastoral environment contains an enchanting mixture of woodlands and agricultural fields. It is triply fragile, since three different kinds of change could affect it; it could be totally cleared and converted to farmland, it could be extensively developed for human habitation and recreation and approach urban densities, or it could be reforested and turned back to timberland. Then, of course, it could be kept the way it is now.

Visually, this environment can accept a wide diversity of uses without appearing to change. Its capacity to accept change is due to the large proportion of available vegetative screening. Consequently change—accomplished in harmony with the forest, groves and woodlots—would be generally acceptable.

This environment is visually suited to medium density uses in the un-cleared forest areas. Here, as in the rural environment, an incongruent cottage, cabin, camper or community can impart a drastic negative visual impression. The pastoral environment is not the place for clusters—whether houses or trailers or campers—within public view along the highway river. Such clusters may be readily acceptable provided they can be effectively screened.





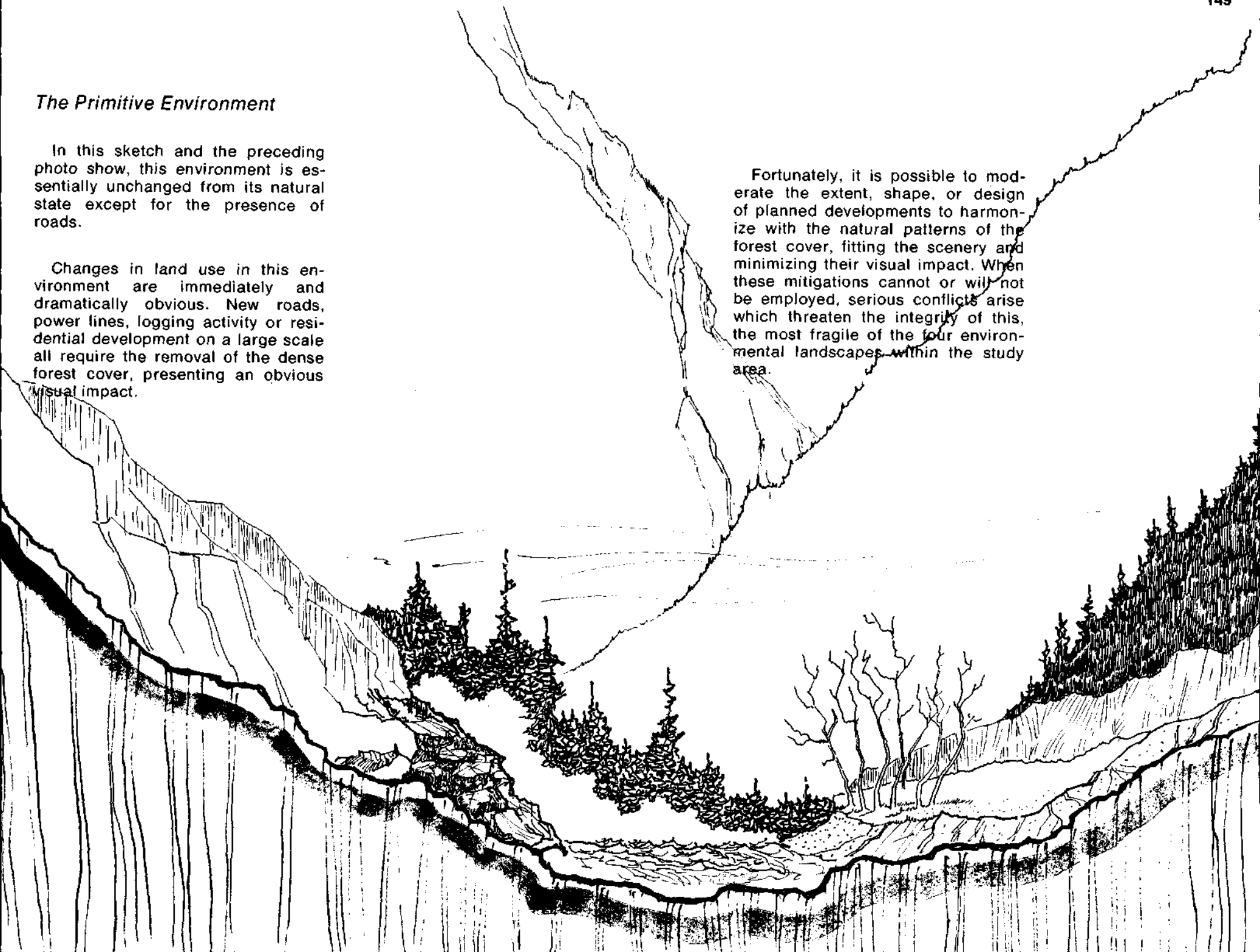
THE PRIMITIVE ENVIRONMENT CASCADE RIVER • HARD CREEK VICINITY

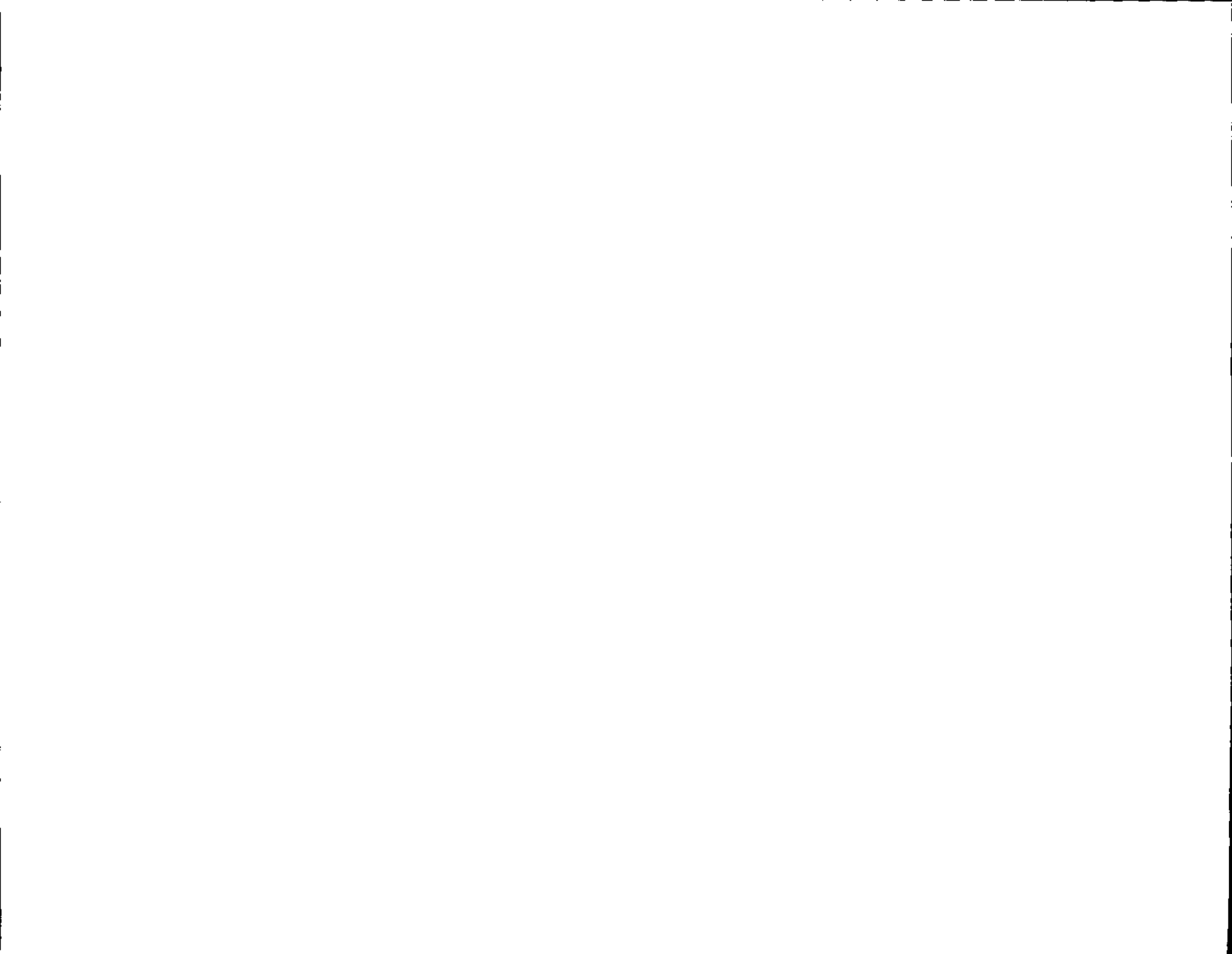
## *The Primitive Environment*

In this sketch and the preceding photo show, this environment is essentially unchanged from its natural state except for the presence of roads.

Changes in land use in this environment are immediately and dramatically obvious. New roads, power lines, logging activity or residential development on a large scale all require the removal of the dense forest cover, presenting an obvious visual impact.

Fortunately, it is possible to moderate the extent, shape, or design of planned developments to harmonize with the natural patterns of the forest cover, fitting the scenery and minimizing their visual impact. When these mitigations cannot or will not be employed, serious conflicts arise which threaten the integrity of this, the most fragile of the four environmental landscapes within the study area.







**APPENDIX**

**D**

## USE INTENSITY INVENTORY

### A. Management Analysis Process

Rivers have finite limits to their capacity to accommodate human use without deterioration. Management prescriptions are based on the precept of accommodating human use while preventing damage to the resource. Consequently, it is first necessary to determine the human capacity of each river. Once determined, the capacity rating for the rivers can be abstracted into management concepts, such as Preservation, Passive Use or Active Use. These concepts will provide meaningful guidelines to future managers in terms of permissible recreation intensities, permissible forms of shoreline activities, or non-compatible activities.

### B. Approach

It is difficult to analyze 157.5 miles of river as a single unit, therefore the river system was reduced to a series of short segments, each of which reacts more-or-less in a unified manner to management activities.

The proposal area is divided into 32 segments, called Runs, each of which represents a fairly homogenous unit suited to isolated analysis. Four additional runs are identified below the proposal area, and are subjected to the same analysis as those runs within the proposal area, in order to suggest management guidelines to state and local governments.

In analyzing the runs, five factors combine to determine the recommended level of human use; these factors are uniqueness, fragility, diversity, accessibility and encroachment. These factors are defined below.

Uniqueness — that quality which defines the significance or rarity of a characteristic relative to the river as a whole

Fragility — a term describing durability, tolerance to change, or ability to survive environmental stress.

Diversity — that quality which relates to the variety, complexity and richness of the physical and visual characteristics of the river and riverscape.

Accessibility — the relationship between the river and adjacent roads which determines how readily the river can be reached by automobile.

Encroachment — the degree to which human modification (with the exception of roads) has intruded upon the river,

its shorelines, and its landscape, and thereby has introduced elements of visual, physical or biological disequilibrium.

In general, river runs that are unique, fragile, of low diversity, inaccessible and unencroached cannot accommodate intensive human uses without the destruction of some significant elements or the disturbance of some natural processes. In contrast, river runs which have relatively few unique or fragile values, are highly diverse, accessible and encroached can generally accommodate intensive human use without further damage to those values.

The general relationship between the five factors can be codified by assigning a numeric value range to each of the factors, and then applying those numbers to a set of formulas designed to measure each run's suitability for three different intensities of use. Formulas are established to rate each run's suitability for Preservation, Passive Use and Active Use. The formulas are set down and explained below.

$$\text{PRESERVATION: } U_1 + F_1 - (2A + 2E)$$

This formula implies that for a run to merit preservation, it must have both unique (U) and fragile (F) values

within its existing character, and must have a very low level of both accessibility (A) and encroachment (E) since both of these factors are multiplied by two and subtracted. Diversity is not an important consideration for preservation.

#### PASSIVE USE:

$$U_1 + F_1 + D_1 - (A + 2E)$$

This formula states that for a run to be managed for passive recreation it must have unique (U), fragile (F) and diversity (D) values inherent in its existing character. Accessibility (A) can be permitted at places, so is only subtracted at face value. Encroachment (E) is still multiplied by two and subtracted, since its relative absence is still desirable for passive recreation forms.

#### ACTIVE USE: $2D_1 - U_1 - F_1 + A - E$

This formula implies that in a run which is high in diversity [(D) which is multiplied by two] with relatively low uniqueness (U) and fragility (F) values, is readily accessible (A) and has tolerable levels of encroachment (E), active recreation forms can be allowed.

To apply the formulas, each river run was analyzed to determine the physical and biological characteristics present within the landscape ad-

acent to the run. However, the adjacent landscape is too complex to accurately assess with a single numeric value. It was necessary to reduce the river and its adjacent visible landscape (defined as the Riverscape) into its basic factors before an analysis can be undertaken.

### 1. Riverscape Components

The Riverscape (the extreme limit of land which can be viewed from the river, and from which in turn some portion of the river is visible) divided itself into four basic components. These components are 1) river channel, 2) streamway, 3) flood plain, and 4) viewshed. The limits of a fifth component — the watershed — generally lie beyond the boundary of the viewshed. These components are defined as follows:

The *River Channel* refers to the river bed which, if not prevented by diking, may change course within the limits of the streamway or flood plain. It is generally marked by the beginnings of the vegetation line.

The *Streamway*, as defined by Wolf Bauer, is "that stream-dependent corridor of single or multiple, wet or dry channel or channels, within which the usual seasonal or storm water run-off peaks are contained and within which environment the flora, fauna, soil and topography is dependent on

or influenced by the height and velocity of the fluctuating river currents."

The *Flood Plain* is that area of land which will be inundated by the river at least once every 100 years.

The *Viewshed* includes all the terrain visible from the river.

The *Watershed* is the total geographic area which contributes to the drainage of the river basin or supplies run-off to the river.

For the purpose of this analysis, it was possible to aggregate these five riverscape components into two general categories; the Waterform, and the River Setting.

The Waterform contains the river channel and the streamway, while the River Setting includes the flood plain, viewshed and watershed.

River Runs are shown on the map at the end of this discussion.

## **2. Analysis of the Waterform and the River Setting —**

The Waterform and the River Setting are each composed of both physical and biological elements which can be recognized, measured and recorded. These elements are displayed below.

To analyze a river run, the presence or absence of the various elements identified in the foregoing checklist was measured, allowing a numeric "score" to be assigned which expressed the uniqueness, fragility and diversity of the physical waterform, the physical river setting, the biologi-

cal waterform and the biological river setting. These "scores" were then applied to the formulas as explained below.

### **PHYSICAL AND BIOLOGICAL ELEMENTS OF THE WATERFORM AND RIVER SETTING**

#### **Waterform, Physical**

1. Gradient
2. Low banks, beaches
3. Point bars
4. Islands
5. Sand and gravel bars
6. Boulders
7. Major confluences
8. Cliffs
9. Shoals or falls
10. Placidity
11. Pools and riffles
12. Rapids

#### **Waterform, Biological**

1. Vegetation
2. Wetlands
3. Anadromous Fish
4. Other fish
5. Waterfowl

#### **River Setting, Physical**

1. Side valleys
2. Landform relief
3. Peaks, ridges
4. Rock outcrops
5. Springs
6. Waterfalls
7. Tributaries

#### **River Setting, Biological**

1. Woodland
2. Scrubland
3. Grassland
4. Clearings
5. Large mammals
6. Small mammals
7. Rare and endangered species
8. Birds

## Analysis

To facilitate the recording of data, a matrix was designed to include both the five factors (uniqueness, diversity, fragility, accessibility and encroachment) and the four riverscape elements (physical and biological waterform, physical and biological

river setting). The matrix is shown below. After evaluating each river run from aerial photographs, information collected on field trips, and supporting maps, the occurrence of each characteristic was recorded for each river run, by entering a numeric code between one and seven. The rating scale follows the matrix. As shown on the matrix, the ratings for uniqueness, fragility and diversity were totaled

and averaged. Ratings for accessibility and encroachment were simply recorded in the appropriate box. The average ratings  $U_1$ ,  $F_1$ ,  $D_1$ , and the flat ratings A and E were then applied by computer to the formula for Preservation, Passive Use and Active Use. The highest total score of the three formulas then became the overall rating for the run being evaluated.

MATRIX		RIVER CHARACTERISTICS				TOTAL	AVERAGE	ACCESSIBILITY	ENCROACHMENT	
		WATERFORM		SETTING						
		physical	biological	physical	biological					
Sauk	Bedal	UNIQUENESS	6	2	5	2	15	3.75		
		FRAGILITY	4	3	5	2	14	3.5	5	3
		DIVERSITY	4	3	5	2	14	3.5		

## RATING SCHEDULE

Criteria	Rating Value	Description	Criteria	Rating Value	Description
Uniqueness	7	Very highly unique	Diversity	7	Very highly diverse physical/visual pattern
	6	Highly unique		6	Highly diverse physical/visual pattern
	5	Moderately highly unique		5	Moderately highly diverse physical/visual pattern
	4	Moderately unique		4	Moderately diverse physical/visual pattern
	3	Moderately low uniqueness		3	Moderately low diversity of physical/visual pattern
	2	Low uniqueness		2	Low diversity of physical/visual pattern
	1	Very low uniqueness		1	Very low diversity of physical/visual pattern
Fragility	7	Very highly fragile	Accessibility	7	Very highly accessible
	6	Highly fragile		6	Highly accessible
	5	Moderately highly fragile		5	Moderately highly accessible
	4	Moderate fragility		4	Moderately accessible
	3	Moderate low fragility		3	Moderately low accessibility
	2	Low fragility		2	Low accessibility
	1	Very low fragility		1	No accessibility

### FORMULAS\*

For Preservation:

$$U_1 + F_1 - (2A + 2E) + 26 =$$

$$3.25 + 3.5 - (14 + 12) + 26 =$$

6.75

For Passive Use:

$$U_1 + F_1 + D_1 - (A + 2E) + 18 =$$

$$3.25 + 3.5 + 3.5 - (7 + 12) + 18 =$$

9.25

For Active Use:

$$2D_1 - U_1 - F_1 + A - E + 18 =$$

$$7 - 3.25 - 3.5 + 7 - 6 + 18 =$$

19.25

19.25 = Management Rating

\*The numeric values of 26, 18 and 18 used respectively in the Preservation, Passive Use and Active Use formulas are normalizing values which adjust each formula to a 0-36 scale. In the example shown, Active Use received the highest rating by 10 points, indicating that this Run is best suited for management which emphasizes its public recreation values.

Criteria	Rating Value	Description
Encroachment	1	Pristine
	2	Very little visual disturbance/physical alteration
	3	Moderately little visual disturbance/physical alteration
	4	Moderate degree of visual disturbance/physical alteration
	5	Moderately high visual disturbance/physical alteration
	6	High degree of visual disturbance/physical alteration
	7	Very high degree of visual/physical alteration

## RIVER RUN ANALYSIS

River, Skagit	Run, Avon	U = 3.25	F = 3.50	D = 3.50	A = 7.00	E = 7.00	Preservation = 4.75 Passive Use = 7.25 Active Use = 18.25
River, Skagit	Run, N. Fork	U = 6.25	F = 6.00	D = 6.00	A = 6.00	E = 4.00	Preservation = 18.25 Passive Use = 22.25 Active Use = 19.75
River, Skagit	Run, S. Fork	U = 6.50	F = 6.00	D = 6.25	A = 6.00	E = 4.00	Preservation = 18.50 Passive Use = 22.75 Active Use = 20.00
River, Skagit	Run, Mt. Vernon	U = 3.25	F = 3.50	D = 3.50	A = 7.00	E = 6.00	Preservation = 6.75 Passive Use = 9.25 Active Use = 19.25
River, Skagit	Run, Skiyou	U = 3.25	F = 3.75	D = 3.75	A = 6.00	E = 5.00	Preservation = 11.00 Passive Use = 12.75 Active Use = 19.50
River Skagit	Run, Lyman	U = 5.50	F = 4.50	D = 5.00	A = 3.00	E = 4.00	Preservation = 22.00 Passive Use = 22.00 Active Use = 17.00
River, Skagit	Run, Hamilton	U = 3.25	F = 4.00	D = 3.75	A = 7.00	E = 4.00	Preservation = 11.25 Passive Use = 14.00 Active Use = 21.25
River, Skagit	Run, Concrete	U = 4.00	F = 3.50	D = 4.25	A = 5.00	E = 6.00	Preservation = 11.50 Passive Use = 12.75 Active Use = 18.00
River, Skagit	Run, Van Horn	U = 3.75	F = 4.00	D = 3.25	A = 6.00	E = 4.00	Preservation = 13.75 Passive Use = 15.00 Active Use = 18.75
River, Skagit	Run, Rockport	U = 4.25	F = 4.25	D = 4.75	A = 5.00	E = 4.00	Preservation = 16.50 Passive Use = 18.25 Active Use = 20.00
River, Skagit	Run, Sauk-Mtn.	U = 5.00	F = 5.25	D = 5.50	A = 6.00	E = 3.00	Preservation = 18.25 Passive Use = 21.75 Active Use = 21.75
River, Skagit	Run, Marblemount	U = 4.25	F = 4.50	D = 4.00	A = 6.00	E = 5.00	Preservation = 12.75 Passive Use = 14.75 Active Use = 18.25
River, Skagit	Run, Bacon-Creek	U = 3.25	F = 3.00	D = 3.50	A = 6.00	E = 5.00	Preservation = 10.25 Passive Use = 11.75 Active Use = 19.75

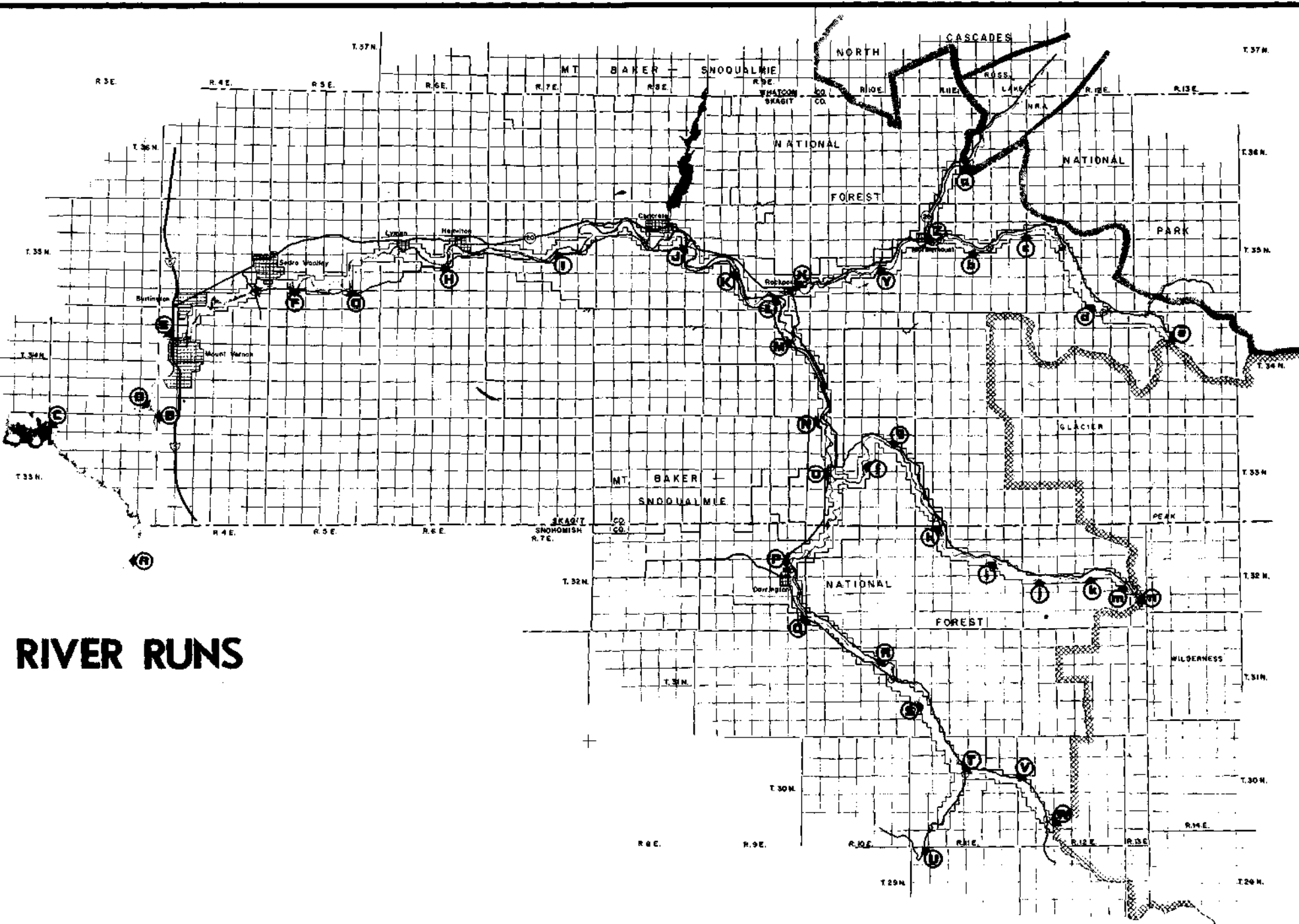
River, Sauk	Run, McCloud	U = 6.00	F = 4.75	D = 4.50	A = 3.00	E = 2.00	Preservation = 26.75 Passive Use = 26.25 Active Use = 17.25
River, Sauk	Run, Illabot	U = 4.25	F = 4.25	D = 4.00	A = 5.00	E = 4.00	Preservation = 16.50 Passive Use = 17.50 Active Use = 18.50
River, Sauk	Run, Rinker	U = 4.75	F = 4.75	D = 4.50	A = 4.00	E = 4.00	Preservation = 19.50 Passive Use = 20.00 Active Use = 17.50
River, Sauk	Run, North-Mtn.	U = 6.00	F = 4.50	D = 5.00	A = 3.00	E = 3.00	Preservation = 24.50 Passive Use = 24.50 Active Use = 17.50
River, Sauk	Run, Darrington	U = 3.50	F = 3.50	D = 3.50	A = 6.00	E = 6.00	Preservation = 9.00 Passive Use = 10.50 Active Use = 18.00
River, Sauk	Run, Murphy-Creek	U = 4.25	F = 4.00	D = 3.75	A = 5.00	E = 2.00	Preservation = 20.25 Passive Use = 21.00 Active Use = 20.25
River, Sauk	Run, Whitechuck	U = 4.75	F = 4.50	D = 4.25	A = 4.00	E = 2.00	Preservation = 23.25 Passive Use = 23.50 Active Use = 19.25
River, Sauk	Run, Falls-Creek	U = 4.25	F = 4.00	D = 3.75	A = 4.00	E = 2.00	Preservation = 22.25 Passive Use = 22.00 Active Use = 19.25
River, Sauk	Run, Bedal	U = 3.75	F = 3.50	D = 3.50	A = 5.00	E = 3.00	Preservation = 17.25 Passive Use = 17.75 Active Use = 19.75
River, N. Fk. Sauk	Run, N. Fk. Falls	U = 4.75	F = 3.75	D = 4.50	A = 4.00	E = 3.00	Preservation = 20.50 Passive Use = 21.00 Active Use = 19.50
River, N. Fk. Sauk	Run, Sloan-Creek	U = 4.50	F = 3.75	D = 4.25	A = 4.00	E = 3.00	Preservation = 20.25 Passive Use = 20.50 Active Use = 19.25

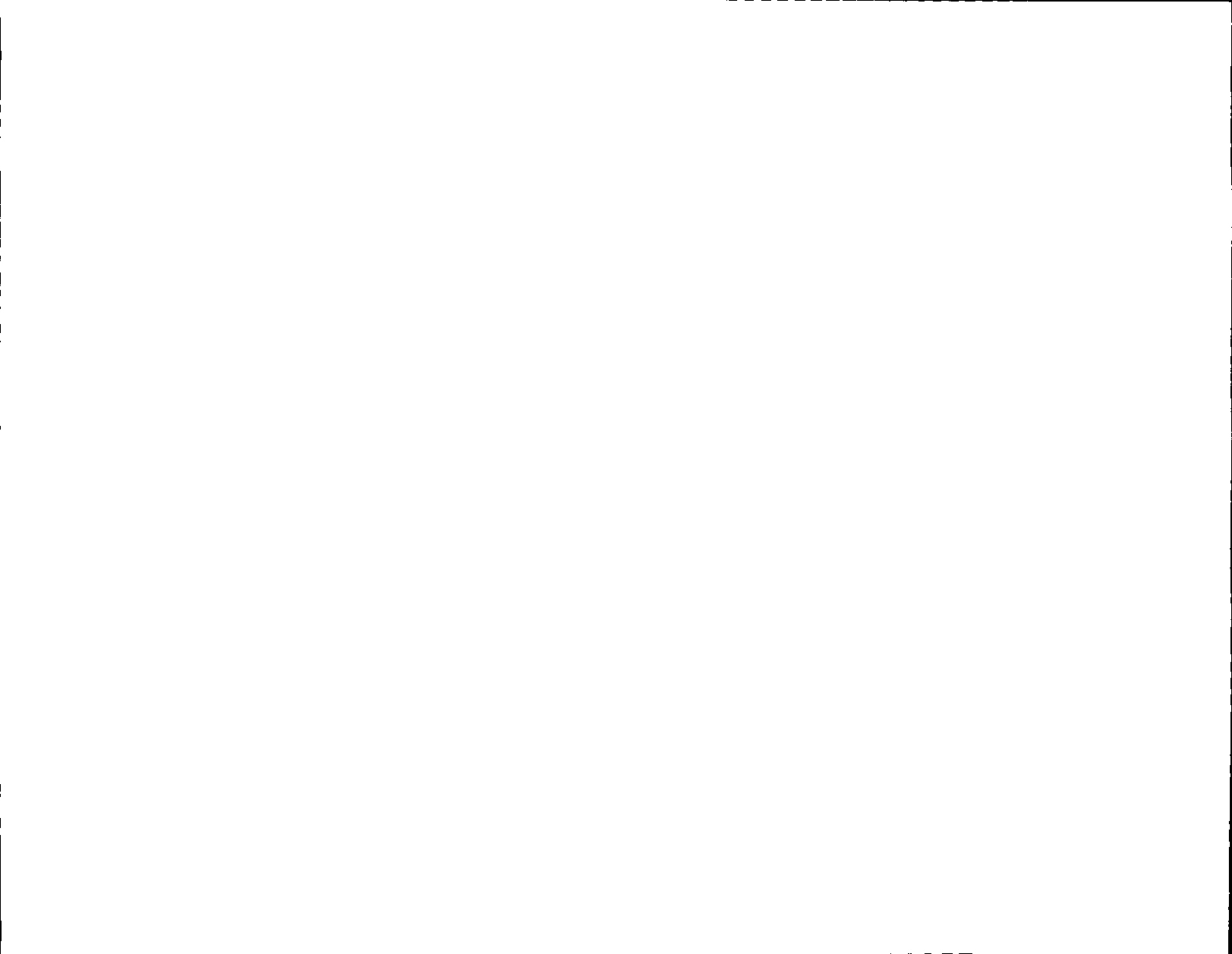


River, Suiattle	Run, Sauk-Pralrie	U = 4.75	F = 3.75	A = 2.00	D = 3.75	E = 2.00	Preservation = 26.50 Passive Use = 24.25 Active Use = 17.00
River, Suiattle	Run, Suiattle-Mtn.	U = 4.00	F = 3.50	A = 4.00	D = 3.75	E = 2.00	Preservation = 21.50 Passive Use = 21.25 Active Use = 20.00
River, Suiattle	Run, Teepee-Falls	U = 4.00	F = 3.00	A = 4.00	D = 3.50	E = 3.00	Preservation = 19.00 Passive Use = 18.50 Active Use = 19.00
River, Suiattle	Run, Huckleberry	U = 3.75	F = 3.00	A = 4.00	D = 3.50	E = 4.00	Preservation = 16.75 Passive Use = 16.25 Active Use = 18.25
River, Suiattle	Run, Gibson-Falls	U = 4.25	F = 3.25	A = 4.00	D = 3.50	E = 5.00	Preservation = 15.50 Passive Use = 15.00 Active Use = 16.50
River, Suiattle	Run, Downey-Creek	U = 4.25	F = 3.00	A = 4.00	D = 3.50	E = 5.00	Preservation = 15.25 Passive Use = 14.75 Active Use = 16.75
River, Suiattle	Run, Hot-Springs	U = 4.25	F = 3.00	A = 4.00	D = 3.50	E = 5.00	Preservation = 15.25 Passive Use = 14.75 Active Use = 16.75
River, Suiattle	Run, Sulphur-Mtn.	U = 4.00	F = 3.00	A = 3.00	D = 3.50	E = 2.00	Preservation = 23.00 Passive Use = 21.50 Active Use = 19.00
River, Cascade	Run, Hatchery	U = 4.50	F = 4.25	A = 5.00	D = 4.00	E = 4.00	Preservation = 16.75 Passive Use = 17.75 Active Use = 18.25
River, Cascade	Run, Lookout-Mtn.	U = 3.75	F = 3.50	A = 6.00	D = 3.75	E = 5.00	Preservation = 11.25 Passive Use = 13.00 Active Use = 19.25
River, Cascade	Run, Marble-Creek	U = 4.00	F = 3.50	A = 3.00	D = 3.75	E = 3.00	Preservation = 21.50 Passive Use = 20.25 Active Use = 18.00
River, Cascade	Run, South-Fork	U = 4.00	F = 3.50	A = 3.00	D = 3.75	E = 3.00	Preservation = 21.50 Passive Use = 20.25 Active Use = 18.00

<b>River Run</b>	<b>Termini</b>	<b>Rating</b>
South Fork	A to B	
North Fork	C to D	
Avon	D to E	Active
Mt. Vernon	E to F	Active
Skiyou	F to G	Active
Lyman	G to H	Passive
Hamilton	H to I	Active
Concrete	I to J	Active
Van Horn	J to K	Active
Rockport	K to X	Active
Sauk-Mtn.	X to Y	Passive
Marblemount	Y to Z	Active
Bacon Creek	Z to a	Active
Hatchery	Z to b	Active
Lookout Mtn.	b to c	Active
Marble Creek	c to d	Preservation
So. Fork	d to e	Preservation
McCloud	L to M	Preservation
Illabot	M to N	Active
Rinker	N to O	Passive
North Mtn.	O to P	Passive
Darrington	P to Q	Active
Murphy Creek	Q to R	Passive
Whitechuck	R to S	Passive
Falls Creek	S to T	Preservation
N. Fk. Falls	T to V	Passive
Sloan Creek	V to W	Passive
Bedal	T to U	Active
Sauk-Prairie	O to f	Preservation
Suiattle-Mtn.	f to g	Preservation
Teepee-Falls	g to h	Passive
Huckleberry Mtn.	h to i	Active
Gibson Falls	i to j	Active
Downey Creek	j to k	Active
Hot Springs	k to m	Active
Sulphur Mtn.	m to n	Preservation

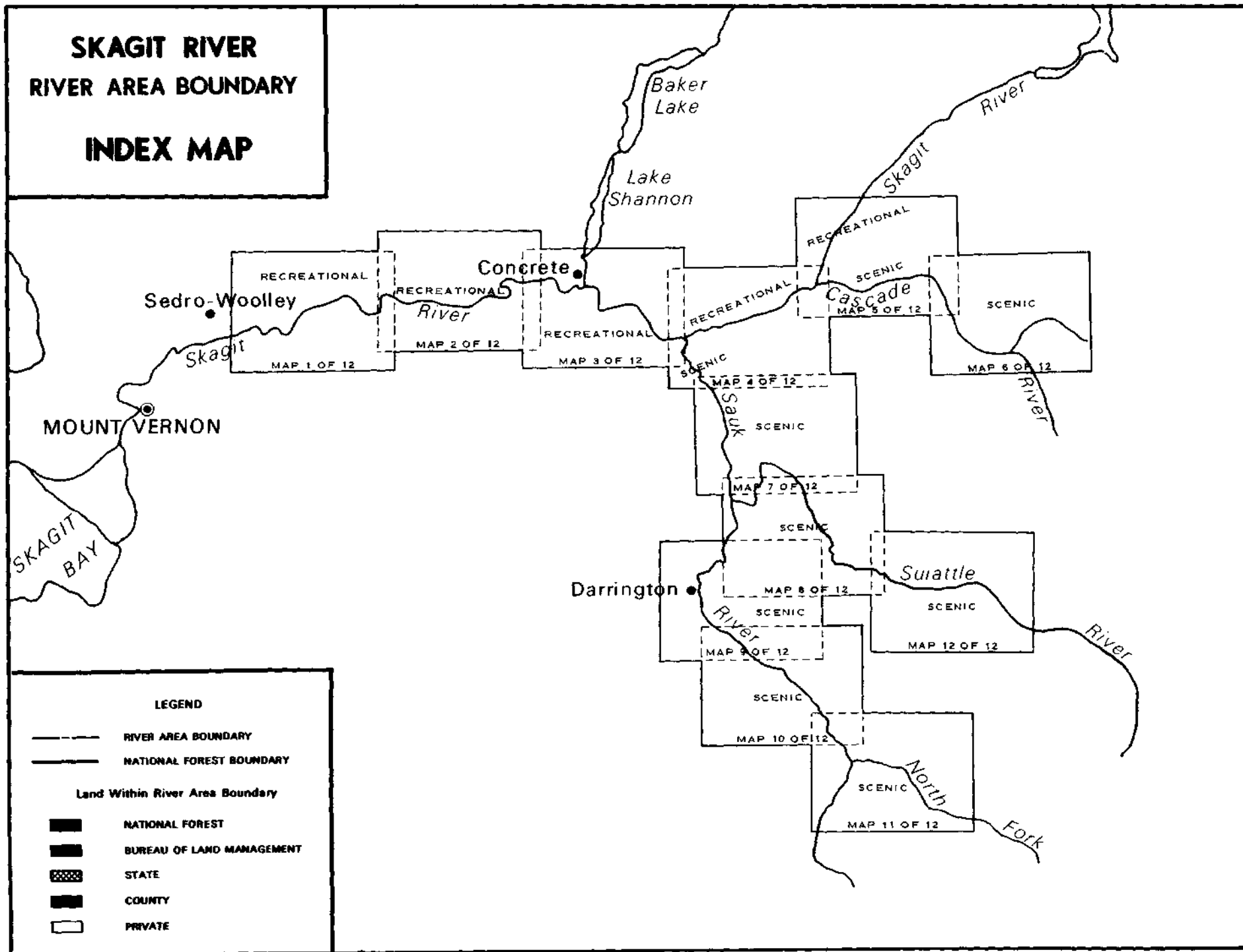
# RIVER RUNS

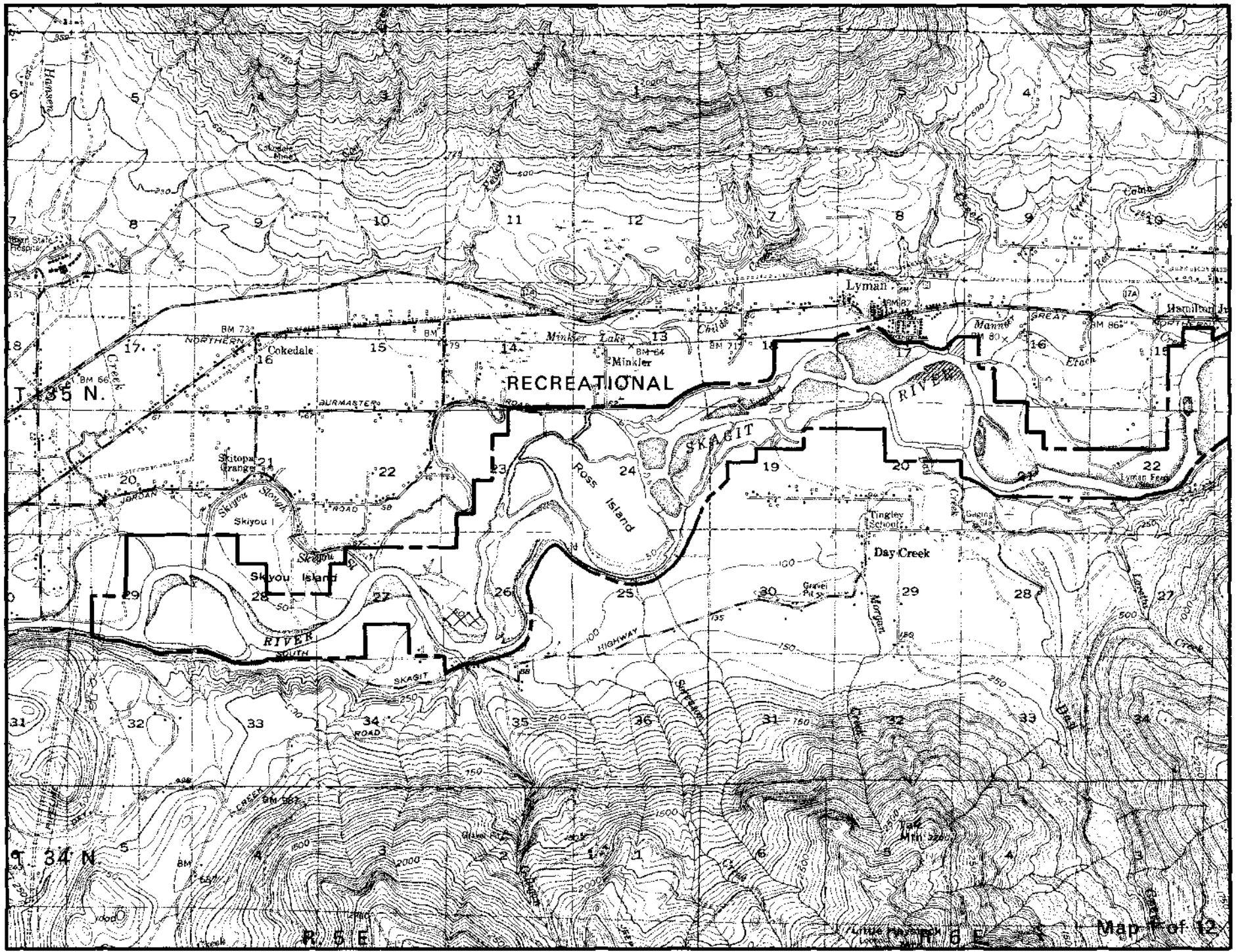




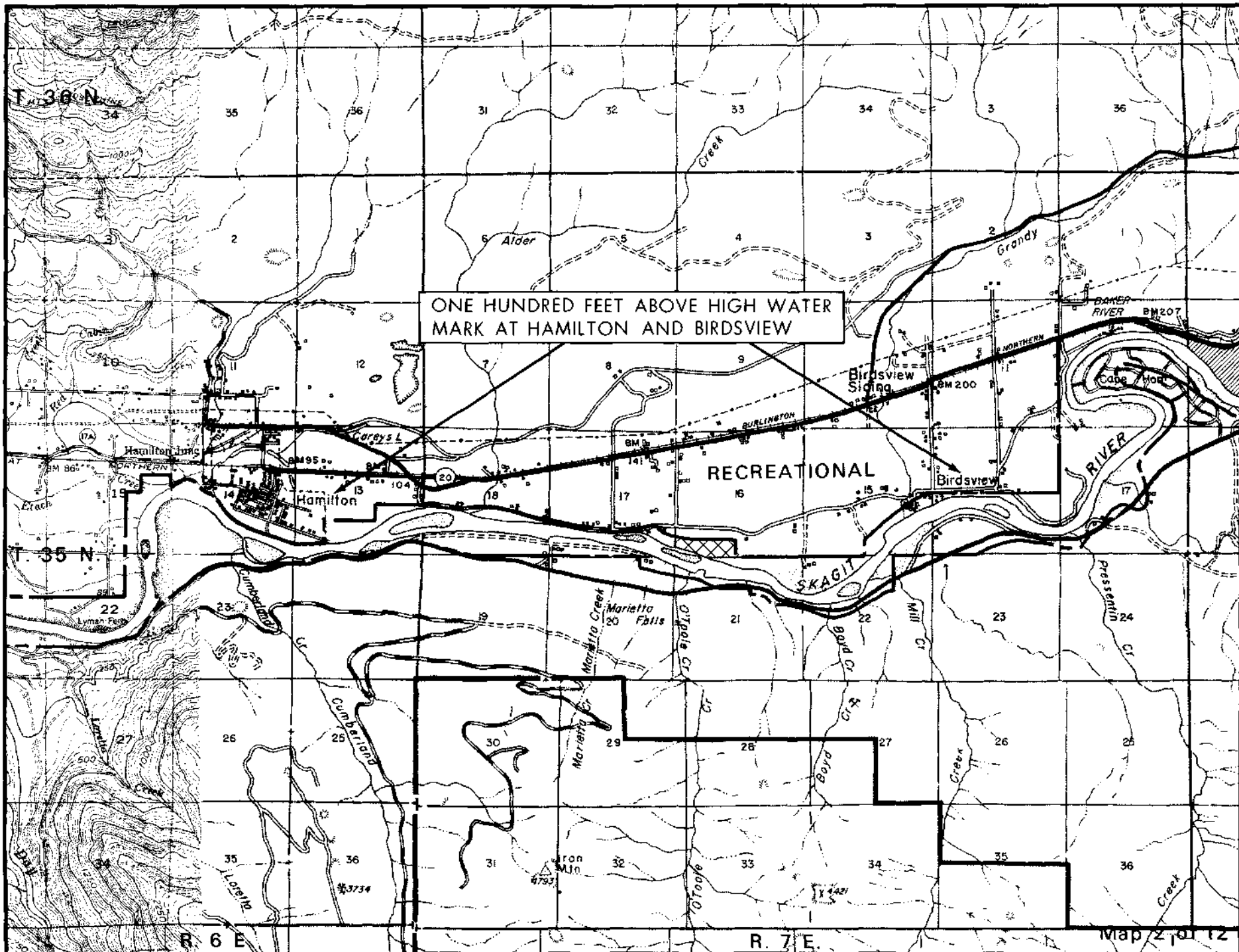
**APPENDIX**

**E**

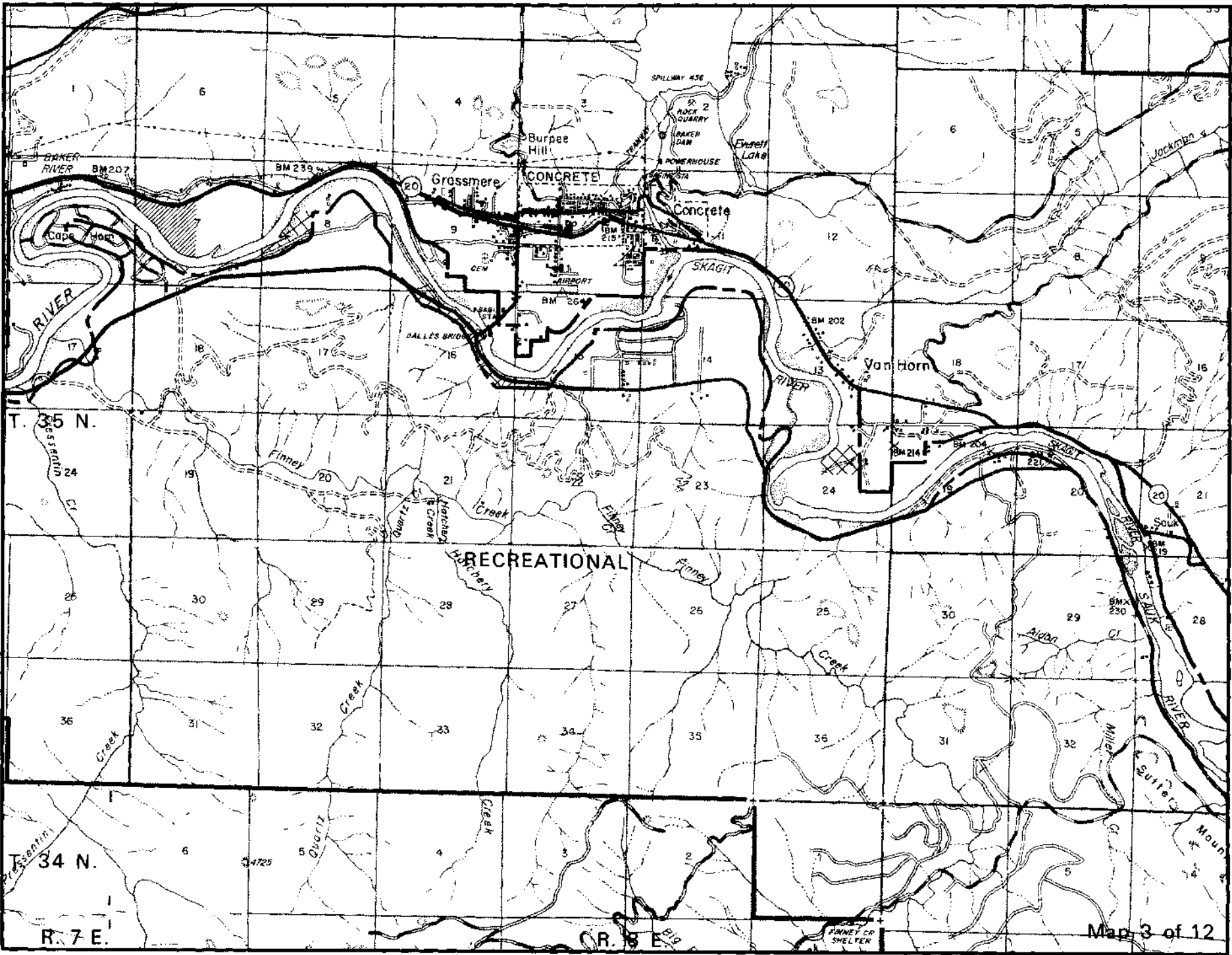


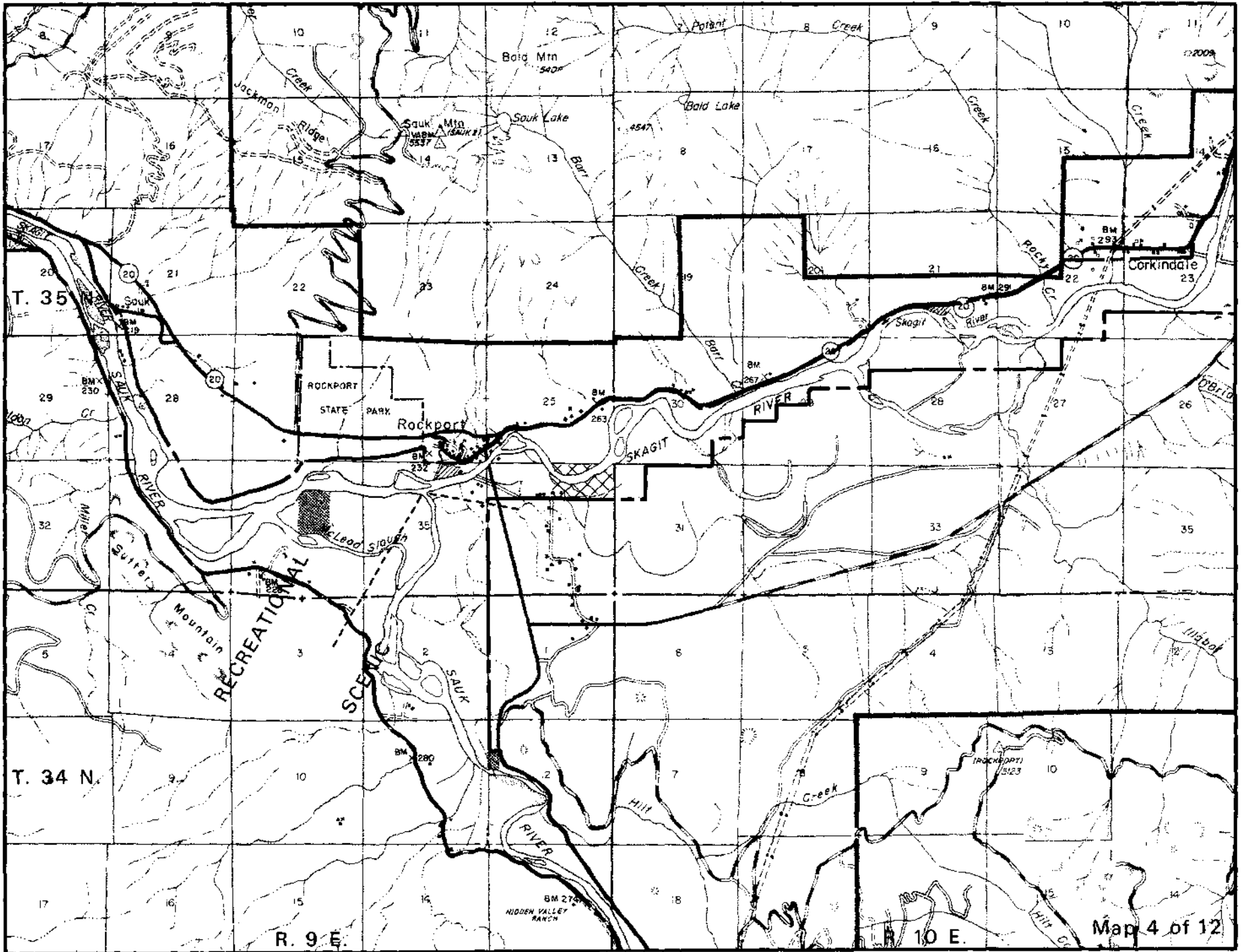


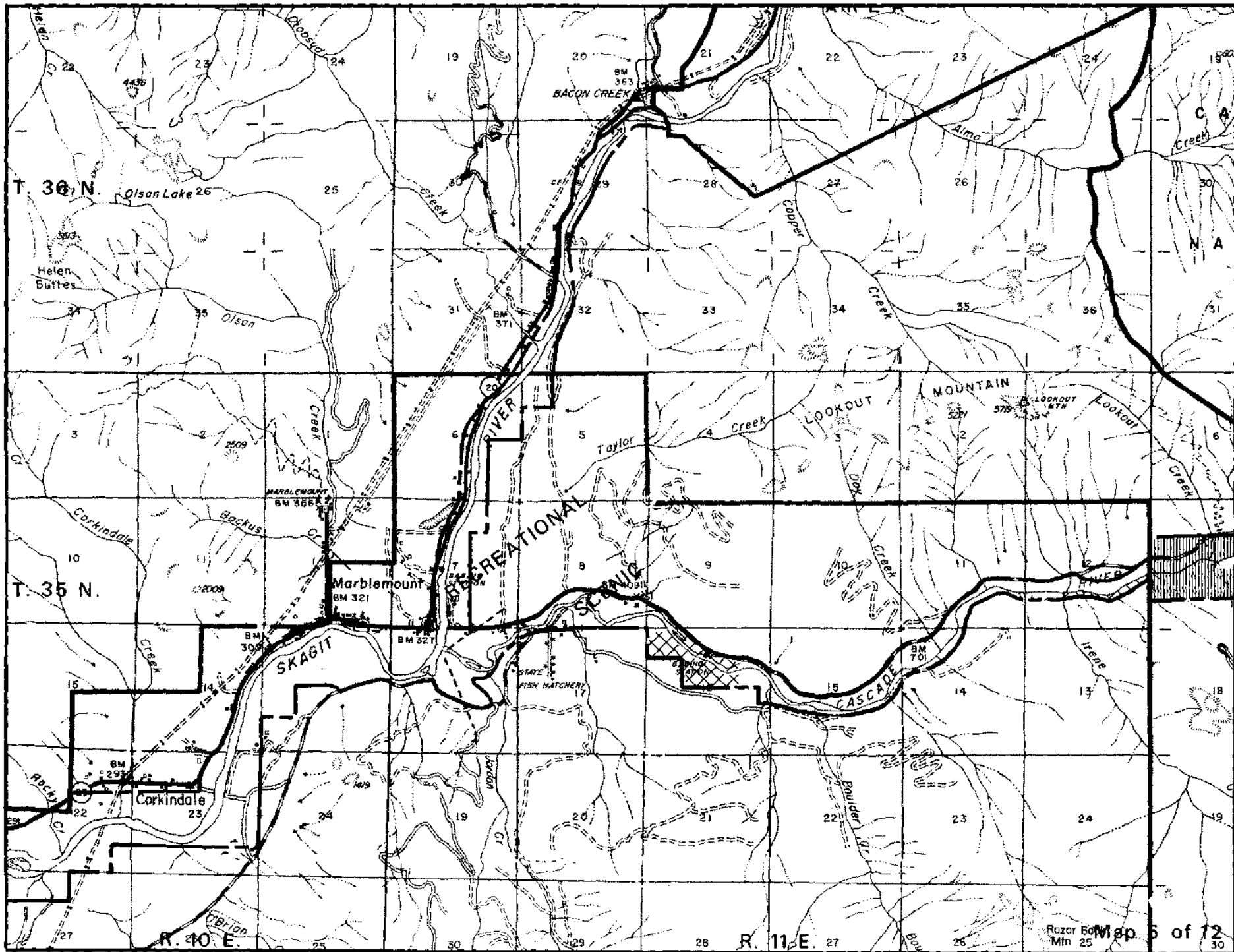
Map of 12

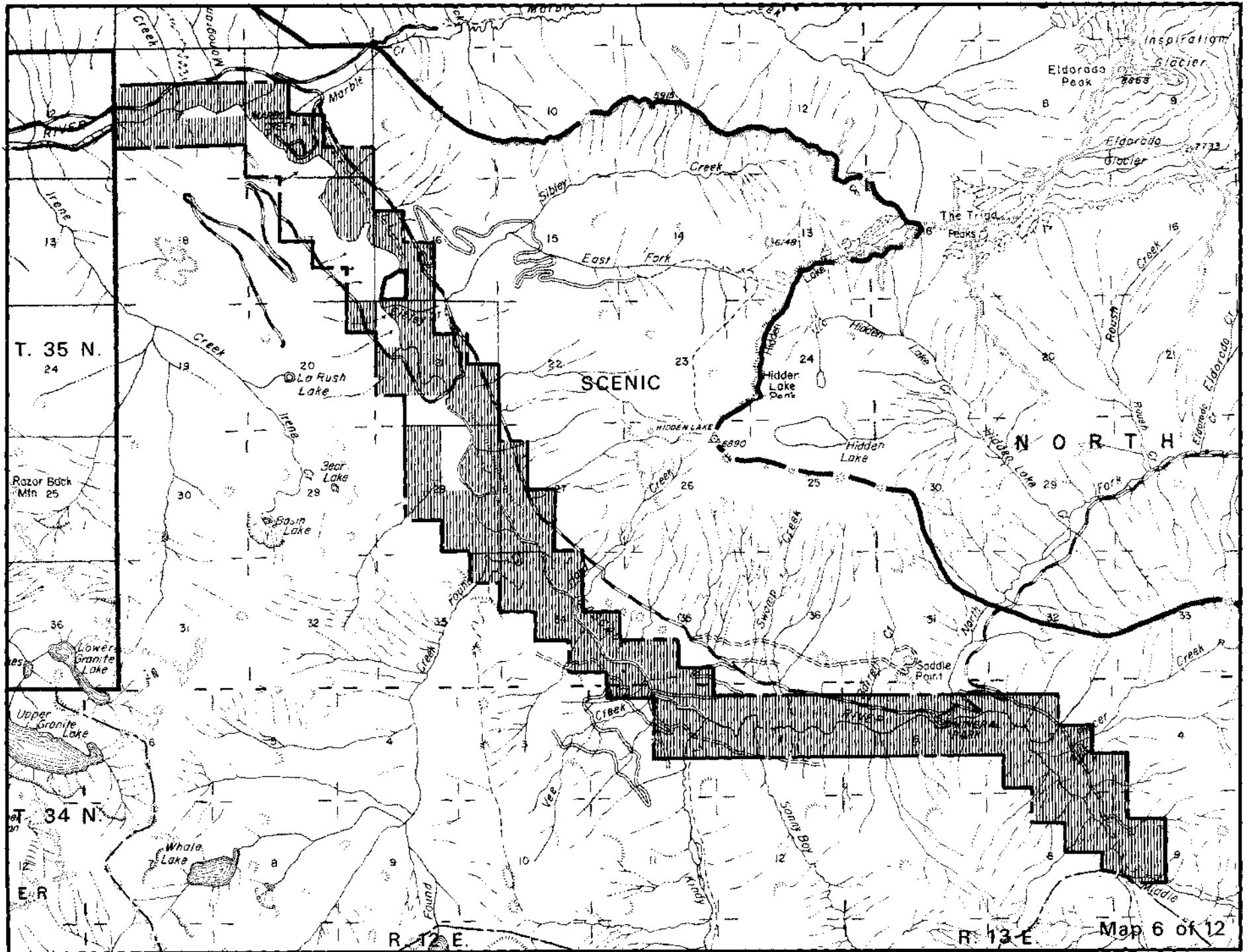


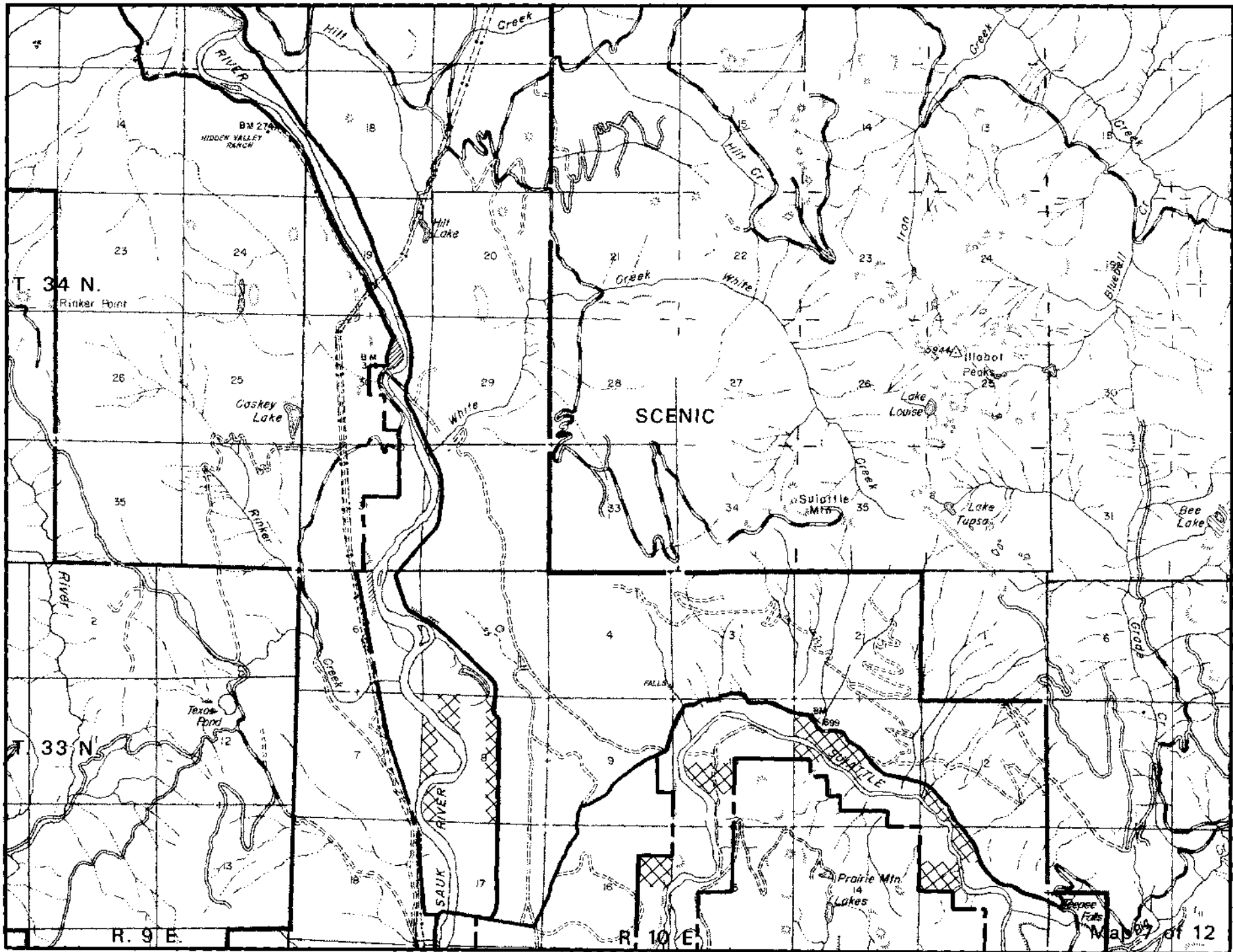












T. 34 N.  
Rinker Point

T. 33 N.

R. 9 E.

R. 10 E.

SCENIC

BM 274  
HIDDEN VALLEY RANCH

BM 3

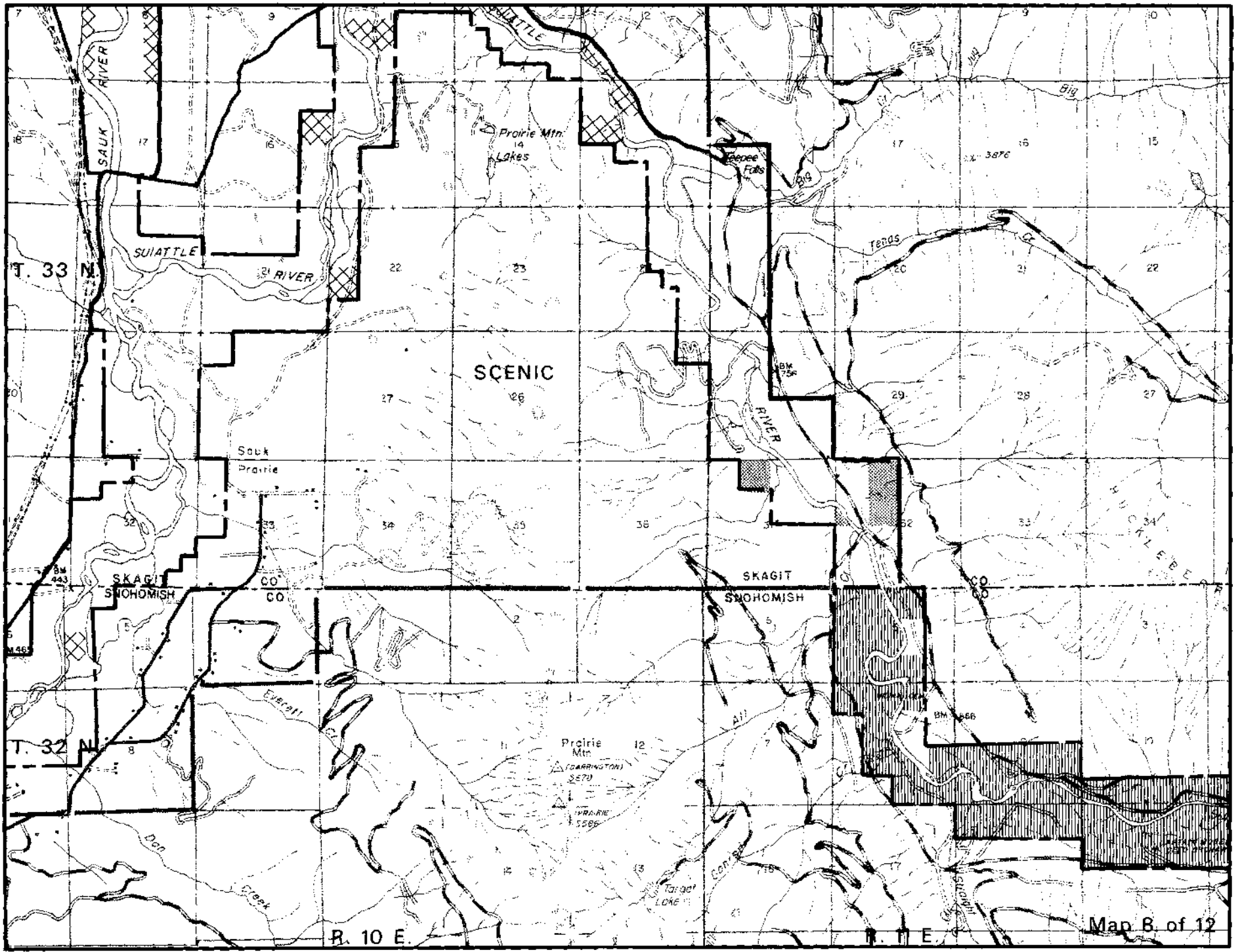
BM 699

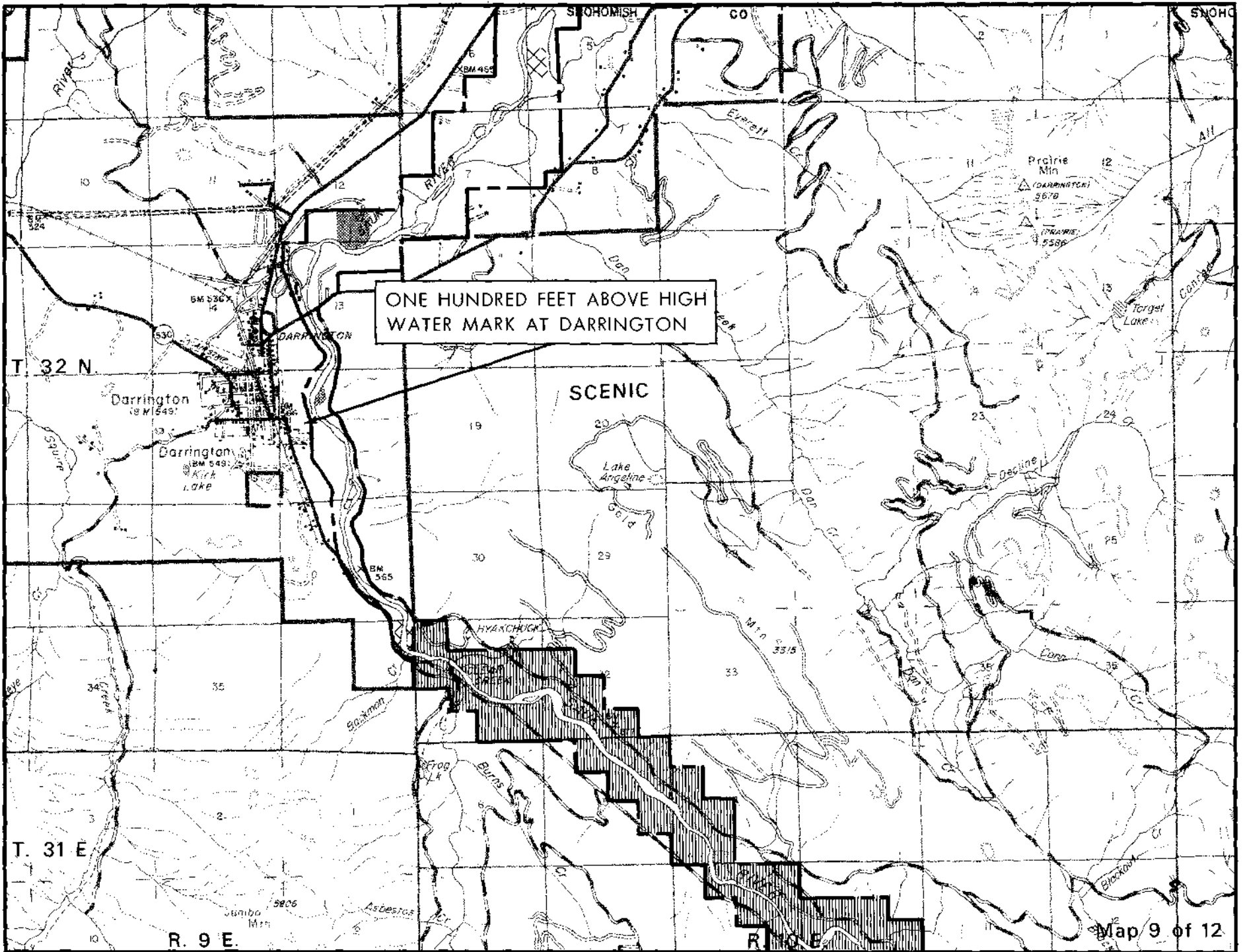
Prairie Mtn.  
14 Lakes

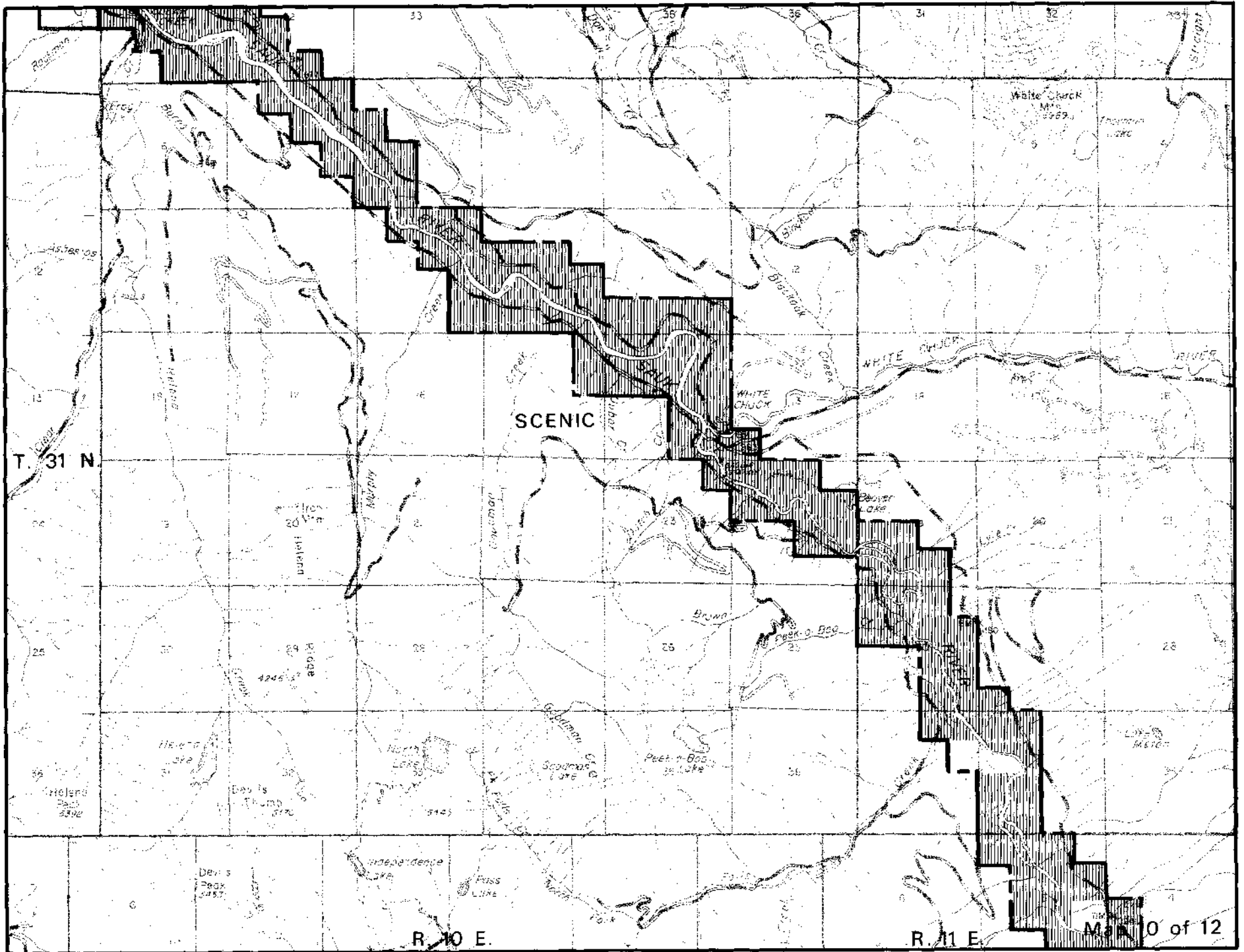
5844  
Hobot Peaks

Sepee Falls

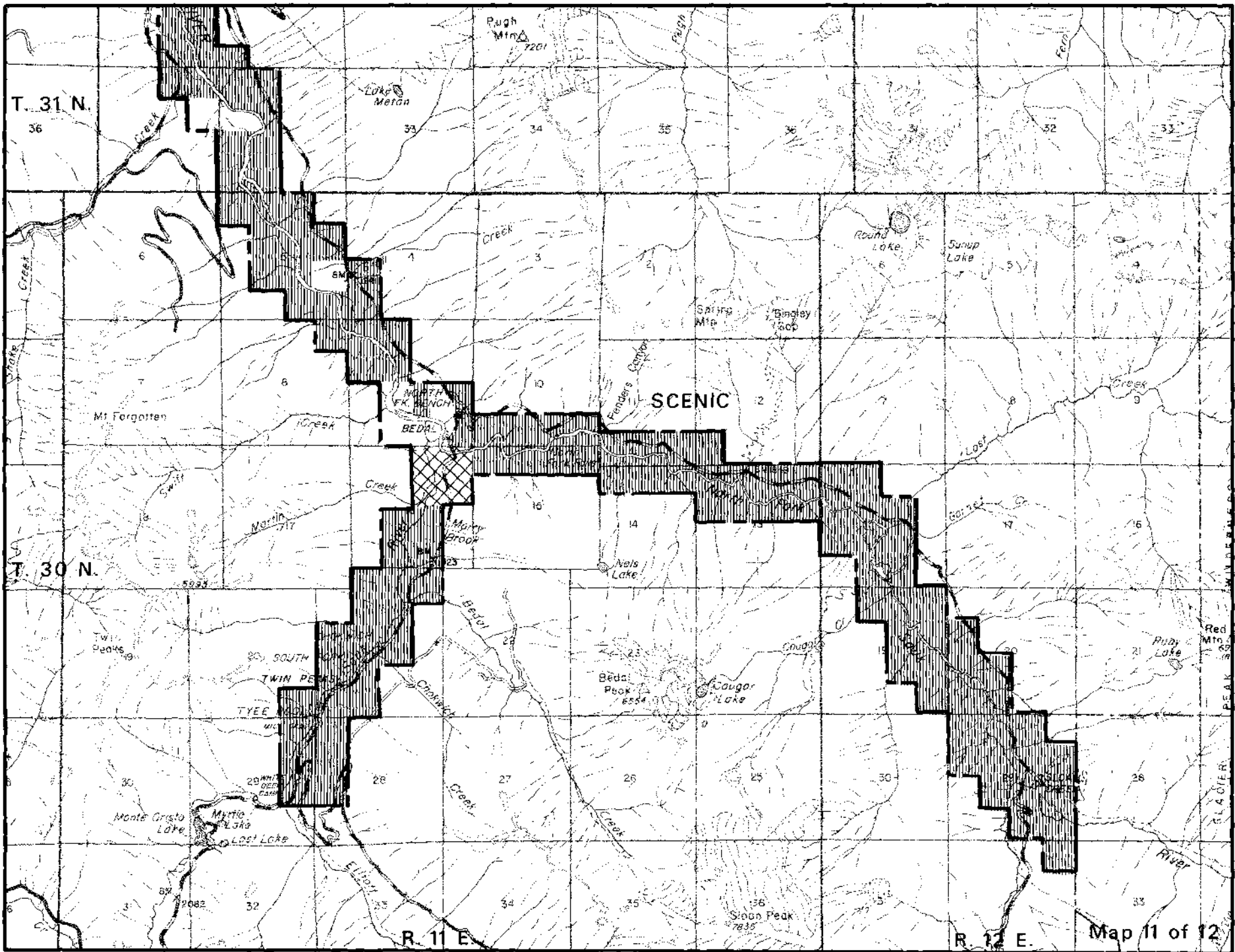
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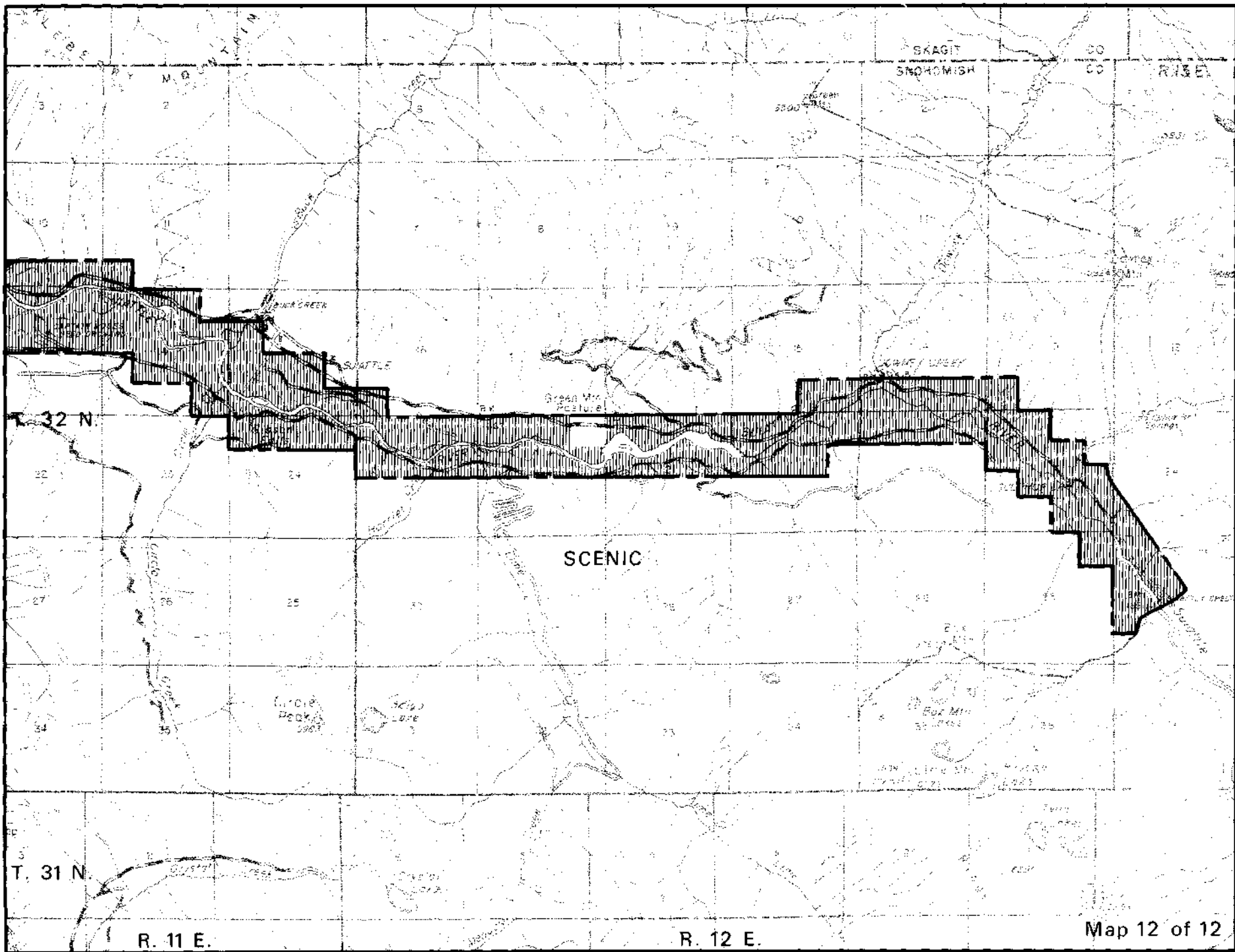












Map 12 of 12

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