PACIFIC NORTHWEST RIVERS STUDY
FINAL REPORT

MONTANA

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EXECUTIVE SUMMARY

The Pacific Northwest Rivers Study was initiated by a measure in the Northwest Power Planning Council (the Council) Fish and Wildlife Program and funded by the Bonneville Power Administration (BPA). The study, begun in 1985, was designed to identify river related natural resource values through a consistent and verifiable data base. The data were to be used by the Council and BPA for future hydroelectric development decisions including establishing areas to be protected from hydrodevelopment to be included in the Council's Protected Areas Program, site ranking and energy supply curves. The Montana Rivers Study assessed Montana's rivers and streams for their fish and wildlife values and their recreational, natural and cultural features. The study was coordinated by the Montana Department of Fish, Wildlife, and Parks with participation from the U.S. Forest Service, Bureau of Land Management, the U.S. Fish and Wildlife Service, and the Montana Department of Natural Resources and Conservation.

Standards and criteria were established to assess each resource value independently using existing data in a comparative assessment. A significance rating was given to each reach assessed of Class I for Outstanding, Class II for Substantial, Class III for Moderate and Class IV for Limited. Resources with an unknown value were identified as a Class V. A review by resource experts and participants followed the assessment. A set of programs written in dBase III+ using IBM compatible personal computers was developed to query the information.

Nearly 20,000 stream miles were rated in the Montana Rivers Study including over 18,000 miles for their fisheries values, 12,000 miles for their recreational features, 400 botanical features, 900 geologic features and 400 wildlife assessment units describing the state's wildlife. Features or stream reaches receiving an Outstanding, or Class I, natural resource value included 2,197 miles or 12 percent of the assessed fisheries reaches, 48 or 12 percent of the wildlife assessment units, 2,160 miles or 18 percent of the reaches assessed for recreation, 73 or 18 percent of the botanical features, and 179 or 23 percent of the geologic features. Lands excluded from the assessment included National Parks and wilderness areas because of their designation prohibiting hydroelectric development. Indian tribes in Montana did not participate in the study.

Based on results from the Montana Rivers Study, the Montana Department of Fish, Wildlife and Parks established criteria and recommended stream reaches in western Montana for their fish and/or wildlife values to be included in the Council's Protected Areas Program. Of the 6,800 miles of stream in western Montana, we recommended a total of 2,048 stream miles be protected from future hydroelectric development including 832 miles for their fisheries values and 1,484 miles for their wildlife values.

In order to present the results of the Montana Rivers Study, the data were summarized by 12 drainages; the Kootenai, the upper Flathead and the Swan, the upper Clark Fork, the lower Clark Fork, the Big Hole and Beaverhead drainages, the Missouri headwaters, the upper Missouri to the Smith, the Rocky Mountain Front, the Central Missouri drainage to Fort Peck Reservoir, the lower Missouri from Fort Peck Dam to the North Dakota border, the upper Yellowstone and the lower Yellowstone. With the exception of the cultural data, the results were summarized by resource area within each drainage and presented here.

Current and potential uses of the data bases in addition to the Council's and Bonneville Power Administration's needs are also discussed.

ACKNOWLEDGMENTS

The final report for the Montana portion of the Pacific Northwest Rivers Study (the Montana Rivers Study) has occurred as the result of efforts from countless individuals, agencies and organizations. These acknowledgments start with Larry Thompson, a key member of the study team who coordinated the natural features assessment and later became the Montana Rivers Study data base manager. Larry was unable to write his portion of the final report due to his death on February 5, 1988 following a nine month battle against a malignant brain tumor. Larry brought to this study the same dedication and enthusiasm he brought to every natural resource project he was involved with and he will be deeply missed.

Pat Graham, along with other state coordinators and BPA and Power Planning Council staff, initiated and organized the massive effort to assess the natural resource values of the Pacific Northwest rivers and streams in 1985. Drew Parkin played a key role in coordinating the four states' assessment processes and findings. The resource experts conducting the assessments deserve a special thanks for providing high-quality and reliable data to write the report from -- George Holton, Burwell Gooch and Bob McFarland in the fisheries assessment; Gael Bissell, John Mundinger and Brian Giddings for the wildlife assessment; Paul Pacini, Stewart Allen and Jim Traub in the recreational assessment; Tom Ring, Nancy Johnson, and Peter Lessica for the natural features assessment; and Tom A. Foor in the cultural assessment. Numerous cooperating resource experts from federal agencies including Earl Reinsel, Don Bartschi, Ray Hoem, and Janet Johnson, provided insight and suggestion to further the study design and results. Biologists, resource managers and public individuals provided the data to assess each resource area, reviewed each drainage write-up and their continued support of the project is greatly appreciated.

Dennice Hamman and Frances Roe converted the original write-ups, typed, and helped edit the report. Mark Gaub assisted in the graphics. Larry Peterman, Pat Graham, Gael Bissell, Tom Pansky, Drew Parkin, Tom Ring, Earl Reinsel and Ray Hoem reviewed the draft report. The study was funded by the Bonneville Power Administration and coordinated from their office by Tom Pansky.

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INTRODUCTION

Throughout Montana's history and settlement, the state's rivers and streams have played a major role in developing our state. From the upriver journey of Lewis and Clark in the early 1800s and paddleboats on the Missouri to the rafts, canoes and power boats that tour them today, our rivers have been used as an important means of transportation and recreational opportunity. As well as their instream importance, their waters also provide irrigation for millions of acres of hay and wheat fields, municipal water supplies, dilution for sewage treatment effluent, and power generation.

The dams on our rivers and streams have been constructed for irrigation, flood control, and the generation of electricity. The first hydropower project in western Montana was constructed in 1902 on the Swan River in the Flathead drainage. One of the largest earthen dams in the country, Fort Peck on the lower Missouri, was completed in 1934. Kerr Dam on Flathead Lake was soon to follow in 1938 and the last major dam construction in Montana occurred on the Kootenai River when Libby Dam was completed in 1972.

In western Montana, the damages to resident fish and wildlife resources from past hydroelectric development have been well documented (Fraley 1986, May and Weaver 1987, Beattie and Clancey 1987 and Chisholm and Fraley 1986). Ten percent of western Montana stream miles were lost due to construction of nine dams from 1902 to 1972. Construction of Hungry Horse Dam on the South Fork of the Flathead River blocked over one-third of the drainage area to the migratory fishery populations of Flathead Lake. Hungry Horse Reservoir inundated nearly 24,000 acres important to wildlife species. The construction of Thompson Falls, Cabinet Gorge and Noxon Rapids dams on the lower Clark Fork River blocked all upstream migration from Lake Pend Oreille and flooded 11,000 acres of big game, furbearers and waterfowl habitat. Libby Dam impounded nearly 50 miles of the Kootenai main stem in Montana as well as numerous lower reaches of spawning tributaries. The reservoir flooded almost 30,000 acres of prime wildlife habitat.

Montana has traditionally been in the forefront in developing protection for river and stream natural resources. In 1959, the Montana Department of Fish, Wildlife and Parks (MDFWP) initiated the "Blue Ribbon Stream" concept identifying our premiere sport fisheries. Instream water rights on these streams were established 10 years later by the Montana legislature. The Water Pollution Act of 1955, the Stream Preservation Act of 1963 and the Streambed and Land Preservation Act of 1975 added additional protective measures. In 1973, the Montana Water Act specifically defined fish and wildlife as beneficial uses of our waters and provided a mechanism to reserve water for instream purposes. In

1978, the first instream flow reservation was granted by the Board of Natural Resources and Conservation on the Yellowstone River.

In 1980, Congress passed the Northwest Power Planning and Conservation Act (the Act) which was designed to balance power needs, hydropower development, and natural resources in the Columbia River Basin. The Act called for the formation of the Northwest Power Planning Council (the Council), which was mandated to develop the Columbia Basin Fish and Wildlife Program. The program was aimed at balancing past and future hydropower development in Washington, Oregon, Idaho and western Montana through protection, mitigation and enhancement of anadromous and resident fish, and wildlife. The Act also stated that the Bonneville Power Administration (BPA) would bear the financial responsibility for the program measures.

Although the majority of the program addressed the mitigation and enhancement of anadromous fisheries, the Council's Protected Areas Program, a measure in the 1984 Council's Fish and Wildlife Program, requested a study be conducted to identify stream reaches with critical fish and wildlife habitat that should be protected from future hydroelectric development.

In the Council's original Draft Fish and Wildlife Program in 1982, Montana submitted a list of Class I fishery streams and critical wildlife habitat to be protected from future hydroelectric development. Because many additional streams were recommended from other states in the Columbia River basin during the draft review period, the Council opted for a study rather than prematurely selecting protected area reaches.

The Pacific Northwest Hydropower Assessment Steering Committee (HASC) was established by the Council to address the study for selection of protected areas in the Columbia River Basin. Its membership consisted of 20 representatives from state fish and wildlife agencies, federal land management agencies, conservation organizations, and power interests. The MDFWP was one of the original members of the HASC. The Pacific Northwest Hydropower Assessment Study Work Plan, developed by the HASC in August 1984, was aimed at providing information to help the Council in designating protected areas, site ranking and energy supply forecasting.

THE MONTANA RIVERS STUDY

As part of the Hydropower Assessment Work Plan, the assessment of nonanadromous fish and wildlife values was conducted by the Pacific Northwest Rivers Study (PNWRS) beginning in 1985. The study, funded by the BPA, was developed to assess and rate the significance of river related natural resource values in Montana, Idaho, Washington and Oregon. The Montana Rivers Study, the Montana portion of the PNWRS, included the assessment of resident fisheries and wildlife values and recreational, natural and cultural features in and along Montana's rivers and streams. Institutional constraints such as national parks, wilderness areas or wildlife refuges, which would prohibit or reduce the likelihood of hydroelectric development, were mapped but streams within these designations were not rated. Montana's Indian reservation land were not assessed in the study.

The Montana Rivers Study was coordinated by the MDFWP and conducted the fish, wildlife and recreational assessments. The Department of Natural Resources and Conservation (DNRC) lead the natural features assessment and the University of Montana's anthropology department headed up the cultural assessment. State agency employees, the U.S. Forest Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management and state universities were major participants in the assessments, providing data, completing questionnaires and reviewing assessment guidelines and rating systems (Appendix A).

In six months, beginning in May, 1985, the study inventoried and compiled data, determined standards and criteria to rate each resource, and assessed the significance of Montana's rivers and streams. Following the assessment, each stream reach for each resource value present was rated as Class I for Unique or Outstanding resources, Class II for Substantial, Class III for Moderate, and Class IV for Limited resources. Reaches with an unknown value were identified as Class V.

A detailed description of the assessment guidelines used for each natural resource area is available under separate cover, Pacific Northwest Rivers Study: Assessment Guidelines: Montana, December 1986 available at the MDFWP Fisheries Division in Helena, Kalispell MDFWP Special Projects Office, or the Natural Resource Information System located at the State Library in Helena. Following is a summary of the assessment guidelines for each resource area.

Assessment Guidelines

FISHERIES

The classification of rivers is nothing new to Montana's fisheries. The first stream classification for recreational fisheries was published in 1959 by the Stream Classification Committee, composed of representatives from the Montana Fish and Game Department (now Montana Department of Fish, Wildlife and Parks), Montana State College (now Montana State University) and the Bureau of Sport Fisheries and Wildlife (now part of the U.S. Fish and Wildlife Service). The classification stemmed from a concern over a . . . "lack of satisfactory methods for measuring . . . their total (stream) fishery - both economical and social."

Although the number of miles assessed and the sophistication of sampling techniques have changed substantially from 1959 to 1985, the intent, purpose and criteria for assessing the state's fisheries have remained nearly the same. The fisheries data base used in the Montana Rivers Study had a head start on all the other resource areas too -- by about 15 years. The Montana Interagency Stream Fishery Data Base, started in 1973 by the MDFWP in cooperation with federal land management agencies, was used to assess Montana streams in 1985. Each stream reach in the data base included the stream reach location and description; fish population estimates and species abundance data; fishing pressure, creel data and recreational opportunity; land use values and physical, chemical and limiting factor information. In order to rate the reaches for the Montana Rivers Study, the data base was corrected in 1985 and updated with additional streams; the fishes of special concern list was revised, and a genetic value was added; and more recent estimates of fish populations and angler use were included.

From the 300 or more variables in the fishery interagency data base, 56 were used to rate each reach in two categories, a species and habitat value and a sport fishery value. In the fisheries assessment, the Class I resource value was divided into two subclassifications: a Class I became an outstanding stream reach and a Class II being a high-valued stream reach; Class III was defined as substantial, rather than a Class II in the other resource area assessments. The final classification, the fishery resource value, was the higher class of the two categories.

The habitat and species value category of each stream reach was determined using a point system. Points were awarded for stream habitats of Montana fishes of special concern, which are native fishes found in limited numbers and/or limited numbers of waters. Montana fish species of special concern include white sturgeon (Acipenser transmontanus), pallid sturgeon (Scaphirhynchus albus), paddlefish (Polydon spathula), arctic grayling (Thymallus arcticus), cutthroat subspecies (Salmo clarkii sp), and bull trout (Salvelinus confluentus). Points were also

given for local value in more arid and/or remote portions of Montana where a stream was important for recreation and/or scientific or nature study. A stream reach containing essential spawning habitat of a Class I or Class II sport fishery was upgraded in the habitat and species value. Upgrading also occurred if a reach was a spring creek.

The sport fishery value of a stream reach was based on an evaluation of these criteria: Fish abundance indicated by biomass or by numbers and sizes of game fish; ingress; aesthetics, and fishing pressure. These were the same criteria used in 1959 in the first recreational fishery classification.

WILDLIFE

Not until the Council provided the impetus for evaluating the natural resource values of Montana's rivers did the state initiate the task of developing a statewide wildlife data base. This major undertaking began under the guidance of an interagency task force consisting of wildlife biologists and managers from the U.S. Forest Service (USFS), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), DNRC, and the MDFWP. The Montana Rivers Study resulted in the compilation of dozens of habitat, species and recreational variables for 400 river basin main stem or sub-basin units.

The first step in creating the wildlife data base was to determine wildlife criteria to use in assessing the potential effects of future hydroelectric development on wildlife species. Review of the existing criteria from Montana's fisheries data base, BLM's riparian data base, state or federal designations of threatened and endangered species and species of special interest or concern, resulted in several draft criteria and data collection documents. These were reviewed, tested, and adopted by the interagency task force. Wildlife resources were evaluated for habitat and species values. Information on specific species distributions or relative numbers for each assessment unit were gathered in the "field" from Montana's technical wildlife people within the USFS, BLM, and MDFWP. In addition, information was collected from technical and annual reports, distribution studies of the Montana Natural Heritage Program (MNHP 1987), and contacts with resource experts. Boundaries for individual units were determined by the interagency group of biologists as they worked together on particular basins.

The final habitat value for each assessment unit was based on the highest rating of two categories. The habitat quality rating depended primarily on the characteristics of the riparian zone. Specific criteria included condition of the riparian zone, diversity of vegetation types, and the relative abundance of mature cottonwood and coniferous forests, wetlands, and islands. The more pristine and diverse the riparian community, the greater

the number of points. The second category reflected the occurrence of specially designated lands, such as wildlife refuges, waterfowl production areas, wildlife management areas, Nature Conservancy Preserves, conservation easements and Wild and Scenic River corridors. Points were awarded according to relative protection these designations had with respect to hydroelectric development and purpose of the designation. The highest ranking of the two habitat categories, habitat quality and designated lands, became the final habitat value.

The final species value was based on the highest ratings of three categories: threatened and endangered species; species/habitats of special interest or concern; and game and furbearing species. For species federally listed as threatened or endangered in Montana, additional criteria from recovery and management plans were used to determine presence or absence of individual species (or its "critical" habitat) within a specific river unit. A two-level system of rating was utilized for several species. For example, a value of 2 was assigned to river reaches containing either bald eagle nests or designated grizzly bear management zones. A rating of 1 was assigned to bald eagle wintering or migration areas or to grizzly bear ranges outside designated management zones. Other threatened or endangered species considered in the assessment process included the gray wolf, whooping crane, and black-footed ferret and peregrine falcon.

The species and habitats of special concern used in this assessment were adapted from the the MDFWP's "Vertebrate Species of Special Concern" and from similar lists used by federal and state agencies. Emphasis was given to those species whose distributions or life histories were closely tied to riparian zones. Species on the list included the harlequin duck, osprey and golden eagle; amphibians such as the tailed frog, Coeur d'Alene salamander, Pacific giant salamander, and rough-skinned newt, and reptiles such as snapping turtle, spiny softshell (turtle), plains hognose snake, and milk snake. In addition to these species, points were awarded for four specialized wildlife habitats including colonial nesting sites for great blue herons, cormorants, and white pelicans; waterfowl staging areas; spring creeks used by waterfowl in winter, and high-density raptor nesting or wintering areas.

For the 15 game and six furbearing species, a rating of 1 to 3 was assigned to reflect relative population densities, the presence of critical habitat, (e.g. winter range) or general habitat suitability. Individual species were weighted differently depending on their statewide management emphasis and dependence on riparian communities. Individual species ratings were combined to form an overall game and furbearer value.

The final resource value was derived by several methods depending on the species and habitat ratings. To qualify as a

Class I or Outstanding resource value, the river reach had to receive a Class I species value with a Class I or II habitat value. Other classifications were based on the average of the species and habitat ratings with the final classification rounded upwards. One exception to this occurred for reaches receiving a Class IV species ratings with Class III habitat rating. In the latter case, the final resource value became a Class IV.

RECREATION

The Montana Rivers Study recreation study had two stages -- identification of river reaches having recreational value and an inventory and evaluation of those reaches. Participating in the study were more than 20 managers and staff members from MDFWP, US Forest Service and Bureau of Land Management; and private and commercial river users. A letter was sent to each manager describing the purpose and goals of the Montana Rivers Study followed by a request to identify river reaches having recreational values. Managers also were asked to provide the names and addresses of river recreationists, clubs, commercial river outfitters, and others who would have an interest in the study as well as project staff identifying additional river users.

Once all the maps had been returned, the river reaches were compared and adjusted to create a final map version. In April of 1985, the adjusted working maps were returned to the managers with a worksheet to complete for each river reach with which they were familiar. The 300 river users identified were mailed a similar letter introducing the study and asking them to provide the same information.

The worksheet contained items on water character and boating suitability, water- and land-based recreation activities taking place on or along the river reach, use levels, access, recreation opportunity spectrum (ROS) class, scenic quality, and the number and type of developed recreation sites along the reach. Managers and other raters also indicated what class they would assign to each river reach, and wrote down explanations in their own words. Value classes had verbal descriptions of the type of river segment that would fall into each class, to insure consistency of class definitions.

Once worksheets were returned, project staff reviewed and compiled the managers' ratings onto a single worksheet for each river reach. If any manager rated a reach as Class I (Outstanding), that was the final value class, regardless of any other ratings received.

After combining information received from managers and users a draft printout of the data was mailed to each manager for review and correction. At the same time, river users who had participated in the study received postcards on which they were

asked to indicate which regional list(s) of river reaches they would like to review. All who responded were sent the same printouts mailed to the managers. A master file was compiled from all the additions and corrections made by managers and users and completed the recreational assessment.

BOTANICAL FEATURES

In the botanical natural features portion of the Montana Rivers Study, 400 unique or exemplary sites were identified along Montana's rivers. Rather than systematically evaluating segments of all major rivers, individual sites were chosen primarily on the basis of both published information and advice from acknowledged experts. Most sites contained endangered and threatened plants, rare or unique plant communities, or previously designated natural areas. Just as the identification of sites reflects the collective experience of these sources, the total number and geographic distribution of the sites is limited by their collective experience as well. It is, therefore, possible that many additional high value class sites have not been included.

Value class assignments were entirely subjective and were based on the recommendations of the experts interviewed and on the professional judgment of the Montana Department of Natural Resources and Conservation staff involved in the project. Where there was uncertainty regarding a value class assignment, the higher value class was assigned with the understanding that the value classes would be adjusted as the study continued.

The final value class for a site was equal to the highest rating given any one of these four criteria that were used to evaluate the site:

A) Scarcity or rarity. Refers to the overall rarity of the botanical natural features. The highest rating was given to sites that contained features that are very rare on a worldwide or national level, and the lowest rating was given to sites that had elements present elsewhere in Montana.

B) Previous designation. Used to rate sites according to whether they had been previously designated for protection by a government or private agency. For example, some sites have been officially proposed as Research Natural Areas (RNAs) by the U. S. Forest Service or potential National Natural Landmarks by the U.S. Department of Interior. These and other nationally recognized sites were given the highest rating (I). Other sites held either statewide significance, local significance or no official recognition.

C) Public and recreational use. Sites were subjectively rated according to their existing level of public and recreational

use. Sites that attracted many visitors from across the nation rated higher than sites that attracted local visitors.

D) Scientific reference or educational value. Sites were rated on their existing level of use for scientific or educational purposes. Sites receiving a high rating might include type localities or sites traditionally used by school groups.

GEOLOGIC FEATURES

In the geological features assessment, unique or exemplary geological or hydrological features and previously designated areas such as National Natural Landmarks (NNLs) were examined. The geologic features assessment followed the guidelines outlined in the botanical features assessment with respect to assignment of value classes and the criteria used. Information on geological features was collected from published sources and through interviews with acknowledged experts with Montana State University, University of Montana, Museum of the Rockies, Carter County Museum, U.S. Geological Survey, and DNRC. For the geological features inventory, existing NNL theme studies provided the starting point for the inventory, and sites were added to these lists.

Statewide Results

FISHERIES

A total of 21,213 miles of streams in 4,238 reaches were contained in the interagency stream data base (Table 1 and 2). Due to insufficient data, only 2,521 stream reaches in 18,868 miles were assessed. Twelve percent, or 2,198 river miles, were assessed a Class I fishery resource value including 161 reaches or 1,716 miles rated Class I for their habitat and species value and 35 reaches or 764 miles rated Class I for their sport fishery value. Twenty-one percent, or 3,961 stream miles were assessed as a Class II, or high-valued fishery resource. A total of 3,470 miles received a Class II habitat and species value and 1,260 miles received a Class II sport fishery value.

The majority (66 percent) of reaches received a Class I habitat and species value due to the presence of genetically pure populations of species of special concern. Another 30 percent of the Class I habitat and species reaches were essential spawning habitat for a Class I fishery. Four percent received a Class I status due to their outstanding spring creek values. Seventy-one percent of these habitat and species reaches were located in the upper Flathead River drainage, the upper Clark Fork River drainage, or the Big Hole and Beaverhead watersheds (Table 3). When stream miles were considered, however, the lower Missouri and Yellowstone rivers and the Milk of eastern Montana contained 33 percent of the Class I habitat and species stream miles in only 15 reaches. Paddlefish and pallid sturgeon, big river fishes of special concern, led to these statistics.

It took an exemplary river to receive a Class I in the sport fishery category. Only 35 reaches made the grade including the entire Madison, the lower Big Hole, Rock Creek, the upper Flathead and the upper Missouri. Fifty percent of the Class I sport fishing mileage was found on the Yellowstone River and within the Missouri headwaters. An additional 49 reaches or 1,260 miles received a Class II sport fishery designation, including the Bitterroot River (with the fifth highest overall fishing pressure in the state) and large portions of the Gallatin, Smith, Clark Fork and Kootenai.

Only seven of the 4,238 reaches assessed statewide were rated a Class I in both categories. All of these were major rivers supporting species of special concern and providing outstanding angling opportunities. Included in these seven reaches were the upper Flathead and its North Fork and both the central and lower Missouri and lower Yellowstone. Class I reaches in the habitat and species category were awarded for the rarity of habitat for populations of species of special concern.

Table 1. Total number and percentages (%) of fisheries assessment reaches within the habitat and species category, sport fishery category and final resource value. Calculated percentages do not include Class VI reaches (reaches unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	157 (6)	345 (14)	471 (19)	1,426 (57)	118 (5)	1,717	4,238 (2,517)
Sport Fisheries	35 (1)	49 (2)	512 (20)	1,568 (62)	348 (14)	1,726	4,238 (2,512)
Final Resource	189 (7)	367 (15)	685 (27)	1,192 (47)	88 (3)	1,717	4,238 (2,517)

Table 2. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fishery category and final resource value. Calculated percentages do not include Class VI fisheries miles (reaches unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	1,716 (9)	3,470 (19)	4,146 (22)	9,121 (48)	416 (2)	2,345	21,214 (18,869)
Sport Fisheries	764 (4)	1,260 (7)	4,864 (26)	9,688 (51)	2,269 (12)	2,368	21,213 (18,845)
Final Resource	2,197 (12)	3,961 (21)	5,726 (30)	6,615 (35)	369 (2)	2,345	21,213 (18,868)

Table 3. Number of reaches and lengths in miles for fisheries assessment by drainage.

Drainage	Final Resource Value Class													
	I		II		III		IV		V		VI		Total	
	Reaches	Miles	Reaches	Miles	Reaches	Miles	Reaches	Miles	Reaches	Miles	Reaches	Miles	Reaches	Miles
Kootenai	8	130	9	48	68	379	102	475	3	12	120	99	310	1,142
Upper Flathead	66	438	133	475	115	483	163	534	1	2	40	65	518	1,997
Upper Clark Fork	33	258	72	730	89	641	142	446	0	0	543	617	879	2,692
Lower Clark Fork	3	14	22	329	61	329	112	490	5	14	308	445	514	1,621
Big Hole/ Beaverhead	20	259	22	142	56	473	76	491	16	56	41	94	231	1,515
Missouri Headwaters (Madison/Gallatin/ Jefferson)	14	146	22	184	32	206	85	508	5	13	135	197	293	1,254
Upper Missouri River	8	58	11	64	25	202	55	179	1	1	90	117	190	621
Rocky Mountain Front	2	8	8	111	39	608	77	535	2	9	2	6	130	1,277
Central Missouri	8	239	14	272	57	691	114	938	5	77	116	168	314	2,385
Lower Missouri	5	266	10	477	17	592	45	878	5	23	28	46	110	2,282
Upper Yellowstone	19	168	21	340	78	644	159	902	38	148	248	398	563	2,600
Lower Yellowstone	3	214	17	551	34	473	56	202	4	8	23	43	137	1,491
Total	189	2,197	367	3,961	685	5,726	1,192	6,615	88	369	1,717	2,345	4,238	21,213

A Class I in the sport fishery category usually meant abundant wild trout where access was readily available and fishing pressure was high. The lack of reaches receiving a Class I in both categories illustrates why the rating system was established to allow the highest class of the two categories to become the final resource value for a reach.

WILDLIFE

The wildlife data base contains information on nearly 70 wildlife variables for 400 river assessment units. Forty-eight assessment units (12 percent) achieved a Class I final resource value (Table 4). Most fell into Class II (39 percent) or Class III (33 percent) final resource values. Relatively few (16 percent) river units contained limited or Class IV wildlife values. These results indicate that most of Montana's rivers and basins contain significant, if not exceptional, wildlife resources.

Among the 12 major river basins in Montana, the Big Hole and Beaverhead drainages clearly contained the greatest percentage of Class I and II streams (Table 5). Of the 18 units within this basin, 39 percent achieved Class I, while 55 percent earned Class II final resource values. The 15 assessment units comprising the Rocky Mountain Front ranked second statewide, with 33 percent in both Class I and II final resource values. With 19 percent of its 43 units in Class I and another 44 percent in Class II, the upper Flathead ranked third among the 12 river basins in overall wildlife values.

Within the habitat category, statewide ratings were skewed to the lower value classes with the largest percentage of units (36 percent) falling into Class IV. Another 29 percent achieved Class III, while 19 percent earned Class II and 16 percent earned Class I habitat ratings. This skewed distribution probably reflects impacts of developments and activities on most of the state's riparian zones, and the relatively poor development of extensive riparian zones in upper drainages of western Montana and along small streams of eastern Montana. Most of the river units achieving Class I habitat values were found along the main stems of major river systems such as the Yellowstone, Missouri, Big Hole, Blackfoot, and Flathead rivers. Only six river units statewide earned the maximum score in all habitat quality categories. These included portions of the Flathead main stem, and the Big Hole, Red Rock, Missouri, and Yellowstone rivers. Most of the North, Middle, and South forks of the Flathead and the central Missouri rivers achieved Class I habitat status for their Wild and Scenic River status. Other streams with notable designated lands include portions of the Flathead main stem, the Swan River, Tobacco River, Teton River, and Beaver Creek in the Milk River drainage.

Table 4. Number and percentages (%) of all wildlife river units within habitat, species, and final resource value classes.

Value	Class				
	I	II	III	IV	Total
Habitat	62 (16)	76 (19)	117 (29)	145 (36)	400 (100)
Species	70 (18)	137 (34)	121 (30)	72 (18)	400 (100)
Final Resource	48 (12)	155 (39)	133 (33)	64 (16)	400 (100)

Table 5. Number and percentages (%) of wildlife river units within the four final resource value classes by river basin.

River Basin	Final Resource Value Class I	II	III	IV	Total
Kootenai	3 (7)	17 (44)	16 (41)	3 (8)	39 (10)
Upper Flathead	9 (21)	19 (44)	12 (28)	3 (7)	43 (11)
Upper Clark Fork	7 (19)	11 (30)	18 (48)	1 (3)	37 (9)
Lower Clark Fork	2 (9)	15 (65)	5 (22)	1 (4)	23 (6)
Big Hole/ Beaverhead	7 (39)	10 (55)	0 (0)	1 (6)	18 (4)
Missouri Headwaters Madison/Gallatin/ Jefferson	4 (16)	8 (32)	9 (36)	4 (16)	25 (6)
Upper Missouri River	2 (12)	4 (25)	7 (44)	3 (19)	16 (4)
Rocky Mt. Front	5 (33)	5 (33)	4 (27)	1 (7)	15 (4)
Central Missouri	4 (8)	18 (34)	17 (33)	13 (25)	52 (13)
Lower Missouri	2 (4)	17 (33)	21 (40)	12 (23)	52 (13)
Upper Yellowstone	2 (4)	19 (40)	12 (25)	15 (31)	48 (12)
Lower Yellowstone	1 (3)	12 (38)	12 (38)	7 (22)	32 (8)
Total	48 (12)	155 (39)	133 (33)	64 (16)	400 (100)

The distribution within the species category was more normal when compared to the habitat category. Most river units fell into Class II (34 percent) or Class III (30 percent) species value, with only 18 percent in both Class I and Class IV. Only the top 10 percent of those river units within each species subcategory could achieve Class I species value. Thus, to earn a Class I species value, the unit must support critical habitat for a diversity of threatened or endangered species, species of special concern, or game and furbearing species in order to accumulate sufficient points. Notable river units which earned more than 115 game points of a possible 153 include the upper Red Rock River, the southern tributaries to the Big Hole, and the western tributaries to the Madison. These river units plus Dupuyer Creek along the Rocky Mountain Front and the East and West Forks of Rosebud Creek in the Beartooth Mountains all supported critical habitat and/or high densities for at least six big game species -- elk, mule deer, white-tailed deer, black bear, moose, and bighorn sheep -- as well as moderate populations of other game and furbearing wildlife.

The three top river units containing significant habitats for species of special concern included the lower portion of the Big Hole and Jefferson Rivers and the upper Madison River basin. Streams with the most threatened and endangered species points include the upper Red Rock, Madison, and Stillwater rivers in western Montana.

RECREATION

A total of 778 river reaches in over 12,000 miles of rivers were identified, mapped, and entered into the master data base. Nine percent were rated as having Outstanding value for recreation, 18 percent as Substantial, 43 percent as Moderate, and 21 percent as Limited. The MDFWP and USFS rated 9,000 miles and the BLM assessed nearly 5,000 miles (Table 6). Only three reaches in the state received a Class I rating from all three agencies; lower Rock Creek in the Clark Fork, the Beaverhead and the Smith River. The value of the remaining nine percent was unknown. Almost three-quarters of the segments were rated as not boated due to small size, low flows, or other reasons. Of the boated stretches, less than five percent were rated as containing major rapids, pointing to the scarcity of the whitewater resource. Thirty-five percent of the Class I river segments were in MDFWP Region 3, southwestern Montana (Table 7).

This was the first comprehensive study of the recreational values of rivers in Montana. The scope of this study was limited because time and budget constraints did not permit the complete field inventory commonly used to conduct inventories of recreational resources. While suitable for use as a planning document in the initial stages of hydropower planning, this inventory is not suitable for actually siting facilities.

Table 6. Summary of number and miles of recreational assessment reaches by agency rating and final recreational value. DFWP = Department of Fish, Wildlife and Parks. USFS = U.S. Forest Service. BLM = Bureau of Land Management.

Agency	Final Recreational Value											
	I		II		III		IV		V		Total	
	Reaches	Miles	Reaches	Miles	Reaches	Miles	Reaches	Miles	Reaches	Miles	Reaches	Miles
DFWP	30	761	70	1,653	127	3,235	95	2,370	131	1,309	453	9,328
USFS	49	910	121	1,796	275	3,574	149	2,050	23	398	617	8,714
BLM	2	212	37	982	67	2,177	44	1,323	5	120	160	4,814
Final Value	67	1,298	145	2,529	345	5,633	155	2,418	66	617	778	12,528

Table 7. Number and percentages (%) of recreational assessment reaches by river basin within the four final resource value classes by river basin.

River Basin	Final Recreational Value Class I	II	III	IV	V	Total
Kootenai	100 (34)	58 (20)	139 (47)	0	0	297
Upper Flathead	6 (2)	72 (19)	181 (48)	105 (28)	10 (3)	374
Upper Clark Fork	211 (14)	324 (21)	737 (47)	225 (14)	67 (4)	1,564
Lower Clark Fork	38 (3)	306 (23)	656 (49)	303 (22)	46 (3)	1,349
Big Hole/ Beaverhead	383 (22)	404 (23)	809 (45)	103 (6)	85 (5)	1,784
Missouri Hdwtrs. Madison/Gallatin/ Jefferson	219 (20)	330 (30)	356 (33)	24 (2)	165 (15)	1,094
Upper Missouri River	8 (3)	58 (21)	112 (40)	84 (30)	16 (6)	278
Rocky Mt. Front	0	149 (18)	552 (67)	107 (13)	15 (2)	823
Central Missouri	80 (6)	69 (5)	767 (56)	413 (30)	32 (2)	1,361
Lower Missouri	0	0	400 (43)	485 (52)	48 (5)	933
Upper Yellowstone	227 (13)	501 (29)	585 (33)	331 (19)	115 (7)	1,759
Lower Yellowstone	0	256 (32)	448 (56)	72 (9)	18 (2)	794
Total	1,272 (10)	2,527 (20)	5,742 (46)	2,252 (18)	617 (5)	12,528

BOTANICAL FEATURES

Considering the final value class ratings for the 400 sites, 18 percent contained botanical features that were considered to be unique or outstanding resources (Table 8). However, 57 percent of all of the sites received either Class I or Class II. This reflects the fact that the inventory effort concentrated on those sites having the highest natural feature values. Only three percent of the sites inventoried were of unknown value.

The four criteria ratings for each of the 400 sites examined in this study reveal some interesting patterns. About one third of the sites received a rating of Class I or II within either the scarcity criterion or the previous designation criterion (Table 9). These two criteria dominate the highest final value class assignments and accounted for 88 of the 100 highest ratings. There is an apparent lack of knowledge about the level of public or recreational use of these 400 sites, as 87 percent of the sites listed an unknown value in regard to public use. Evaluating public use of an area requires sampling a broad audience, and interest in rare plants or unique plant communities is just beginning to surface. The scientific and educational criterion also appears to be under-represented in the highest ratings. Only two percent of the sites received recognition for having exemplary value and 64 percent are of unknown value with respect to the scientific and educational criterion.

Most of the botanical features and designated areas are located in western Montana. For example, 34 percent of all sites were located in either the upper or lower Clark Fork River drainage, and about 41 percent of the final value Class I rankings occurred in those two drainages (Table 10). In contrast, only one of the 400 sites occurred in the entire Milk River section of the Lower Missouri drainage, far fewer than would be expected on the basis of its length. This pattern can be explained in part by the known high degree of endemism that occurs within the topographically varied southwestern portion of the state. Another possibility is that the pattern is a reflection of a non-uniform distribution of research effort. Therefore, further study in the eastern part of the state is recommended, along with a systematic statewide field inventory to determine the resource value of additional sites throughout Montana.

Table 8. Number (%) of botanical natural feature sites within the four final value class assignments.

	Final Value Class					
Resource	I	II	III	IV	Unk.	Total
Botanical natural features	73 (18%)	155 (39%)	119 (30%)	43 (11%)	10 (3%)	400

Table 9. Number (%) of sites that fell within the four value classes for each of the four criteria.

	Value Class Rating				
Criterion	I	II	III	IV	Unk.
Scarcity	36 (9%)	101 (25%)	98 (25%)	89 (22%)	76 (19%)
Previous designation	52 (13%)	87 (22%)	117 (29%)	139 (35%)	5 (1%)
Public/ recreation use	4 (1%)	7 (2%)	9 (2%)	33 (8%)	347 (87%)
Scientific/ educational	8 (2%)	86 (22%)	23 (6%)	26 (7%)	257 (64%)

Table 10. The number of botanical natural feature sites within the final value classes for each of the 12 drainages.

	Final Value Class					
Drainage	I	II	III	IV	Unk.	Total
Kootenai	1	12	2	4	0	19
Upper Flathead	8	30	27	2	0	67
Upper Clark Fork	22	30	45	4	2	103
Lower Clark Fork	8	12	9	3	0	32
Bighole/Beaverhead	7	11	10	2	1	31
Missouri Headwaters	2	16	3	11	1	33
Upper Missouri	10	3	4	3	0	20
Rocky Mtn Front	10	8	1	0	0	19
Central Missouri	3	14	3	1	0	21
Lower Missouri	1	3	6	2	2	14
Upper Yellowstone	1	10	3	3	1	18
Lower Yellowstone	0	6	6	8	3	23
Total	73	155	119	43	10	400

GEOLOGIC FEATURES

The inventory identified 924 geological features, including type locations (Table 11). Scientific and educational value and the previous designation or nomination of sites were the driving factors in the ranking (Table 12). Most paleontological sites received a rating of Class I. Most of the geological features were located in the central and western part of the state, in high-density clusters around Missoula, Bozeman, and Butte (Table 13). This is probably a reflection of the great amount of previous work done at Montana State University and the University of Montana as well as the greater geologic complexity in these areas.

An unexpected outcome of the study was the large number of sites, especially Class I and II, identified (Table 11). This is explained in part by interviewers instructing participants to identify only the most outstanding or significant features.

Although a large number of sites were identified, no field inspection or study of maps and photos was conducted, and the inventory is by no means complete. Further study is certain to reveal additional sites of high value. Priorities for future study are identification of major cottonwood/island/alluvium complexes, re-evaluation of rankings for waterfalls based on a more comprehensive set of criteria, including aesthetics, and additional peer review of map data and data bases.

Unlike the fisheries inventory, which assigned value classes to extensive lengths of rivers and streams based on the resources present in that stretch, the geological features inventory identified individual sites scattered throughout basins. The value class for each site was assigned to the stream reach within a particular site. Consequently, the total mileage of streams in any value class cannot accurately reflect the spatial extent and location of many geologic features.

Table 11. Number (%) of geologic natural feature sites that fell within the four final value class assignments. This table does not include geologic-type locations or sites located within Indian reservations, wilderness areas, or national parks.

	Final Value Class					
Resource	I	II	III	IV	Unk.	Total
Geologic natural features	179 (20%)	246 (27%)	281 (32%)	11 (1%)	174 (20%)	891

Table 12. Number (%) of sites that fell within the four value classes for each of the four criteria.

	Value Class Rating			
Criterion	I	II	III	IV
Scarcity	21	127	387	10
Previous	81	28	18	716
Public/ recreation use	38	51	38	18
Scientific/ educational	108	227	314	19

Table 13. The number and percent of geologic feature sites within the final value classes for each of the 12 drainages. This table does not include geologic-type locations or sites located within Indian reservations, wilderness areas, or national parks.

	Sites in Value Class				
Drainage	I	II	III	IV	Total
Kootenai	3	4	8	--	15
Upper Flathead	15	12	23	--	50
Upper Clark Fork	18	22	31	4	75
Lower Clark Fork	3	15	16	--	34
Big Hole/Beaverhead	23	12	33	1	69
Missouri Headwaters	21	31	35	2	89
Upper Missouri	10	21	23	--	54
Middle Missouri	39	40	33	1	113
Lower Missouri	10	18	18	1	47
Rocky Mtn Front	12	20	17	--	49
Upper Yellowstone	18	32	23	1	74
Lower Yellowstone	7	89	21	1	118
Total	179	316	281	11	787

Protected Areas Recommendations

By the fall of 1986, the Pacific Northwest Rivers Study had completed its major goal of identifying and documenting significant natural resource values of the Columbia River Basin's rivers and streams. The tasks completed at that time included the update of the assessment guidelines used in completing the study, peer review of the findings, and data revision and computer entry. By the summer of 1987, refinement of selected study components, data management system development, and initial report production had been completed and the application of study findings to protected areas recommendations and policy issues was initiated.

During early 1987, the Montana River Study's fisheries and wildlife data bases were updated and reviewed. In the fisheries data base, the revision emphasized refinement of critical species information, sub-division of segments where more specific information had become available and updating recreational and fish population data for use in the sport fishery category. The wildlife update was fairly extensive, including a thorough quality check of entered data, revision of threatened and endangered species and species of special concern data, sub-dividing units which originally encompassed several habitat components, and correction of locations of state and federally designated wildlife areas.

In March of 1987, the Council requested participation from the four Pacific Northwest state fish and wildlife agencies in recommending areas to be protected from future hydroelectric development based on their fish and wildlife values and the ranking of hydro sites throughout the region based on their fish and wildlife values. In April, the MDFWP, after consultation with the DNRC, agreed to participate in the Council's schedule and process for protected areas but not to participate in the site ranking portion of the program. The schedule called for protected areas stream recommendations and criteria by June 15.

The HASC developed fish and wildlife criteria for protected areas designation which the state fish and wildlife agencies used as guidelines in developing their own criteria. Protected areas criteria for fishery streams developed by the MDFWP were Class I stream reaches determined by the Montana Rivers Study which contained essential habitats necessary for sustaining Montana's Class A and Class B fish species of special concern (native fishes found in limited numbers and/or limited number of waters) where genetic purity has been established through electrophoresis and no substantial populations of contaminating species are present or streams with outstanding recreational fisheries or essential spawning habitats for outstanding recreational fisheries.

For wildlife, the criteria developed by the MDFWP included habitats identified as essential to the recovery of federally

threatened and endangered species including bald eagle nest sites and forage streams, critical eagle wintering areas, important grizzly bear range or movement corridors and historic peregrine eyrie sites with a high potential for reoccupancy or streams which support river otter population levels of moderate or high densities, Montana riparian species of special concern including amphibians, harlequin ducks and osprey; or essential winter or spring range for outstanding populations of elk, whitetail and mule deer, bighorn sheep, or moose.

Following an extensive review of the protected area stream list and criteria by MDFWP fish and wildlife biologists, 100 reaches in 840 stream miles in western Montana met the fisheries criteria and were recommended for protection by the MDFWP to the Council (Table 14) (Appendix B). Twenty-four percent or 200 miles were recommended for the presence of fish species of special concern, including westslope cutthroat trout, bull trout, native rainbow trout and white sturgeon; 19.2 percent were outstanding sport fisheries including portions of the upper Flathead, Kootenai and Blackfoot rivers, and Rock Creek; and 56.8 percent were essential spawning habitat for outstanding sport fisheries.

A total of 234 stream reaches in 1,484 miles were recommended for their wildlife values including 65.5 percent or 971 miles for threatened and endangered species; 12.8 percent or 190 miles for species of special concern and 21.7 percent or 322 miles for big game critical winter range (Table 14). Only 31 stream reaches in 244 miles met both the fish and wildlife criteria.

A total of 2,056 miles or 30 percent of the 6,800 stream miles in western Montana were recommended for protection from future hydroelectric development by the MDFWP to the Council in October, 1987. Of the 14 proposed hydrosites currently active in western Montana, the protected areas recommendations would close to development only one proposed hydroelectric site located on the Kootenai River 10 miles below Libby Dam.

The recommended streams constitute irreplaceable resources where hydroelectric development would have significant adverse effects which cannot be adequately mitigated. Aside from insuring that ratepayer's investments in fish and wildlife rehabilitation are not undermined by new development, protected areas designation will give future developers a clearer message on the value of fish and wildlife resources and provide the Federal Energy Regulatory Commission with information to make hydropower decisions that better reflect the environmental protection being encouraged in the Columbia River basin.

In October, 1987 the Council published an issue paper on the subject of protected areas and took public comment on the overall issue of whether areas should be designated for protection as well as issues concerning in and out of basin and whether protected areas should include more then just essential fish and wildlife

Table 14. Stream miles for fish and wildlife in western Montana recommended to the Northwest Power Planning Council for protection from future hydroelectric development.

FISH CRITERIA

Drainage		Essential Spawning Habitat	Species of Special Concern	Class I Sport Fishery	Total
Swan	Reaches	4	0	0	4
	Miles	25.9	0	0	25.9
Flathead	Reaches	22	19	1	42
	Miles	148.2	84.1	48.3	280.6
Kootenai	Reaches	16	4	1	21
	Miles	201.8	32.0	25.9	259.7
Clark Fork	Reaches	8	15	1	24
	Miles	70.0	65.4	48.2	183.6
Blackfoot	Reaches	5	0	1	6
	Miles	21.4	0	31.7	53.1
Bitterroot	Reaches	0	3	0	3
	Miles	0	37.4	0	37.4
Total	Reaches	55	41	4	100
	Miles	467.3	218.9	154.1	840.3

WILDLIFE CRITERIA

Drainage		Threatened or Endangered	Species of Special Concern	Big Game Critical Habitat	Total
Swan	Reaches	32	5	6	43
	Miles	239.1	51.3	23.8	314.2
Flathead	Reaches	26	6	0	32
	Miles	171.6	35.1	0	206.7
Kootenai	Reaches	37	2	26	65
	Miles	189.9	27.8	83.0	300.7
Clark Fork	Reaches	18	7	30	55
	Miles	116.0	58.4	124.3	298.7
Blackfoot	Reaches	19	1	9	29
	Miles	216.1	9.1	55.1	280.3
Bitterroot	Reaches	1	1	8	10
	Miles	38.6	8.5	36.2	83.3
Total	Reaches	133	22	79	234
	Miles	971.3	190.2	322.4	1,483.9

habitats. The comment period ran for approximately 90 days followed by informal consultations with interest groups on the subject. At the April Council meeting in Missoula, Montana, the Council decided unanimously to enter rulemaking (the process by which it amends its fish and wildlife program) to consider designating protected areas with specific rules for anadromous and resident wild fish; and resident non-wild fish and wildlife. A new public comment period and hearings will be held in each state before the Council makes a final decision in 1988.

In addition to the Council's Protected Areas Program, the subject of fish and wildlife protection from future hydroelectric development was also addressed in the BPA's final public review of the revised Long-Term Intertie Access Policy in 1987. BPA would prohibit Intertie Access for new hydroelectric projects licensed within Protected Areas identified through the Council's program. The policy would provide BPA consistency with the Council's Fish and Wildlife Program and the policy would evolve through completion of the Council's sub-basin and system planning efforts.

DATA AVAILABILITY AND USES

Although the data collected by the Montana Rivers Study are summarized in this report, there are over 4,000 stream reaches listed in the Montana Rivers Study Data Management System. A hard copy or floppy discs of the individual stream data by reach and a software system to query the data are available on 5-1/4 inch floppies and contain approximately 7 megabytes of information (Appendix C). The software programs were written in dBase III+ language and are designed to be used on IBM compatible personal computers using the MSDOS operation system. The data can be queried by a variety of geographic descriptors, by final value class or by river name. A more detailed description of the data management system can be found in The Montana Rivers Study Data Management System, User's Manual, March 1987. This publication and the data are available at the Montana State Library Natural Resource Information System in Helena through Jim Stimson, Data Manager (444-4356); or the Montana Department Fish, Wildlife and Parks Fisheries Division headquarters in Helena (444-3187); or the Special Projects Bureau of MDFWP Region 1 office in Kalispell (752-5501).

Data Uses

The data within the Montana Rivers Study data management system provide a comparative assessment of Montana's rivers and streams natural resources which can be used to conduct preliminary stream reviews. These data are not intended, however, to be used for siting facilities. The data bases utility will increase as data is expanded, updated, and revised. Although originally intended for addressing energy related issues, the use of the data has greatly expanded to other resource uses and development questions. These uses have included:

- US Forest Service and Bureau of Land Management review of streams for inclusion in Wild and Scenic Rivers review

- State and Federal Agencies

    * Initial scoping and resource planning activities
    * Input to regulatory and administrative processes
    * Preliminary assessments for stream-related site development
    * Documentation of unique and valuable natural features

- Fish, Wildlife and Parks state waterways program, river management plans

- Private groups interested in potential land acquisitions

Other potential uses could include:

- Preliminary review of private, state and federal timber sales to identify sensitive areas

- Habitat improvement project review and evaluation.

- Non-point source pollution impacts, stream quality studies, and road construction sensitivity analyses.

- Preliminary hydro siting evaluation data; replying to hydro developers' data requests.

- Information on unique/rare natural research areas; special habitat identification; future research needs; and response to special interest group's requests for information; identification of potential off-site mitigation sites.

- Preliminary review for land acquisition for protection and/or enhancement

DRAINAGE SUMMARIES

In order to present the natural resource data and results of the Montana Rivers Study, the state was divided into 12 drainages along drainage lines and geographic boundaries (Figure 1). The 12 drainages were the Kootenai; the upper Flathead and the Swan; the upper Clark Fork to the Bitterroot; the lower Clark Fork to the Idaho border; the Big Hole and Beaverhead drainages; the Missouri headwaters including the Madison, Gallatin and Jefferson; the upper Missouri to the Smith; the Rocky Mountain Front drainages; the central Missouri to Fort Peck Reservoir; the lower Missouri to the North Dakota border; the upper Yellowstone to the Bighorn; and the lower Yellowstone to the North Dakota border. Data were summarized for each resource area independently and presented in each section in the following order: introduction to drainage, fisheries, wildlife, recreation, botanical features and geologic features. Due to concern over potential vandalism created by the identification of the cultural resource site locations, the cultural data will not be presented in this report.

Because of the number of reference documents used to complete the drainage summaries, the literature citations were not identified in the text. Instead, the literature citations follow the text with subheadings by drainage and by resource area.

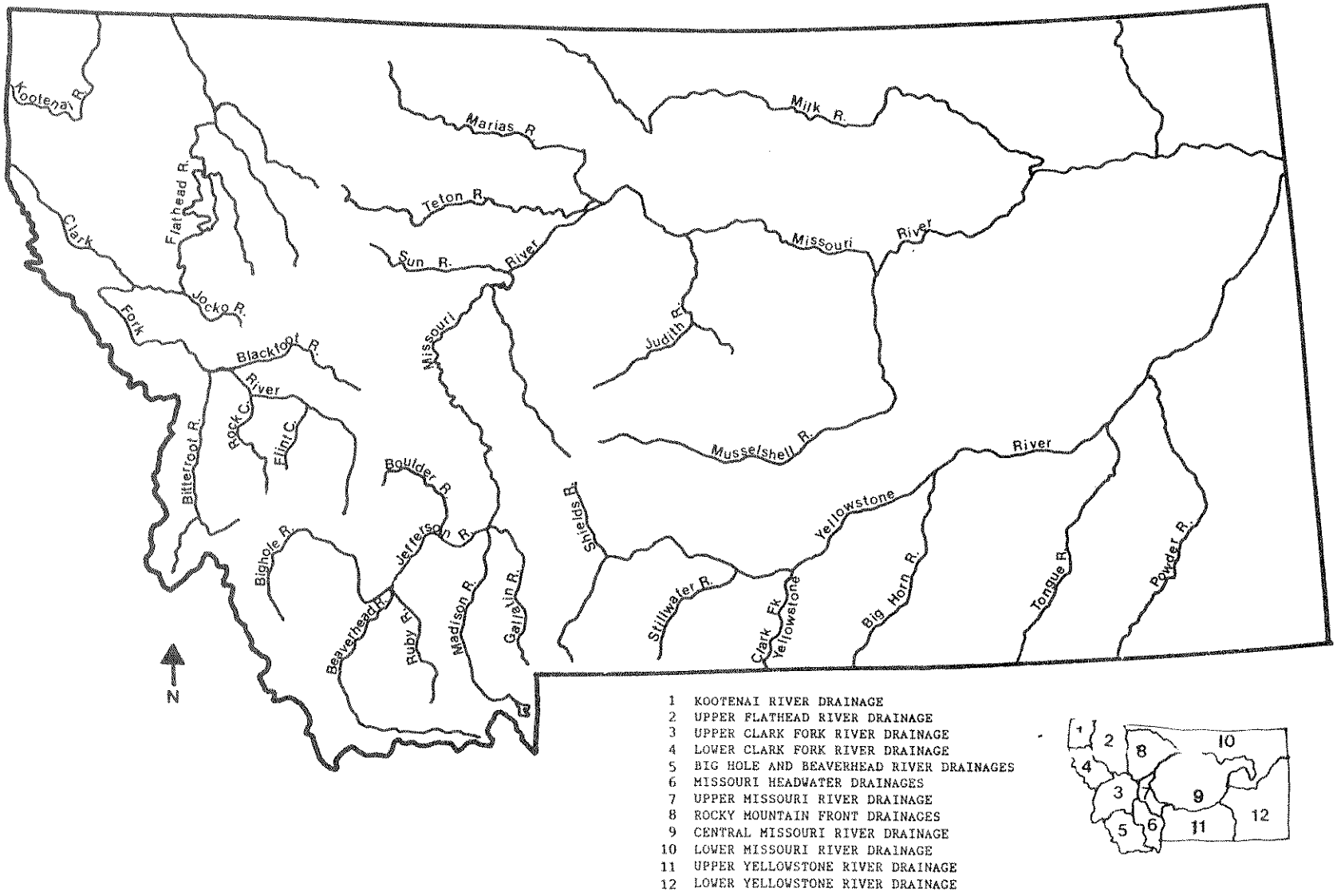

Figure 1. State of Montana with major rivers. Insert indicates 12 drainages referred to in report.

KOOTENAI RIVER DRAINAGE

KOOTENAI RIVER DRAINAGE

Boundaries: Libby Dam to Idaho border
Drainage size: 11,740 square miles
Main stem length: 100 miles
Tributaries: Yaak, Tobacco, Fisher, Wigwam
Cities/Towns: Libby, Troy
Access: U.S. Highway 2

The Kootenai River drainage is a land of contrasts. Here in northwest Montana, the Purcell, Cabinet, and Salish mountains seem to rise even beyond their 7,000 and 8,000 feet above valley floors that are the lowest in the state at only 1,800 to 1,900 feet (Figure 2). Eastbound Pacific storms stumble on these ranges and drop up to 100 inches of rainfall each year, nurturing huge conifer forests in a climate moist by Montana standards. The long, U-shaped canyons of these impressive ranges drain to form the Kootenai River and its major tributary, the Yaak.

Named for the Kutenai Indian Tribe, the "people of the waters," the river originates in British Columbia's Kootenay National Park and flows through Montana for 100 of its 485 miles before joining the Columbia at Castlegar, British Columbia (Figure 2). The Kootenai is the second largest tributary to the Columbia, surpassed only by the Snake River, and has a greater annual discharge than the Flathead or the Yellowstone. The majority of the Kootenai River drainage is managed by the Kootenai National Forest, with timber and mining being the two major land use activities.

The secluded nature of this river has not been isolated from major controversies, however. The free-flowing course of the Kootenai River was shortened considerably when the Army Corps of Engineers closed the gates on 400-foot Libby Dam in 1973, creating Lake Koocanusa, which extends into Canada for almost half its 90 miles. Dramatic flow fluctuations created in the river below the dam caused the Corps to propose a re-regulatory dam 10 miles farther downstream. Although construction started on the "re-reg" dam in 1978, a court injunction temporarily stopped the project and it was finally abandoned because official authorization had not been obtained from Congress. Dreams of damming the remainder of the Kootenai still did not die. The feasibility of a "run-of-the-river" project at Kootenai Falls was pursued in the late 1970s. This project was finally put to rest by a unanimous decision of the Federal Energy Regulatory Commission (FERC) in 1987. Today, the town of Libby has proposed a run-of-the-river hydroelectric facility at the old re-reg site. A preliminary permit was granted by FERC in 1987.

Of the remaining 47 miles of free-flowing Kootenai River, one place stands out -- one of the last remaining major undeveloped waterfalls in Montana and the Pacific Northwest. Between the towns of Libby and Troy, the placid water drops through China

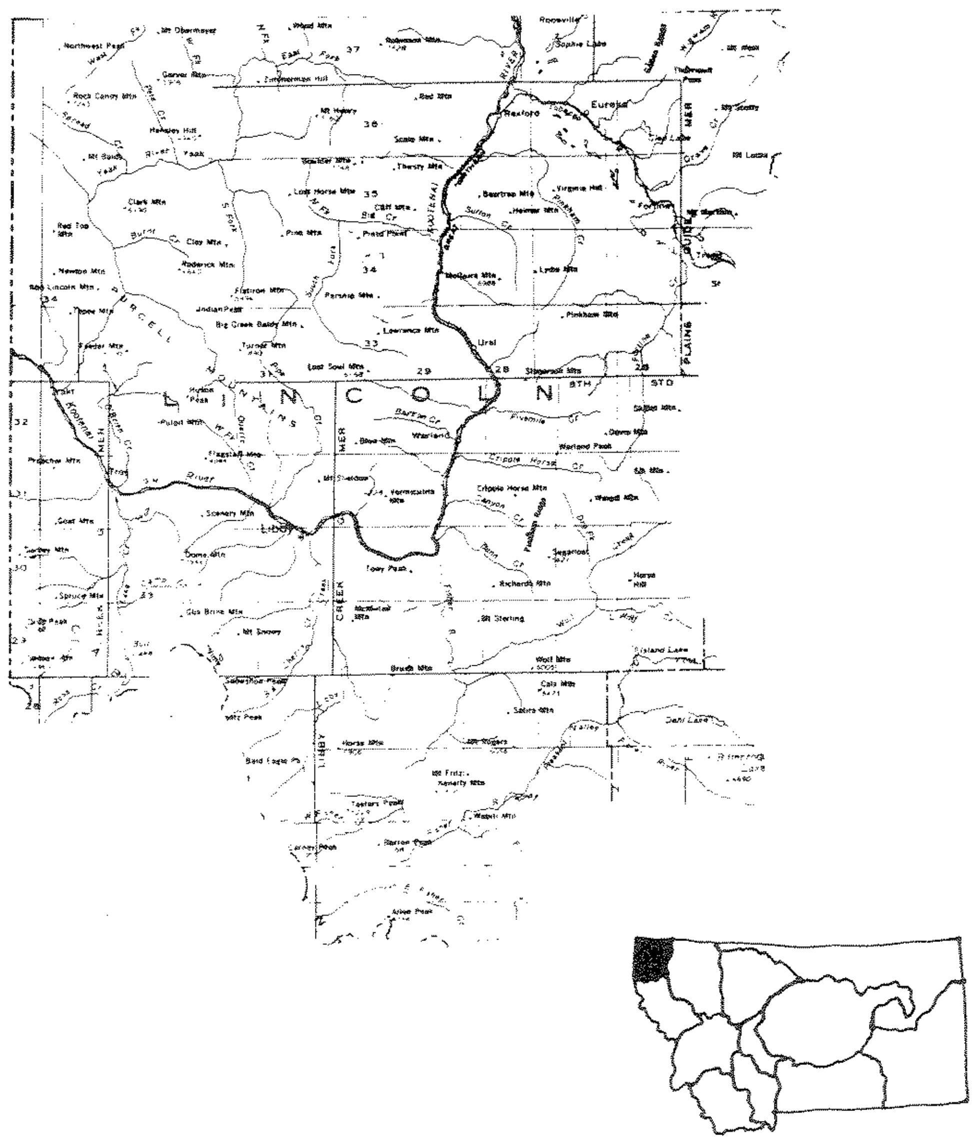

Figure 2. Map of Kootenai River drainage.

Rapids and then surges over Kootenai Falls and into a two-mile canyon, filling the air with spray and the powerful sound of crashing water. Erosion has created a complex series of bedrock channels and drops, producing a long series of falls, cascades, and large but boatable rapids. The river here drops 90 feet in eight tenths of a mile, and with an average flow of 13,000 cubic feet per second, the effect is impressive. A rocky trail winds down to the falls from an overlook just off Highway 2. The view is partially blocked by lofty pines and cedars. Once at the water's edge, visitors can walk downstream to a swinging bridge that spans the canyon.

Fisheries

Over 1,100 miles of stream fisheries contained in 310 reaches were inventoried in the Kootenai River drainage (Tables 15 and 16). Nearly 40 percent of the reaches could not be assessed due to insufficient fisheries information, which dropped the stream reaches rated to 190 in 1,044 miles. Seven reaches received a Class I in the habitat and species value, six of them because of their value as essential spawning habitat to the Class I sport fishery, the Kootenai River from Libby Dam to Kootenai Falls. Only nine percent of the river miles received a final resource value of II, well below the state average of 21 percent. Essential spawning habitat for two Class II sport fisheries (the lower Kootenai River and the lower Yaak River), the presence of species of special concern and local community value led to these values.

The majority of the stream miles in the Kootenai received a final resource value of Class III or below. The inaccessibility of the drainage, both from a recreational and research standpoint, contributed to the relatively low ratings of the Kootenai's fisheries.

Approximately 10,000 years ago, two taxonomic groups of rainbow trout were geographically separated into the coastal and inland forms. The rainbow trout found in nearly every major drainage in Montana originated from a coastal steelhead trout population and came to Montana via hatchery trucks beginning in 1899. The inland form of rainbow trout, a Class B species of special concern, is unique to the Kootenai drainage in Montana. The presence of pure inland populations led to upper Callahan Creek and its two forks receiving a Class II habitat and species value. In an effort to determine drainage-wide status of this species, rainbow populations have recently been collected in seven tributaries to the Yaak River for electrophoretic analysis.

The 21 miles of Kootenai River between the falls and the Idaho border received a Class I final resource value because of the existence of the only living sea monster in the state of Montana . . . or so we still hope. The white sturgeon (Acipenser transmontanus to the biologist, "wiyal" to the Kutenai Indians),

Table 15. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the Kootenai River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	7 (4)	9 (5)	54 (28)	117 (62)	3 (2)	120	310 (190)
Sport Fisheries	1 (.5)	2 (1)	35 (18)	144 (76)	8 (4)	120	310 (190)
Final Resource	8 (4)	9 (5)	68 (36)	102 (54)	3 (2)	120	310 (190)

Table 16. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the Kootenai River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	104 (10)	48 (5)	256 (24)	623 (60)	12 (1)	99	1142 (1043)
Sport Fisheries	26 (3)	28 (3)	251 (24)	709 (68)	29 (3)	99	1142 (1043)
Final Resource	130 (12)	48 (5)	379 (36)	475 (45)	12 (1)	99	1142 (1043)

is the largest freshwater sport fish in North America, originating over 100 million years ago. The last observed white sturgeon in the Kootenai was in 1981, during the annual spawning migration, and it is feared this reach of the Kootenai may no longer be providing spawning habitat to the white sturgeon. Its absence may have resulted from the dramatic inversion of the river's annual flow pattern and the modified seasonal water temperature regime since the construction of Libby Dam, from past pollution problems or over-exploitation.

Declines in white sturgeon populations throughout the Columbia River prompted the Northwest Power Planning Council to recommend research to determine the impacts of dam operations on this species. Preliminary results indicate that white sturgeon larval behavior was negatively impacted by changes in temperature and flow regime. Also, genetic isolation due to the trapping of populations between dams may be causing selective mortality in response to changes in the river.

Easy access and an abundant population of rainbow trout, with a chance for a trophy, contributed to the Class I sport fishery for the Kootenai River from the dam to Kootenai Falls. A reduction in suspended sediment loads and nutrient concentrations, and a substantial modification of the thermal and flow regimes occurred in the river in the early 1970s. The negative environmental impacts of the dam were partially reduced through maintenance of a minimum instream flow and a sophisticated selective water withdrawal system in the dam which maintains river temperatures between 50 and 60 degrees Fahrenheit from May to October. The decrease in sediment production contributed to a nine-fold increase in rainbow numbers in river sections below the dam, although about half of the fish in 1977 were greater than 12 inches, compared to only 22 percent today. Current rainbow growth rates are comparable to pre-impoundment growth. A notable exception to the average fish size has occurred in the tailwater area of the dam where a trophy fishery has developed for large rainbow trout from five to 15 pounds. Biologists theorize these "lunkers" are either resident fish taking advantage of fish being passed through the turbines or may be migrating from Kootenay Lake.

Wildlife

From a pair of harlequin ducks bobbing through a series of rapids, to a Ural-Tweed bighorn ewe feeding along the river benches as they green up in spring, the Kootenai River drainage provides habitat for an abundance of rare and unusual wildlife species, including the Cabinet Mountain grizzlies, the last remnant population of Columbian sharp-tailed grouse in Montana, bald eagles and ospreys.

The Kootenai River drainage was divided into 39 wildlife units along natural habitat boundaries (Table 17). Although only seven percent of the units received a Class I final resource value, 44 percent earned species ratings of Class II. Twenty-three units (59 percent) achieved species value of Class II or better, reflecting consistently high, although not always outstanding, wildlife values.

Chief reasons for the Kootenai's consistently high species values are the frequent occurrences of habitats important for grizzly bears, bald eagles, and big game. Nearly 72 percent of the Kootenai's assessment units contained habitat essential for grizzly bear recovery. These units included all of the east and west drainages of the Cabinet Mountains, the entire Yaak drainage, the Wigwam River, portions of the Tobacco River, and Lake Koocanusa tributaries.

Near the Idaho border, Lake Creek harbors both bald eagle nesting and grizzly bear habitat. Important bald eagle wintering areas are found along the entire Kootenai River as well as along portions of the Fisher, Tobacco, and Libby Creek drainages. Nearly two thirds of the Kootenai's units include essential winter range for white-tailed deer, mule deer, and/or elk. Moderate to high populations of moose and black bear also occur in 85 to 95 percent of the units, respectively. The highest game species values in the Kootenai were assigned to two upper Yaak units and to the tributaries along the east side of Lake Koocanusa.

In addition to threatened/endangered and big game species, the Kootenai is a summer home for one of the most unique and interesting Montana wildlife species of special concern, the rare harlequin duck. Of all the waterfowl species, harlequins breed exclusively on turbulent whitewater streams. Traveling more than 600 miles up the Columbia River basin from the rocky Pacific coast, breeding harlequins make their summer homes in the turbulent waters and thundering rapids of northwest Montana. Their congregation point along the Kootenai is Kootenai Falls, the only known accessible site outside of Glacier National Park where harlequin ducks can be regularly observed. The falls receive more than 64,000 visitor days of use per year. Because harlequins are long-lived with relatively small stable populations, they are vulnerable to habitat alterations. Kootenai Falls and many of Montana's high gradient streams where harlequins may breed have been proposed for micro-hydro and larger hydroelectric development.

One of the few remaining native bighorn populations in northwest Montana presently occupies Lake Koocanusa's east face. The native Ural-Tweed herd is slightly smaller and darker, and morphologically distinct from most other bighorn sheep populations in the Rocky Mountains. Due to its isolation in the undeveloped northwest corner of the state, this herd did not undergo the major declines in the early 1900s that eliminated most of Montana's

Table 17. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the Kootenai River drainage.

Value	Class				
	I	II	III	IV	Total
Habitat	3 (8)	9 (23)	12 (31)	15 (38)	39 (100)
Species	7 (18)	16 (41)	13 (33)	3 (8)	39 (100)
Final Resource	3 (7)	17 (44)	16 (41)	3 (8)	39 (100)

other native sheep populations. However, all has not gone well for this unusual group of animals. During the early 1970s, sheep numbers suddenly dropped from 150-200 to only 20-25. The decline was attributed to construction of Libby Dam, which inundated a significant portion of their low elevation winter and spring range; relocation of Highway 37 through their year-round range, and ecological succession of their preferred open ponderosa pine/bunchgrass community to a dense forest community, due to fire suppression. A Bonneville Power Administration-funded mitigation project is currently underway to enhance remaining sheep habitat along the reservoir. Enhancement activities include burning and logging treatments to improve forage quality and the construction of critical travel corridors across the highway and roadside cliffs to reduce traffic mortalities. Recent counts indicate population numbers have increased to nearly 100 animals.

Recreation

The study inventoried the recreational attributes and values of 23 river segments in the Kootenai drainage--nearly 300 miles of river, about two percent of the 12,528 miles statewide (Table 18). Results from managers and river users assessed one-third of the drainage's river miles as Class I (Outstanding) recreational resources, including the Kootenai River between the Highway 37 bridge and the Idaho border and the Yaak River between Yaak and the mouth. This drainage thus contained eight percent of the state's Outstanding river mileage.

The rivers were valued for their excellent recreational opportunities, fishing quality, wildlife habitat, boating potential, and cultural and historic sites. Some rivers in the region received lower ratings because private lands restricted river access. Raters said use was heavy on 23 percent of the river miles, moderate on 29 percent, and low on 48 percent. Access was abundant on 25 percent of the drainage's river mileage, moderate on 45 percent, and limited or restricted on 22 percent.

Scenic quality was rated Class II (Substantial) and Class I (Outstanding) on 64 percent of the drainage's river miles. None of the segments were thought to provide a primitive setting, due in part to the fact that wilderness areas were omitted from the Montana Rivers Study. Twenty percent of the miles were rated as semi-primitive and 40 percent (119 miles) were placed in the transition category between semi-primitive and rural landscapes.

Shore fishing was the most common water-based activity, followed by boat fishing, canoeing, kayaking, and rafting, all possible on the Yaak and Kootenai rivers.

Botanical Features

The Kootenai River drainage contains six percent of the state's botanical natural feature sites that received a final value rating of either Class I or Class II. Of the 19 sites inventoried within this drainage, seven (37 percent) are proposed U.S. Forest Service Research Natural Areas (RNAs).

An outstanding example of a RNA is the Lower Ross Creek area, which is located south of Troy along Highway 56. This site covers about 839 acres and includes a population of old-growth western red cedar -- one of the few remaining stands that survived fires that ravaged these forests at the turn of the century.

Another outstanding site in this area is an isolated piece of palouse prairie grassland that contains the last surviving breeding population of Columbian sharp-tailed grouse (Tympanuchus phasianellus columbianus) west of the Continental Divide. Once inhabiting the northern desert and intermountain grassland valleys west of the Rocky Mountains, the Columbian sharp-tailed grouse was extirpated in Oregon and California by the late 1960s. Distributions in Washington, Idaho, and Colorado are drastically reduced from previous ranges. Fortunately for the Tobacco Valley population, the Nature Conservancy is presently acquiring the last remaining stands of native palouse prairie grasslands, which support sharp-tailed grouse dancing and nesting grounds. This area also contains a high-quality example of a bunchgrass community dominated by needlegrass (Stipa comata) and rough fescue (Festuca scabrella). Also found within these grasslands is the largest known population of Spalding's catchfly (Silene spaldingii) -- a candidate for listing as a threatened species by the U.S. Fish and Wildlife Service.

Just north of Libby is a proposed U.S. Forest Service RNA called Hoskins Lake. This 450-acre site is a good example of a typical mixed-coniferous forest type found in northwestern Montana. The canopy is dominated by mature Douglas fir and western larch, and includes grand fir, western white pine and lodgepole pine. Also within the RNA are two connected lakes that are surrounded by marsh vegetation and wetlands.

Within this drainage are five other plant species listed for protection by the Montana Rare Plants Project (MRPP). The rock ledges above Yaak River Falls is the site of a population of Geyer's biscuitroot (Lomatium geyeri), currently listed as rare by the MRPP. Close to this area, along the Yaak River Gorge, is a near pristine forest community of old-growth western hemlock, Douglas fir and Ponderosa pine.

The northern bastard-toadflax (Geocaulon lividum) is a Pacific slope species that grows in Montana's mesic spruce forests, including two sites in the Kootenai River drainage -- one at Loon Lake and one near Pete Creek.

Table 18. Number of reaches, miles and percentages of recreational assessment reaches by value class in the Kootenai River drainage.

Value Class	Reaches	Miles
Outstanding	5 (21.7%)	100 (33.7%)
Substantial	5 (21.7%)	58 (19.6%)
Moderate	13 (56.6%)	139 (46.8%)
Limited	0	0
Unknown	0	0
Totals	23	297

Geologic Features

Two percent of the Class I and II geologic sites were found in the Kootenai River drainage. Many of the resource experts contacted during the Montana Rivers Study were not familiar with this part of the state.

Several features stand out. The first is the drumlin field near Eureka on Indian Creek. Drumlins are smooth, elongated hills of compacted glacial till shaped under glacial ice. According to geology experts at the University of Montana, the drumlin field is "oriented in a northwest-southeast direction parallel to the regional direction of ice flow during the Pleistocene." The drumlin field is not covered with trees and is easily seen from U.S. Highway 93 north of Eureka.

Another outstanding feature in the area is the stream terraces of the Yaak River about five miles above its mouth. A stream terrace is a level area adjacent to or above a water body that indicates a former water level. When viewed in cross sections, stream terraces appear as two sets of stairs descending towards each other on opposite sides of a stream with the stream at the bottom.

Miner, Savage, and Schoolhouse lakes southeast of Troy near Lake Creek are kettle lakes, believed to have been formed when blocks of ice became detached and were buried by glacial till. After the glacier retreated, the ice melted and left depressions that filled with water.

UPPER FLATHEAD RIVER DRAINAGE

UPPER FLATHEAD RIVER DRAINAGE

Boundaries: Headwaters to Clark Fork River
Drainage size: 11,425 square miles
Tributaries: North, Middle, South forks; Swan, Jocko, Stillwater, Whitefish
Cities/Towns: Columbia Falls, Kalispell, Polson
Access: U.S. Highway 2 and 93, Montana 200

This is a land of grizzly bears and wolves, of whitewater adventure, cutthroat trout, and wilderness. From the rugged summits of the Mission, Swan, Salish, Whitefish and Flathead mountains to the peaceful backwaters of rivers born in their highest reaches, the Flathead is Montana's purest glacier country (Figure 3). Flathead Lake, at 171 square miles, is the largest natural freshwater lake west of the Mississippi and one of the state's most coveted recreational sites.

Society long ago recognized the need to protect some of the Flathead's outstanding features, and created both the million-acre Glacier National Park and the Bob Marshall Wilderness, America's first designated wilderness area. The "Bob" and the contiguous Great Bear Wilderness total 1.7 million acres. Congress also designated the three forks of the Flathead River part of the National Wild and Scenic River System. Because wilderness areas and national parks are exempt from hydropower development, the Montana Rivers Study did not address lands within their boundaries. The upper Flathead River drainage received outstanding ratings anyway.

Fisheries

A total of 1,932 miles of streams in 474 reaches were rated in the upper Flathead River drainage, composed of the Middle, South and North forks of the Flathead River, the Whitefish and Stillwater rivers entering above Flathead Lake and the Swan River entering north of Bigfork (Table 19). The drainage held the greatest percentage of Class I stream reaches and stream miles in the state, 35 percent and 20 percent, respectively. The upper Flathead also held 38 percent of the reaches and 20 percent of the miles statewide rated Class II in the habitat and species value (Table 20). These high percentages of Class I and Class II reaches resulted mainly from the presence of the westslope cutthroat trout.

The history of the westslope cutthroat trout (*Salmo clarki lewisii*) in Montana began nearly 70,000 years ago during the last ice age when the cutthroat trout reached the interior of western North America from the Pacific Ocean. Two genetically isolated subspecies diverged during this period, the westslope cutthroat in the Clark Fork, Kootenai and upper Missouri drainages, and the Yellowstone cutthroat (*Salmo clarki bouvieri*) in the Yellowstone

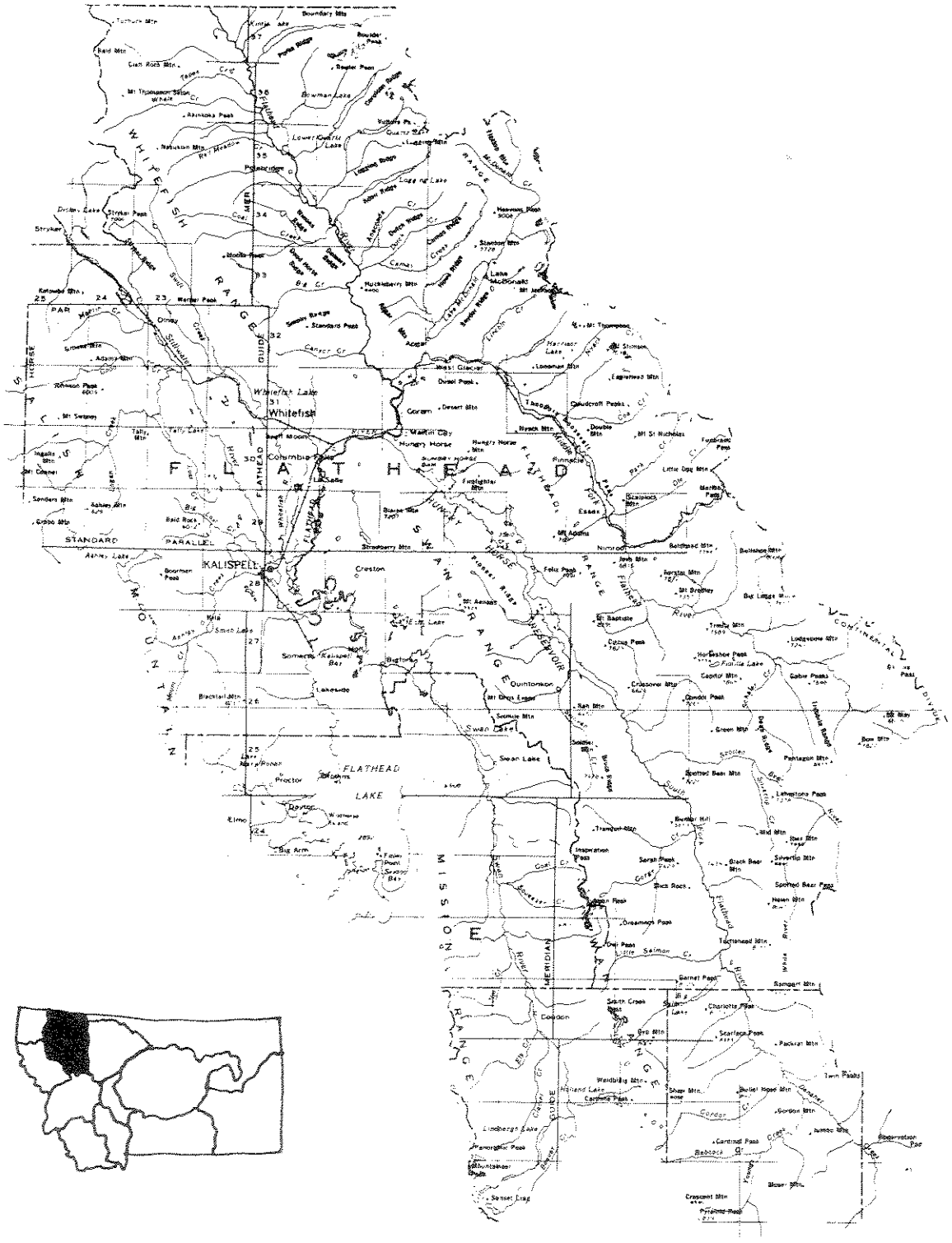

Figure 3. Map of upper Flathead River drainage.

Table 19. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the upper Flathead River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	66 (14)	133 (28)	115 (24)	163 (34)	1 (<1)	40	518 (478)
Sport Fisheries	4 (8)	2 (<1)	86 (18)	377 (79)	9 (<1)	40	518 (478)
Final Resource	66 (14)	133 (28)	128 (27)	150 (32)	1 (<1)	40	518 (478)

Table 20. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the upper Flathead River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	438 (23)	477 (26)	446 (23)	571 (30)	2 (<1)	65	1999 (1934)
Sport Fisheries	79 (4)	57 (3)	480 (25)	1295 (67)	20 (<1)	65	1996 (1931)
Final Resource	438 (19)	475 (26)	483 (26)	534 (29)	2 (<1)	65	1997 (1932)

River drainage. The range of the westslope was severely reduced in a mere 30-year period beginning in the mid 1900s. Unhappy with the size and sporting nature of the "natives", settlers introduced rainbow, brown, and brook trout into Montana's waters. Habitat destruction through logging, mining and agricultural practices also took its toll. The genetic differences between the two subspecies also went unrecognized as Yellowstone cutthroat and rainbow trout continued to be stocked on top of westslope, causing extensive interbreeding. Although populations appeared to be thriving, genetic purity and vigor was being lost.

Ecological and genetic research in the last 25 years has led to major changes in the state's fisheries management in an effort to preserve and maintain the native cutthroat species. The genetic differences between the westslope and Yellowstone were finally identified in the 1960s. For much of the state, however, their ranges had been severely reduced, with populations only being found in headwater areas of smaller tributaries. In the Flathead, where westslope populations were probably their strongest historically, the decisions that were made to reverse the process worked. The first step was to change the cutthroat brood stock in all northwest hatcheries to pure westslope. An intensive effort to determine genetic purity in the remaining cutthroat populations through genetic investigation was then begun. Once a pure population was identified, restoration occurred through habitat protection, maintenance of barriers to prevent potential genetic invasion, and strengthening of populations through hatchery plants, where necessary. Habitat protection has been secured through wilderness designation in the South and Middle forks, and further protection will occur in the North Fork and Swan River drainages if pending wilderness legislation is passed.

The substantial amount of data collected over the last 10 years by regional and contract fisheries staff contributed to the high habitat and species values found in the upper Flathead. Only seven percent of the identified reaches could not be rated due to insufficient fisheries information, compared to 61 percent of the Clark Fork drainage reaches with insufficient fisheries data. Intensive surveys of other western drainages could expand the current identified range of the westslope.

While maintaining the highest number of stream reaches in the state with a Class III or better in the habitat and species value, the Flathead holds the fourth lowest number of miles with a rating of Class III or lower in the sport fishery category. The sport fisheries of the Flathead are dependent upon adfluvial populations of westslope cutthroat and bull trout and kokanee migrating from Flathead Lake to spawn in the main stem and its tributaries. Due to a short growing season, cold water temperatures and naturally unproductive waters, resident stream populations are generally slow-growing with low biomass, therefore not attracting considerable angling attention. The 80 miles of Class I sport

fishery located on the main stem and the North Fork were dependent on the seasonal migrations from the lake.

The final resource values of the Swan, Whitefish and Stillwater rivers were overshadowed by the outstanding quality of the Flathead's three forks and main stem. Of the 205 reaches in the upper Flathead drainage receiving a Class I or II final resource value, only 12 reaches were not located in the main stem or its three forks. These reaches were found in the Swan drainage, including a Class II sport fishery on the Swan River from Lindbergh to Swan Lake and 11 Swan River tributaries containing essential spawning habitat or potentially pure westslope cutthroat trout. The entire Whitefish and Stillwater river main stems received a final resource value of Class III or IV.

Wildlife

More than 40 percent of the Flathead River drainage is contained in the Bob Marshall-Great Bear wilderness complex and Glacier National Park, protected areas that harbor healthy populations of nearly every wildlife species native to the region. But what about wildlife values outside their boundaries, in areas included in the Montana Rivers Study? Of 43 wildlife units in the upper Flathead, a notable 65 percent received final resource values of Class I or II (Table 21). Eleven (26 percent) earned Class I species value and seven (16 percent) earned Class I habitat ratings. Reasons for high species values include the presence of important grizzly bear habitat in 77 percent of the upper Flathead's river units and the occurrence of breeding or wintering bald eagle habitat in 64 percent of the units. Nearly 40 percent of the units contain both important bald eagle and grizzly bear habitat. In addition, the only established population of the endangered gray wolf in Montana occurs along the North Fork of the Flathead River.

Four units earned Class I ratings in both habitat and species values. These included the Middle Fork of the Flathead River, a segment of the Swan River just above Swan Lake, and the Flathead main stem from Columbia Falls to Flathead Lake. These river reaches contain exceptional riparian habitats with mature cottonwood forests, abundant wetlands, islands, and a myriad of vegetation types. Of only seven streams statewide, the Flathead main stem above Kalispell and the Middle Fork main stem earned the maximum number of habitat quality points possible in the assessment process.

The Middle Fork's Class I species value stems from breeding bald eagles and grizzly bear habitat, but this reach also provides important seasonal ranges for deer, elk, mountain goat, moose, and black bear. The braided section of the Flathead main stem earned Class I species value because it supports one of the highest breeding osprey densities in Montana as well as colonial nesting

Table 21. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the upper Flathead River drainage.

Value	Class				
	I	II	III	IV	Total
Habitat	7 (16)	15 (35)	13 (30)	8 (19)	43 (100)
Species	11 (26)	10 (23)	18 (42)	4 (9)	43 (100)
Final Resource	9 (21)	19 (44)	12 (28)	3 (7)	43 (100)

herons. In addition, the river system's backwater areas, spring creeks and channels provide important resting and wintering habitat for waterfowl, and supports one of the highest river otter populations in Montana.

Recently, the Northwest Power Planning Council adopted an impressive wildlife mitigation plan for Hungry Horse Reservoir. This program targets protection of more than 9,000 acres of grizzly and black bear low elevation/riparian habitat through conservation easements and fee-title acquisitions mostly within the North and Middle Fork drainages. This project, in conjunction with lands already acquired by the U.S. Forest Service along the wild and scenic corridors, will protect some of the best wildlife habitat associated with major valley river systems in western Montana.

Probably the most unique and least disturbed river section in the upper Flathead that received a Class I in both habitat and species is the 15-mile section of the Swan River from Swan Lake to Squaw Creek. This reach supports critical habitat for bald eagles and grizzly bears, and contains both a 1,778-acre National Wildlife Refuge and 400-acre Nature Conservancy Area.

Recreation

The Montana Rivers Study inventoried the recreational attributes and values of 27 river segments in the upper Flathead River drainage -- about 374 miles of river, three percent of the 12,528 miles studied statewide. Much of the best recreational water in the drainage is excluded from the study because it lies within wilderness areas, the Wild and Scenic River System, and Glacier National Park.

Managers and river users rated two percent of the drainage's river miles as Class I (Outstanding), 19 percent as Class II (Substantial), 48 percent as Class III (Moderate) and 28 percent as Class IV (Limited) (Table 22). Scenic quality of the mountains and surrounding areas and good fishing were the two most common reasons in assigning value classes by raters. Several segments were downgraded for having few recreational values, and several were described as meandering streams.

Use was heavy on just three percent of the river miles and low on 18 percent, with 41 percent of the river mileage described as having moderate levels of recreational use. Scenic quality was rated as Substantial to Outstanding on 36 percent of this region's river miles, highlighting this component of recreational value. However, 31 percent of the mileage was said to have less than moderate scenic quality.

Access was rated as abundant or moderate for about 45 percent of the river miles, while about 50 percent of the rivers statewide had these levels of access. Another 25 percent was rated as having

Table 22. Number of reaches, miles and percentages of recreational assessment reaches by value class in the upper Flathead River drainage.

Value Class	Reaches	Miles
Outstanding	1 (3.7%)	6 (1.6%)
Substantial	3 (11.1%)	72 (19.2%)
Moderate	13 (48.1%)	181 (48.4%)
Limited	8 (29.7%)	105 (28.0%)
Unknown	2 (7.4%)	10 (2.7%)
Totals	27	374

limited or restricted access, mostly because of private land bordering the river.

Fishing from shore was the most common pursuit--a primary activity on 67 percent of the river segments studied. Fishing from a boat was a primary activity on 48 percent--about the same proportion of streams also rated as canoeable. Kayaking and rafting took place on 30 percent of the segments. Forty-one percent of the segments were rated as Not Boated.

The most notable sections of floating water in the upper Flathead are the infamous Mad Mile on the Swan near Bigfork, Fool Hen Rapids on the North Fork of the Flathead, and Meadow Creek Gorge on the South Fork of the Flathead River about two miles below Lost Jack Creek.

Botanical Features

The upper Flathead River drainage has 67 botanical natural feature sites, 17 percent of the statewide total of 400. This drainage also contains the second largest number (38, or 17 percent) of natural feature sites that received a final value of Class I or Class II. Twenty-one (31 percent) of the sites, however, are located within Glacier National Park, the Flathead Indian Reservation, or U.S. Forest Service wilderness areas.

The Swan and Flathead rivers contain numerous oxbows and sloughs that provide unique growing sites for many aquatic and riparian plants. One such area is Egan Slough near the mouth of the Flathead River, which contains many unusual aquatic plants, including the Columbia water-meal (Wolfia columbiana) and pygmy water-lily (Nymphaea tetragona), both listed as rare by the Montana Rare Plants Project.

Along the Swan River just south of Swan Lake and adjacent to a U.S. Fish and Wildlife Service waterfowl preserve is the largest known concentration of howellia (Howellia aquatilis), a globally endangered aquatic plant recently protected by The Nature Conservancy's purchase of the 400-acre Swan River Oxbow Preserve. Known as Montana's rarest plant, howellia shows low genetic variability and little tolerance for disturbance. This endangered plant is now extinct in many parts of its former range in California and Oregon. It is only found in temporary ponds or sloughs, so it appears that this underwater annual may require a seasonal period of drying for germination to occur. The other known Swan Valley sites that harbor this plant are moist meadows and shallow ponds around Holland and Lindbergh Lakes. Another unusual plant found within the Swan River Oxbow Preserve is the northern bastard-toadflax (Geocaulon lividum), a Pacific slope species that grows in Montana's mesic spruce forests.

An outstanding example of a Resource Natural Area (RNA) in this drainage is Coram RNA, designated part of the World Biosphere Reserve System, a worldwide network of unique biologically pristine ecosystems. The 839-acre site was established as a natural area within the Coram Experimental Forest in 1933, and is currently under consideration as a National Natural Landmark (NNL). The RNA contains old-growth forest trees (some up to 500 years old) dominated by Douglas fir and western larch. This area is used in scientific research as a control or baseline site with which to compare disturbed forest areas.

Unique botanical features found within the Flathead drainage include two species of moonwort, relatives of the fern family. Wavy moonwort (Botrychium crenulatum) is found primarily in marshy areas in California, but it is also known from one small disjunct population in the Swan Valley. This endangered species is threatened by logging and residential development. Another regionally endemic moonwort in the Flathead Valley is Mountain moonwort (Botrychium montanum), found in meadows and moist coniferous forests. A rare Montana orchid recommended for protection by Montana Rare Plant Project is Clustered lady's-slipper (Cypripedium fasciculatum), found only in moist wooded areas at low- to mid-elevations in the foothills of the Mission Mountains.

Columbia River crazyweed (Oxytropis campestris var. columbiana) is known from only two areas -- the northern portion of the Columbia River drainage above Spokane, Wash., and the North Fork of the Flathead River and Flathead Lake in Montana. This threatened plant grows on the gravelly shores of lakes and rivers. Activities such as residential development, recreational use, and shoreline erosion occurring along the Flathead River and Flathead Lake threaten this regionally endemic species.

Geologic Features

Upstream from Flathead Lake one finds a variety of interesting geologic features along the North, South, and Middle forks of the Flathead River. Six percent of the Class I or II geologic feature sites identified in the study, excluding type locations, were found in the upper Flathead River drainage.

Some of the finest examples of oxbows in the state can be found along the Flathead River just upstream from Flathead Lake. Formed when the river cut a new channel and eventually abandoned the old channel, these oxbows are present today as crescent-shaped lakes, ponds, and sloughs. McWenneger, Church, Egan, and Half Moon sloughs are characteristic of this feature.

A good example of a glacial landform eroded from bedrock, known as roche moutonnee, can be seen on the hill at Somers. The side of the hill facing the oncoming glacier is typically abraded

and worn smooth, while the opposite side of the bedrock hill has fractured rocks carried away by the glacier in a process known as plucking.

Near Echo Lake north of Bigfork are old sand dunes and glacial stream deposits, formed when the Swan Range acted as a barrier to the transport of sand by wind. They are best exposed in a road-cut along Highway 35.

In an area drained by LeBeau Creek north of Whitefish is an outstanding example of ice-scoured glacial pavement. The bedrock of the area, the Belt series (partially metamorphosed sedimentary rocks), was scoured by glaciers moving southeast out of Canada. The glaciers transported and left behind large isolated rocks known as glacial erratics because they are a different type of rock than the local rock and have been transported from areas tens or, occasionally, hundreds of miles away.

Teakettle Mountain north of Columbia Falls provides a vista where several geologic features can be seen at once. From Teakettle Mountain one has excellent views of three fault block mountains, complex folded and faulted mountains, major valleys, the Rocky Mountain trench, Flathead Lake, glacial features of erosion and deposition, and stream features of the Flathead River on the main valley floor.

UPPER CLARK FORK RIVER DRAINAGE

UPPER CLARK FORK RIVER DRAINAGE

Boundaries: Headwaters to Bitterroot River
Drainage size: 9,003 square miles
Main stem length: 140 miles
Tributaries: Little Blackfoot River, Flint Creek, Blackfoot River, Rock Creek, Rattlesnake Creek, Bitterroot River
Cities/Towns: Deer Lodge, Drummond, Clinton, Bonner, Milltown, Missoula
Access: Interstate 90

From the pristine peaks of the Bitterroot mountains to the mining district of Butte and Anaconda, the headwaters of the Clark Fork River and its tributaries are a study in diverse topography, land use and resource values. Elevations vary from 3,000 to 10,000 feet in this drainage which includes the Anaconda, Flint Creek, Sapphire, Garnet and Bitterroot mountains. Entering the Clark Fork above Missoula, the Bitterroot and Blackfoot rivers form the upper Clark Fork River drainage (Figure 4). Over 8,000 square miles of western Montana is drained by the upper Clark Fork River drainage including wilderness areas, alfalfa fields, ghost towns, municipalities, and abandoned mines. Four wilderness areas, the Selway-Bitterroot, Bob Marshall, Lincoln-Scapegoat, and Anaconda-Pintler occupy the headwaters of many major Clark Fork tributaries. The Clark Fork main stem from Garrison to Missoula is bordered by a railroad bed and interstate highway system.

> "We have recognized the opportunity -- indeed the responsibility -- to bring the Clark Fork back to life. We can feel proud that, in Montana's second century, the Clark Fork will gradually be restored to what a river should be -- a source of life and of inspiration to those whose lives touch it."
>
> Gov. Ted Schwinden, 1986

The headwaters of the Clark Fork River form in the copper mining and smelting district of Butte and Anaconda. For more than 70 years, the upper Clark Fork received untreated wastewater from mine tailings and smelting activities. These heavy, metal-laden wastes which have accumulated along the banks of this once beautiful river are still visible today.

One component of MDFWP's commitment to the Clark Fork River was the 1986 request for instream flow reservations in the main stem and its upper tributaries including Flint Creek, the Little Blackfoot River, and Harvey Creek. Instream flows for fish, wildlife, and recreation have been recognized as a beneficial use of Montana waters since passage of the Water Use Act in 1975. The Board of Natural Resources and Conservation is expected to reach a decision on instream flow requests in the upper Clark Fork in the fall of 1988.

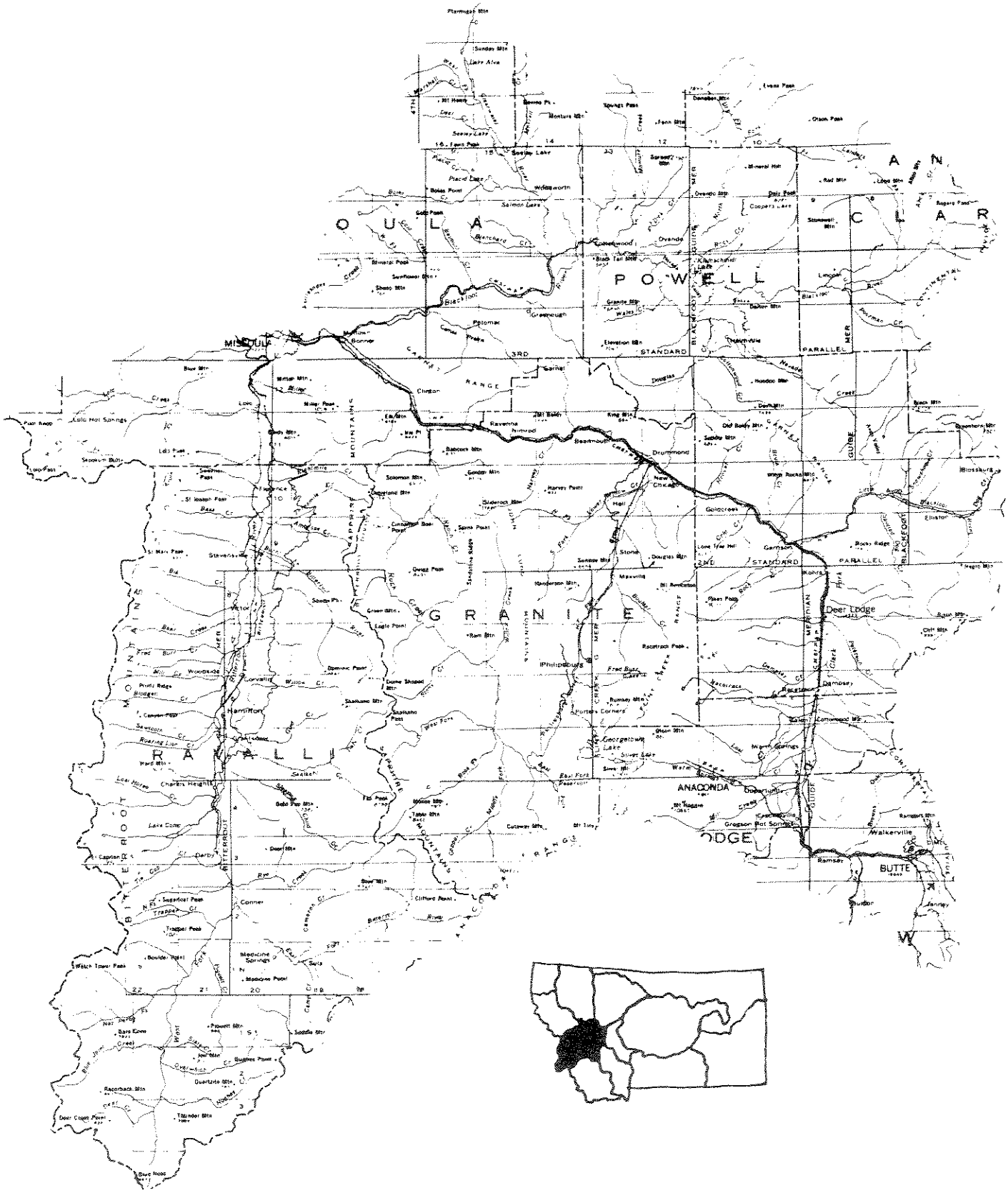

Figure 4. Map of upper Clark Fork drainage including Blackfoot and Bitterroot River drainages.

The Bitterroot River flows northerly for approximately 84 miles before entering the Clark Fork just below Missoula. The river is bordered on the west by the Bitterroot Mountains and the east by the Sapphire Mountains. The Bitterroot has rapidly become a new bedroom community for Missoula. The majority of the Bitterroot Valley below Hamilton has been developed in crops and pasture, and in order to irrigate these lands, water has been diverted from the main stem and numerous tributary streams, causing stream dewatering, channel alterations, and fish loss to irrigation canals.

The Blackfoot River drains a similar acreage to the Bitterroot along its 122-mile westerly journey to the town of Bonner, where it meets the Clark Fork River. A poster by Missoula artist Monte Dolack captures the spirit of the Blackfoot: blue water shimmering under an even bluer sky; golden-red cliffs above deep pools; dense coniferous forests; ducks on the water and a fat trout beneath it . . . a hint of granite peak in the background. The values of the Blackfoot were partially protected by a legislative act in 1969, which gave the MDFWP authority to reserve instream flows on the state's 12 best trout streams, including the Blackfoot. And recently, twenty-six miles of the river have been designated a "River Recreation Corridor," the only one of its kind in the state. Fifteen to 20 years ago, landowners along the river were faced with increasing development in the river corridor from subdivisions and recreational land sales and increasing recreational use, resulting in litter and trespassing. A task force was formed, coordinated by the Bureau of Outdoor Recreation and with representation by landowners, the Nature Conservancy, the University of Montana, the Bureau of Land Management, local and state agencies, and the county commissioners. The Recreation Management Agreement, orchestrated by the Nature Conservancy and MDFWP, has been adopted by landowners along the river to help protect both the river and their property. The Nature Conservancy has secured 9,000 acres of conservation easements along much of the main stem river corridor.

Fisheries

A total of 336 reaches in 2,000 miles were rated for their fisheries value in the upper Clark Fork River drainage (Tables 23 and 24). Another 543 reaches could not be rated due to a lack of fisheries information. The drainage held 12 percent of the state's Class I reaches and ranked third in Class I stream miles statewide. Included in these Class I resources were three Class I sport fisheries and 30 reaches with a Class I habitat and species value. The drainage also holds the largest number of stream miles with a Class II final resource value. Of the 555 stream miles rated Class II in the habitat and species value, 367 miles were identified as essential spawning habitat to a Class II sport fishery. Nearly 50 percent of the miles received a Class III, or substantial rating, in the sport fisheries, including

Table 23. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the upper Clark Fork River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	30 (9)	65 (19)	49 (15)	174 (20)	18 (5)	543	879 (336)
Sport Fisheries	3 (1)	9 (3)	116 (35)	189 (22)	16 (5)	546	879 (333)
Final Resource	33 (10)	72 (21)	89 (26)	142 (16)	0 (0)	543	879 (336)

Table 24. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the upper Clark Fork River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	178 (9)	555 (27)	464 (22)	859 (41)	19 (<1)	617	2692 (2075)
Sport Fisheries	80 (4)	216 (12)	980 (47)	772 (37)	19 (<1)	628	2695 (2067)
Final Resource	258 (12)	730 (35)	641 (31)	446 (21)	0 (0)	617	2692 (2075)

sections of the Clark Fork, Flint Creek, the Little Blackfoot, most of Rattlesnake Creek, the upper Blackfoot, and numerous westside tributaries to the Bitterroot.

More than half of the 868 stream miles rated in the Bitterroot River drainage received a Class II final resource value. Included in the 133 miles of Class II sport fisheries were the Bitterroot main stem and its east and west forks. Only 33 miles in the drainage received a Class I final resource value and these were all reaches which contained pure westslope cutthroat trout. The 45 reaches receiving a Class II habitat and species value included essential spawning habitat and potentially pure westslope cutthroat trout populations or pure populations where genetic invaders exist in the drainage.

Recent information collected on the Bitterroot main stem found trout populations between Hamilton and Stevensville lower when compared to upper river sections less affected by irrigation demands. Dewatering was found to reduce young-of-the-year populations, which eventually limited adult population size. In an effort to compensate for water losses during the irrigation season, MDFWP has purchased 15,000 acre-feet of water from Painted Rocks Reservoir, a multi-purpose project located on the West Fork Bitterroot River. The supplemental releases have enhanced the upper river rainbow population by 200 percent since 1983. A cooperative water management system to better distribute irrigation waters has been recommended by the recent fishery studies.

In the Blackfoot River drainage, sufficient fisheries data were available on only 66 of the 288 identified reaches in the drainage to allow for a fisheries assessment to be made. Most of the 222 unassessed reaches were short upper reaches where only habitat data have been collected. Six reaches received a Class I final resource value, including five essential spawning streams to the Class I portion of the Blackfoot River from the Clearwater River to its mouth. Abundant rainbow trout, mountain whitefish, and trophy-size bull and brown trout in a setting of outstanding natural beauty led to this Class I designation. Class II reaches included the Blackfoot main stem from Arrastra Creek to the Clearwater, five essential spawning streams and six streams containing potentially pure westslope cutthroat and/or bull trout populations.

The upper Clark Fork River and its drainage above Missoula conjures up a variety of images from hazardous waste sites and milling and smelting pollution to Milltown Dam with its accumulated mine waste, to Rock Creek with its potpourri of trout. How about combining past mining with trophy fishing? It has been done on the upper Clark Fork River from Warm Springs to Dempsey Creek, abused for over half a century from untreated mine effluent. In the first stream classification map in 1959, the Clark Fork from Warm Springs to the Little Blackfoot was rated a

Class V -- a fishery of limited value. From the Little Blackfoot to Milltown Dam, conditions improved slightly, increasing the rating to a Class IV. Since the construction of settling ponds and other waste treatment improvements by the Anaconda Minerals Company in the river's headwaters area, a steady improvement in water quality has resulted. The subsequent increase in fish numbers has led to a Class II sport fishery value for the river's upper 41 miles and a Class III sport fishery in the remaining 70 miles today. From Dempsey Creek to Rock Creek, however, trout populations have remained depressed due to poor habitat conditions caused by stream channelization, dewatering and mining pollutants still present in the river substrate and along its floodplain.

Also within in the upper Clark Fork drainage is a Class I sport fishery on Rock Creek from its mouth to the confluence of its forks. This 48-mile reach has been rated a Class I sport fishery since the first classification map in 1959. The fishery in 1959 was characterized by heavy plants of rainbow trout which coincided with the highest angler use and harvest ever recorded on Rock Creek. Rock Creek's fishery over the 25-year period to the present has found the cessation of trout stocking, the use of restrictive creel limits and gear, and a change in angler preference to catch-and-release. Today, catch and released fish contribute over 90 percent of the fish to a fishing trip, 24 percent of the anglers are from out of state, rainbow trout over 14 inches have increased 300 to 1,000 percent since more restrictive regulations were initiated, and the goal of providing a greater number of fish 14 inches and larger has been met.

Eight essential spawning tributaries to Rock Creek and 13 stream reaches containing isolated populations of pure westslope cutthroat trout received a Class I in the habitat and species value in the upper Clark Fork drainage. The same mining that destroyed the fishery of the main stem for over half a century also isolated native populations in tributary streams from introduced exotic species. Douglas Creek (including its three forks), which flows into a settling pond in the Flint Creek drainage, is a prime example of this isolation where abundant populations of pure westslope cutthroat trout exist today.

Wildlife

The upper Clark Fork River drainage, which offers some of the most spectacular and diverse wildlife areas in Montana, was divided into 37 assessment units -- 13 within the upper Clark Fork River drainage, nine within the Blackfoot drainage, and 15 within the Bitterroot River (Table 25). The Blackfoot River far outranked all other Clark Fork river basins in both species and habitat quality. Four of the Blackfoot's nine units earned a Class I final resource value. Six units received a Class I species rating while two secured Class I habitat ratings. Outstanding river units include the North Fork of the Blackfoot,

Table 25. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the upper Clark Fork River drainage.

Value	Class I	II	III	IV	Total
Habitat	5 (14)	6 (16)	8 (22)	18 (48)	37 (100)
Species	10 (27)	12 (32)	14 (38)	1 (3)	37 (100)
Final Resource	7 (19)	11 (30)	18 (48)	1 (3)	37 (100)

the Blackfoot main stem and west side tributaries from the North Fork to the Clearwater drainage, and all of the Clearwater drainage. Reasons for such high values stem from the upper Blackfoot's pristine habitat, its ability to support high numbers of breeding and wintering eagles, its essential grizzly bear habitat, its abundant populations of wintering elk, mule and white-tailed deer, and its high densities of black bear and terrestrial and aquatic furbearers. Gallery forests, meandering river channels with abundant wetlands and numerous spring creeks provide habitat for nesting ospreys, great blue heron, wintering and migrating waterfowl, and river otter. The inherent high species and habitat values of the Blackfoot have not gone unnoticed. The MDFWP has secured approximately 50,000 acres of critical big game winter range along both the Blackfoot and Clearwater rivers.

Three other river segments within the upper Clark Fork River drainage meet the outstanding resource value criteria: two comprise the entire Rock Creek drainage, while the third includes the lower Bitterroot River between the confluences of the East and West forks of the Bitterroot and Lolo Creek just south of Missoula. Rock Creek's abundant big game and relatively undisturbed diverse riparian habitats gave this basin its outstanding resource value. In comparison, the Bitterroot main stem earned its Class I status because of high quality wetlands, cottonwood forests, and numerous islands that provide important habitat for wintering and migrating bald eagles, colonial nesting birds, ospreys, and waterfowl. The Lee Metcalf National Wildlife Refuge protects much of the excellent habitat quality along this river reach.

Recreation

Recreational attributes and values of 92 river segments were inventoried in the upper Clark Fork drainage -- nearly 1,600 miles of river, or about 12 percent of the 12,528 miles studied (Table 26). River managers and users rated 13 percent of the drainage's river miles as Class I (Outstanding), 21 percent as Class II (Substantial), 47 percent as Class III (Moderate) and 14 percent as having Class IV (Limited). These proportions seem to indicate that the drainage has overall lower recreational value than the adjacent southern drainages. But a river having moderate value in Montana is still a valuable resource from a national perspective. Perhaps even more important are the values of rivers like the Bitterroot and Clark Fork to local and regional residents.

Their were 379 reasons given by raters for the value classes they assigned, and the most frequently given reason -- comprising five percent of the total responses -- was "moderate use levels." This was followed closely by mixed public and private access, private property, scenic quality, mountainous terrain, good

Table 26. Number of reaches, miles and percentages of recreational assessment reaches by value class in the upper Clark Fork River drainage.

Value Class	Reaches	Miles
Outstanding	9 (9.8%)	211 (13.5%)
Substantial	14 (15.2%)	324 (20.7%)
Moderate	42 (45.7%)	737 (47.1%)
Limited	21 (22.8%)	225 (14.4%)
Unknown	6 (6.5%)	67 (4.3%)
Totals	92	1,564

fishing, and limited recreational potential. This mix of favorable and unfavorable reasons shows that the drainage contained streams along the whole spectrum, from limited to outstanding value.

Recreational use levels were heavy on 25 percent of the river miles, moderate on 40 percent, and low on 15 percent, reflecting in part the rivers' proximity to Missoula and the surrounding areas. The drainage contained 18 percent of the state's heavily used rivers and 12 percent of the low use level segments. Scenic quality was rated as Substantial to Outstanding on 49 percent of this region's river miles, about 13 percent of the state's river miles having this high a level of scenic quality. The many creeks flowing through the Bitterroot's spectacular side canyons enhance the hiking opportunities south of Missoula.

About 25 percent of the region's river miles provided opportunities for semi-primitive or primitive recreation experiences, lower than other, less-developed drainages located farther away from population centers. Access was rated as abundant or moderate for about 63 percent of the river miles, while about 50 percent of the rivers statewide had these levels of access. Twenty-two percent of the mileage was said to have abundant access, compared to 16 percent statewide. These relatively high levels of access are expected close to growing areas such as Missoula and the Bitterroot Valley.

Fishing from shore was by far the most common water-based activity, taking place on 77 percent of the stream segments studied. Boating didn't occur on 59 percent of the segments, a proportion lower than that of adjacent drainages and likely reflecting the opportunities on the four major rivers in the drainage. Boating was a primary or secondary activity on 38 percent of the segments. The drainage contained 26 percent of the state's supply of 478 miles of moderate rapids and 22 percent of flat water stretches studied. The most frequent land-based activity was viewing scenery, a primary activity on 52 percent of the segments. Tent camping was a primary activity on 38 percent, picnicking on 35 percent, car camping and non-motorized trail use on 28 percent, and motorized trail use on 14 percent.

The Blackfoot is a gem among Montana rivers, giving Missoulans and others an opportunity to fish, sit by the river, spend the night at their choice of several campgrounds, or float through exhilarating rapids. It's the site of the annual Blackfoot Whitewater Weekend sponsored by the University of Montana Wildland Recreation Management program. The Blackfoot holds some of the bounciest, most pleasant Class II and III whitewater in Montana. The many access points provide a number of options, each with its own beauty. Roundup to Ninemile probably has the most rapids, but other popular stretches are Bear Creek upriver and Thibideau below. Another treat is "the ledge," a pourover extending far out into the river, backed up by a long, calm eddy. At most flow levels it's forgiving. This is the perfect after-work spot. One

can drive to the ledge, unload the boat, paddle across, surf to his or her heart's content, and paddle back. And no shuttle!

Botanical Features

The upper Clark Fork drainage contains 103 of the 400 botanical natural feature sites inventoried in this study. This phenomenon may be a result of an uneven research effort, due to the proximity of Missoula and the University of Montana. This drainage contains the largest number of natural feature sites -- 52 sites or 23 percent of the total 228 -- that received a final rating of either Class I or Class II. Nineteen of the 103 botanical natural feature sites are located in U.S. Forest Service wilderness areas.

A unique plant in this drainage is the Bitterroot trisetum (Trisetum orthochaetum), known only from the Lolo Hot Springs area. This species was discovered in 1951, but it could not be relocated until recently, when it was found five miles from its original site. Botanists believe the plant may be a sterile hybrid.

An endemic plant species found within this drainage is Sapphire rockcress (Arabis fecunda), a recently described species known only from Ravalli County, Montana. This rare plant grows on scattered sites of calcarious soil that occur in two small areas in the Sapphire Mountain Range. Another unusual plant in the drainage is the giant helleborine, (Epipactis gigantea). Although fairly common in the southern part of its range, it is listed as an endangered species in this region. Here, at the northern limit of its range, this shallow-rooted orchid can be found near warm springs, and it is threatened by the development of these areas.

A regionally endemic plant found within the upper Clark Fork drainage is Howell's gumweed (Grindelia howellii), a species of moist prairies, meadows and disturbed areas such as road shoulders. This plant is threatened by heavy grazing, land development and the invasion of spotted knapweed (Centaurea maculosa), and is a candidate for listing as an endangered species by the U.S. Fish and Wildlife Service.

An outstanding Research Natural Area (RNA) within the upper Clark Fork River drainage is the Lost Horse Canyon, a major drainage on the east side of the Bitterroot Mountains. Within this area are three proposed RNAs totaling 5,679 acres: the Bitterroot Mountain Snow Avalanche, the Upper Lost Horse Canyon and Lower Lost Horse Canyon. As of 1986, only the Upper Lost Horse Canyon RNA has been officially designated for protection. This RNA features 2,025 acres of subalpine zone forest. The Lower Lost Horse RNA features a mid-elevation montane mixed-coniferous forest, and the Bitterroot Mountain Snow Avalanche RNA contains

several active shrub-covered avalanche chutes that cut through a spruce-fir forest.

The Plant Creek RNA, a 257-acre site just south of Missoula, established in 1986, represents one of the few remaining patches of undisturbed old-growth montane forest found in western Montana. As a result of fires and heavy timber harvesting, it is uncommon to find an undisturbed, lower elevation (5,000 feet) forest of 300-year-old western larch and Douglas fir.

Sheep Mountain Bog was established as a RNA in 1983, making it one of the few protected bogs in the northern Rocky Mountains. This 2.5-acre sphagnum moss bog was formed within a glacial cirque basin at 6,280 feet, and has has served in dating vegetation history through the examination of its accumulated organic deposits that include pollen, spores, and volcanic ash from throughout the Pacific Northwest. Also, the northern bog lemming (Synaptomys borealis), a scarce and locally distributed vole, has been reported in the area.

Geologic Features

Nine percent of the Class I and II geologic feature sites, excluding type locations, were found in the upper Clark Fork drainage. Two areas are noted for their glacial moraines, the first on Monture Creek near Ovando. One glacier originating in McCabe Creek to the east joined another in Monture Creek, and the combined glacier covered much of the valley floor north of Ovando. Lateral moraines, pothole lakes, and outwash plains show the extent of glaciation. Although farming has disturbed some of the vegetation in the area, landforms resulting from glaciation are very distinct. The second area clearly showing a glaciated landscape is located adjacent to Racetrack Creek outside of Deer Lodge. This area consists of a deeply glaciated valley and large moraine.

Another interesting glacial feature can be seen just north of the small town of Maxville on Flint Creek. The large boulders covering the ground as one heads north out of the hills resulted from either an earth flow or from the bursting of an ice dam. Air photos of the area indicate that the rock debris probably originated in the Boulder Creek drainage, which flows into Flint Creek from the east at Maxville.

Good examples of ripple marks and mud cracks in the Belt series sedimentary rocks is visible near the Flint Creek Campground just northeast of Georgetown Lake. These features indicate the depositional environment for the Belt Supergroup, a series of slightly metamorphosed, fine-grained sedimentary rocks widespread throughout northwestern Montana. The depositional environment was that of low-gradient streams feeding a large, shallow basin in an arid climate. The mudcracks resemble those

found when a shallow pond dries out. This site is also said to contain fossilized Cambrian trilobites.

Evidence of former glacial Lake Missoula extends to the upper portions of the Clark Fork Basin. On the open, grassy hillsides of Mount Sentinel and Mount Jumbo at Missoula, one can clearly see the wave-cut shorelines of this former glacial lake. About 35 parallel benches encircling the hillsides indicate a water level in the lake about 700 feet above the present valley floor. The 2,900-square-mile lake formed near what is now the Idaho border when lobes of the vast Cordilleran ice sheet from British Columbia dammed the Clark Fork. The dam apparently was breached several times.

LOWER CLARK FORK RIVER DRAINAGE

LOWER CLARK FORK RIVER DRAINAGE

Boundaries: Bitterroot River to Idaho border
Drainage size: 22,073 square miles
Main stem length: 200 miles
Tributaries: St. Regis, Flathead, Thompson
Cities/Towns: St. Regis, Plains, Thompson Falls
Access: Interstate 90, Montana Highway 200

From a car window or train boxcar, one can see most of the 200 miles of the lower Clark Fork River as it snakes through forested foothills, grasslands, narrow canyons, and broad cottonwood-lined river valleys en route to Idaho's Lake Pend Oreille. With an average flow of 21,000 cubic feet per second, the Clark Fork is Montana's largest river (Figure 5). The relatively few remote miles on this stretch -- most notably Alberton Gorge west of Missoula -- can be experienced firsthand in a rubber raft or kayak.

Because of its integration with civilization, the lower 170 miles of the Clark Fork River in Montana is another drainage of diverse resource uses. Paper mill effluents, municipal sewage, past mining and logging activities, and construction of three dams have degraded wildlife and fishery habitat and diminished the Clark Fork's recreational appeal. Man's heavy imprint upon the land resulted in the lower Clark Fork River drainage receiving few outstanding ratings in the Montana Rivers Study. Scenic quality, for example, was rated Class I or II on only three percent of the 1,350 miles of rivers and streams assessed for recreation -- a likely reflection of conflicting land uses.

The Flathead, the lower river's major tributary, was not assessed due to its location on the Salish and Kootenai Indian Reservation.

Fisheries

A total of 1,176 miles in 206 reaches were assessed for their fisheries value in the lower Clark Fork River drainage (Tables 27 and 28). Insufficient fisheries data prevented the evaluation of 60 percent of the identified reaches. Only one percent of the reaches rated received a Class I final resource value, the lowest number of Class I reaches of all drainages in the state. No reaches received a Class I in the sport fishery value but four reaches received a Class II. These 140 miles of Class II sport fisheries included the Clark Fork main stem from the Bitterroot to the Flathead, the lower 26 miles of the Thompson River, and the lower 14 miles of Fish Creek. Bull trout, rainbow trout, cutthroat trout and whitefish provide local fisheries in the Thompson River and Fish Creek.

Figure 5. Map of lower Clark Fork River drainage.

Table 27. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the lower Clark Fork River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	3 (1)	22 (11)	51 (25)	114 (55)	16 (8)	308	514 (206)
Sport Fisheries	0 (0)	4 (2)	40 (20)	149 (72)	13 (6)	308	514 (206)
Final Resource	3 (1)	25 (12)	61 (30)	112 (54)	5 (2)	308	514 (206)

Table 28. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the lower Clark Fork River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	14 (1)	203 (17)	384 (33)	539 (46)	37 (3)	445	1622 (1177)
Sport Fisheries	0 (0)	140 (12)	323 (27)	660 (56)	53 (4)	445	1621 (1176)
Final Resource	14 (1)	329 (28)	329 (28)	490 (42)	14 (1)	445	1621 (1176)

Easy accessibility to the Clark Fork main stem between Missoula and Superior has helped produce the 11th heaviest stream fishing pressure in the state (1985 estimate). However, current MDFWP studies on this 105-mile section have found relatively low numbers of trout for a river of this size. Population estimates indicate an average of 200 to 400 catchable trout (8 inches or larger) in this reach of the Clark Fork. Rainbow trout comprised 90 percent of the trout fishery. Preliminary results indicate that a scarcity of high quality trout spawning habitat in the main stem and its tributaries may be limiting catchable trout.

Historically, the sport fishery of the lower Clark Fork was dependent upon the annual spawning migrations of cutthroat trout, bull trout, lake whitefish and kokanee from Lake Pend Orielle in Idaho. Although the resident fishery of the lower Clark Fork was considered generally "unproductive," this complex of species from Pend Orielle provided a variety of angling opportunities from March to December in the main stem and tributary streams. Access to the lower river by migrating populations was lost when three run-of-the-river dams were constructed beginning in the early 1900s. Thompson Falls Dam, 70 miles upstream from Lake Pend Orielle, was constructed in 1916. Noxon Rapids Dam, completed in 1959, is located 38 miles downstream from Thompson Falls. Just across the Idaho border, 11 miles upstream from Lake Pend Oreille, lies Cabinet Gorge Dam, completed in 1952. Seventy miles of river habitat has been impounded by these dams, or 34 percent of the river downstream from Missoula. Fisheries mitigation has been provided by the Washington Water Power Co. and numerous fisheries management schemes have been devised, including massive rehabilitation efforts and stocking programs totaling nearly 10 million fish in eight species. Target species today include largemouth and smallmouth bass, brown and bull trout, ling and the McCounaghy strain of rainbow trout.

The range of westslope cutthroat trout historically extended throughout the lower Clark Fork River drainage. Three reaches in the lower Clark Fork rated Class I in the habitat and species value contained isolated pure populations of westslope cutthroat. Lack of genetic verification of the purity of the remaining populations prevent identification of critical habitats. Of the 203 miles of stream receiving a Class II habitat and species value, 37 miles in six reaches contained genetically pure cutthroat (tested by electrophoresis) but were threatened by genetic contaminants in the drainage, and another 72 miles had potentially pure populations but genetic verification had not been conducted. Of the remaining 181 rated reaches, 98 have westslope cutthroat trout listed as a species present in their waters. Potentially, the lower Clark Fork may still be providing extensive habitat to this species of special concern.

Wildlife

The lower Clark Fork River drainage's steep and dissected terrain, fire history, and abundant public lands have led to its notoriety as elk, deer, moose, sheep and goat country. Many tributaries received exceptional species values because of their high big game densities. Unfortunately, much of the riparian habitat of the lower Clark Fork River has been altered by construction of the three run-of-the-river hydroelectric projects, as well as by railroads and highways, including Interstate 90 from Missoula to St. Regis, which border the river for its entire length. These human activities largely explain why most of the lower Clark Fork main stem units received lower habitat quality ratings of III or IV.

What the lower Clark Fork River's 23 river units lack in riparian habitat is balanced by high species (and occasionally habitat) values along its tributaries. More than 75 percent of the tributary units received a species rating of Class I or Class II. (Table 29). Large populations of, and critical habitat for big game species such as white-tailed deer, mule deer, elk, black bear, moose, bighorn sheep, mountain lion, and furbearers such as beaver, lynx, bobcat and marten, contributed greatly to these high species values. In addition, grizzly bear habitat in the Cabinet-Yaak ecosystem and critical bald eagle nesting and wintering areas were important factors. Tributaries with a species ratings of Class I included the Fish Creek, Bull River, and Vermilion River drainages.

Two reaches (nine percent) in the lower Clark Fork received a final resource value of Class I. The Bull River from its headwaters in the Cabinet/Yaak Wilderness to its confluence with the Clark Fork near Noxon contained all the essential ingredients for a Class I stream: habitat for grizzly bear and bald eagles, high game and furbearer populations, and most notable, high quality riparian habitat. In a region where streams are steep and rivers are dammed, the lower Bull River's meandering floodplain of wet meadows, bogs, and backwater sloughs is a unique resource.

The remote and rugged Fish and Petty Creek drainages also contain high quality wildlife characteristics. Known for its large populations of mule deer, elk, and mountain lions, Fish Creek originates high along the Idaho border and flows easterly to join the Clark Fork about 40 miles west of Missoula. Upper portions of the basin burned in the early 1900s and created a diversity of important big game habitats. Adjacent Petty Creek supports a growing bighorn sheep herd well known for trophy class rams. For the most part, riparian habitat quality in both drainages is in good to excellent condition.

Table 29. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the lower Clark Fork River drainage.

Value	Class I	II	III	IV	Total
Habitat	1 (4)	3 (13)	14 (61)	5 (22)	23 (100)
Species	4 (17)	15 (65)	3 (13)	1 (4)	23 (99)
Final Resource	2 (9)	15 (65)	5 (22)	1 (4)	23 (100)

Recreation

The Montana Rivers Study inventoried the recreational attributes and values of 118 river segments in the lower Clark Fork drainage--about 1,350 miles of river, or 11 percent of the 12,528 miles studied. Managers and recreational river users rated just three percent of the drainage's river miles as Class I (Outstanding), 23 percent as Class II (Substantial), 49 percent as Class III (Moderate) and 23 percent as Class IV (Limited) (Table 30).

The two most frequently given reasons for proposing that a river be placed in a certain value class (but each comprising only seven percent of the number of responses) were good fishing on the positive side, and, on the negative side, that limited recreational opportunities were present. These were followed closely by comments on good hunting, the small size and intermittent flows of some inventory streams, and scenic quality. Recreational use was heavy on just eight percent of the river miles, moderate on 45 percent, and low on 26 percent, relatively low levels of use compared to other western Montana drainages.

Scenic quality was rated as Substantial to Outstanding on only three percent of this region's river miles, likely a reflection of conflicting resource uses. Forty-five percent of the river miles were thought to have moderate or lower scenic quality. Notable exceptions were rivers having views of the Mission, Bitterroot, and Cabinet mountain ranges.

About 35 percent of the region's river miles provided opportunities for semi-primitive or primitive recreation experiences, lower than other less-developed drainages. Nearly all of these miles were semi-primitive, with only one percent of the segments rated as providing primitive recreation opportunities. Access was rated as abundant for 39 percent of the river miles. Although the drainage contained 11 percent of the inventoried river miles, it had 27 percent of the mileage having abundant access.

Picnicking, viewing scenery, tent camping, and non-motorized trail use were the most popular land-based recreational activities. Fishing from shore was by far the most common water-based activity, taking place on 61 percent of the stream segments studied and a primary activity on 42 percent. Boat fishing, however, was a main activity on 17 percent of the segments. Rafting, kayaking, and canoeing were each a primary activity on 13 percent of the segments.

An abundant spectrum of recreational opportunities exist in the lower Clark Fork, from 169 miles of flat water to 109 miles of moderate rapids to 37 miles of major rapids--half of the state's supply of big water. Much of this lies in the Clark Fork as it crashes through Alberton Gorge between Alberton and Tarkio, a

Table 30. Number of reaches, miles and percentages of recreational assessment reaches by value class in the lower Clark Fork River drainage.

Value Class	Reaches	Miles
Outstanding	5 (4.2%)	38 (2.8%)
Substantial	22 (18.6%)	306 (22.7%)
Moderate	53 (44.9%)	656 (48.6%)
Limited	33 (28.0%)	303 (22.5%)
Unknown	5 (4.3%)	46 (3.4%)
Totals	118	1,349

14-mile day trip located 35 miles west of Missoula. This pool-and-drop section is a favorite of Missoula kayakers which can be run in every conceivable type of raft. Several of the rapids are rated Class III and IV (on the white-water rating system). Access is not formal but not difficult, either. A common, privately-owned put-in is below the bridges at the Cyr exit. Some boaters launch a few miles upstream for a flatwater run with one notable exception--Rest Stop rapid, a name that describes both its location and what will happen to the errant raft that misses the tongue.

The first rapid, right around the first corner from Cyr, is a straight shot through bouncy waves. The Cliffside series offers more of the same, but with bigger, more sharply angled waves and a good hydraulic at the bottom. Next is Triple Bridges, an unmistakable landmark and a good put-in for running the three miles to Fish Creek. A short distance below lies Tumbleweed, the most difficult rapid in the Gorge, but the Chicken Chute at the far right is an easier out. A run up the middle can be disastrous and even a clean left-center run is complex as the steep tongue disappears into crashing waves. Just 100 yards or so below Tumbleweed is a little reward for a successful run -- a mid-river glassy trough called Surfer Joe. The final noteworthy rapid, Fang, signals the end of the good rapids.

Botanical Features

The lower Clark Fork drainage contains nine percent of the state's botanical natural features receiving a final value of Class I or Class II, no more than the average for the state. Of the 32 sites inventoried within this drainage, ten (31 percent) are located on the Flathead Indian Reservation.

Many of the outstanding botanical features inventoried in this drainage are proposed Research Natural Areas (RNAs) or National Natural Landmarks (NNLs). An outstanding example is Council Grove, a 400-acre site on the Clark Fork River just west of Missoula, which contains wetland areas and a forest stand of black cottonwood and ponderosa pine. The site also contains a population of pointed broom sedge (Carex scoparia), a plant listed by the Montana Rare Plants Project as rare. Council Grove is a popular bird-watching site, and although it has received heavy grazing pressure in the past, it has regional significance as a rare example of a near-pristine riparian forest in western Montana.

A different forest grove from that of the river bottomlands is a population of mature mountain hemlock found within the proposed Ulm Peak RNA. This moist, 725-acre site is located along the Montana/Idaho state line within the Coeur d'Alene Mountains. This population is considered unique in western Montana, because it is here that the species reaches its eastern limit. Normally, it is

the dominant conifer of the coastal forests in the Pacific Northwest.

A regionally endemic plant found within the lower Clark Fork drainage is Cascade reedgrass (Calamagrostis tweedyi), a relative of the more common pinegrass (Calamagrostis rubescens). The Montana Rare Plants Project lists this species as rare and the U.S. Fish and Wildlife Service is considering it for federal protection. Cascade reedgrass is found in meadows and open coniferous forest near the headwaters of Cold Creek and Little Joe Creek.

Geologic Features

About four percent of the Class I or Class II geologic sites identified in the Montana Rivers Study were found in the lower Clark Fork River drainage.

Glacial Lake Missoula left its mark in this basin. Near the Montana-Idaho border, lobes of the vast Cordilleran ice sheet from British Columbia dammed the Clark Fork, creating water depths of about 2,000 feet behind the dam. The glacial lake covered an area of roughly 2,900 square miles and extended roughly 250 miles upstream at least as far as Drummond and possibly as far as Garrison. The ice dam is thought to have broken several times. In Montana, the most impressive features associated with draining of the lake are the giant ripple marks on the Flathead Indian Reservation north of Perma -- although the Montana Rivers Study did not look for features on reservations.

Exposures of sediments deposited in the glacial lake also are common in this drainage. These lacustrine deposits may be 20 or more feet thick. Typically, the deposits include layered, light-colored silts, clays, and fine sands. Occasionally, one may find a much larger rock embedded in the fine sediments. These larger rocks may have been floated out into the lake on an ice raft. As the ice melted, the large rocks were deposited along with the other finer lake sediments. The fine-grained sediments can be viewed in many places in the basin, such as the Tarkio Flats area. Along Interstate 90 these Lake Missoula sediments are well exposed in a road cut on Cayuse Hill between Ninemile and Alberton.

Paralleling the north side of the St. Regis River from Taft to St. Regis is the Osborn Fault, a high-angle normal fault of late Cenozoic age. Evidence of the fault consists of the scarplike (cliff-like) mountain front and gullies or valleys segmenting the scarp into triangular facets. In several areas near the fault trace, mines were opened to extract silver and other precious metals from adjacent mineralized areas.

BIG HOLE AND BEAVERHEAD RIVER DRAINAGES

BIG HOLE AND BEAVERHEAD RIVER DRAINAGES

Boundaries: Headwaters to Jefferson River
Drainage size: 6,381 square miles
Main stem length: Big Hole 156 miles; Beaverhead 211 miles
Tributaries: Red Rock River, Horse Prairie Creek, Ruby River
Cities/Towns: Dillon, Jackson, Lima, Melrose, Twin Bridges, Wisdom, Wise River
Access: Interstate 15; Montana 41, 43 and 278

The Continental Divide borders the southwest corner of Montana on three sides. In this remote region, eight mountain ranges and the high, windswept, sage-covered valleys separating them collect heavy snowfall, supplying the Big Hole and Beaverhead rivers, which merge at Twin Bridges to become the Jefferson River (Figure 6). Elevations vary from the 11,000-foot summits of the Pintlars down to 4,600 feet where the Jefferson is born. The longest continuous water course in the U.S. is said to begin in Hell Roaring Canyon, a tributary of the Red Rock River.

The Big Hole and Beaverhead rivers share a common destination and some of Montana's best fisheries, wildlife, and recreational values, but there the similarities end. In the Big Hole drainage, sandhill cranes and the rare arctic grayling still find niches, hay is put up using "beaver slides," and cattle outnumber people 100 to one. The river's journey to Twin Bridges is uninterrupted by reservoirs and is one of the last major rivers in the country still undammed. By contrast, the Beaverhead River is captured in Clark Canyon Dam near its origin at the confluence of the Red Rock River and Horse Prairie Creek. Highway and railroad crossings contribute to a lack of solitude along the Beaverhead, and irrigation withdrawals on the lower reaches have reduced scenic and fisheries values.

Fisheries

A total of 1,423 miles of stream in 190 reaches were assessed in the Big Hole and Beaverhead drainages. Although an additional 41 reaches were identified in the fisheries data base, these reaches could not be assessed due to insufficient data. Based on a cursory look through the "Missouri River Mile Index" and discussions with area biologists, only a fraction of the streams in these two drainages have been entered in the data base. Of the stream reaches rated, 71 miles were rated a Class I for their sport fisheries value and 93 miles received a Class II (Tables 31 and 32). Included in the Class I reaches were the lower 89 miles of the Big Hole River from Wise River to the mouth and the upper 12 miles of the Beaverhead from the dam to Grasshopper Creek. Portions of the Red Rock and the Ruby and additional reaches of the Big Hole and Beaverhead received Class II sport fishery values. The lower 36 miles of the Beaverhead received a Class III

Figure 6. Map of Big Hole and Beaverhead River drainages.

Table 31. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the Big Hole and Beaverhead River drainages. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	17 (9)	21 (11)	28 (15)	108 (57)	16 (8)	41	231 (190)
Sport Fisheries	3 (2)	4 (2)	54 (28)	84 (44)	42 (22)	44	231 (187)
Final Resource	20 (11)	22 (12)	56 (30)	76 (40)	16 (8)	41	231 (190)

Table 32. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the Big Hole and Beaverhead River drainages. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	187 (13)	139 (10)	167 (12)	871 (61)	56 (4)	94	1514 (1420)
Sport Fisheries	71 (5)	93 (7)	566 (40)	496 (22)	191 (13)	99	1516 (1417)
Final Resource	259 (18)	142 (10)	473 (33)	491 (35)	56 (4)	94	1515 (1421)

sport fishery value as did the majority of the Ruby River. In fact, 40 percent of the stream miles in the Big Hole and Beaverhead drainages received a Class III in the sport fishery value. The majority of these 566 miles were productive small stream fisheries, where brook, cutthroat or rainbow are abundant, fishing is fun and easy and locations are relatively unknown.

The Big Hole River has been recognized as a blue ribbon trout stream since the first stream classification occurred in 1959. In 1985, the lower river supported non-resident angler-days second only to the Madison River among southwest Montana streams. A "slot" limit was placed on a 10-mile river section from Divide to Melrose, where anglers could harvest only fish less than 13 inches and greater than 22 inches. Recent data indicate the regulation has been extremely effective in increasing numbers of 16-inch and larger brown trout but not in increasing the number of 13-15 inch fish.

Only 22 percent of the stream miles in the Big Hole and Beaverhead drainages received a Class I or II in the habitat and species category, compared to a state average of 40 percent. Again, these results were probably more a reflection of insufficient data than of insufficient populations of species of special concern. The upper Big Hole River and 13 other reaches in the Big Hole and Beaverhead drainages received a Class I designation because of their arctic grayling populations.

In past geologic time, the grayling was found throughout northern North America. During the last ice age, the population was separated into two bands 500 to 800 miles apart. In northern Canada and Alaska, grayling populations are still widespread; to the south, a relict population isolated from its principal range existed in Montana in the headwaters and the main stem of the Missouri to Great Falls and in Michigan. Extinct in Michigan streams since the 1930s, the fluvial arctic grayling has been lost throughout its Montana range except for the upper Big Hole drainage. Recognized as a species of special concern since the early 1970s, with documentation in 1981 of its range being reduced to ten streams in the Bighole, efforts to save the fluvial arctic grayling are still under way. A change in fishing regulations to protect this species, as well as a renewed attempt to determine the grayling's remaining range and habitat requirements, are currently being conducted by the MDFWP and the Beaverhead National Forest.

The presence of westslope cutthroat trout led to three Class I and half of the 20 Class II reaches in the habitat and species value. Although nearly all the major tributaries and alpine lakes of the Big Hole and Beaverhead have been planted with brook, rainbow, or Yellowstone cutthroat, many upper reaches probably still contain genetically pure populations of westslope. Inventories of tributaries to the Big Hole River are presently being conducted by the MDFWP in cooperation with the Beaverhead

National Forest. Following the field season of 1987, ten tributaries that support pure westslope cutthroat trout, and an additional tributary that contained arctic grayling, have been identified.

Poindexter Slough, a Class I spring creek, enters the Beaverhead River just south of the town of Dillon. This is the only spring creek in the state purchased by the Department of Fish, Wildlife and Parks for its recreational value, which includes an outstanding rainbow and brown trout fishery. Numerous other spring creeks and riverside channels flow into the Beaverhead. By contrast, only one spring creek has ever been inventoried in the Big Hole River drainage.

Wildlife

From the blue ribbon waters of the Big Hole River to the high swampy marshlands of the Red Rock National Wildlife Refuge, southwestern Montana support abundant big game populations, as well as threatened or endangered species and other species of special concern. Of 18 units comprising the Big Hole and Beaverhead River drainages, all but one unit received a final value class rating of II or better (Table 33). Of seven class I units, five lie within the upper Big Hole and Red Rock River drainages. The remaining two units include the headwaters of Horse Prairie Creek and a 63-mile reach of the Beaverhead River below Clark Canyon Dam.

The Centennial Valley, through which the Red Rock River flows, is one of the most remote, cool, high-mountain valleys in Montana, with winter temperatures plummeting to 50 degrees below zero, and 150 inches of snow falling each year. Bordered by the rugged, timbered Centennial Mountains on the south and the sagebrush-covered Gravelly Range on the north, the valley consists of marshlands, wetlands, and ponds connected by the Red Rock River. This variety of habitat combined with the lack of valley development provides outstanding habitat for long-billed curlews, sandhill cranes, trumpeter swans, waterfowl, peregrine and prairie falcons, and bald and golden eagles. Moose, pronghorns, elk, and deer dot the countryside.

Wildlife values for the lower stretch of the Red Rock River were also outstanding in the Montana Rivers Study. Although the lower river received a Class II habitat rating, it received one of the highest scores for game species in the state. The lower Centennial Valley and its tributaries support large populations of pronghorn, moose, deer, elk, sheep, black bear, mountain lion, sage grouse, beaver and bobcat.

Equally outstanding for its incredible beauty and wildlife values, portions of the Big Hole and lower Beaverhead main stems also received Class I wildlife values. The habitat along the lower

Table 33. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the Big Hole and Beaverhead River drainages.

Value	Class				
	I	II	III	IV	Total
Habitat	9 (50)	6 (33)	3 (17)	0 (0)	18 (100)
Species	7 (39)	9 (50)	0 (0)	2 (11)	18 (100)
Final Resource	7 (39)	10 (55)	0 (0)	1 (6)	18 (100)

50 miles of the Big Hole and 30 miles of the Beaverhead below Dillon is composed of braided river channels, mature cottonwood forests, numerous islands, wetlands, and backwater channels. Although partially developed, the Big Hole's riparian zone remains highly diverse and excellently preserved, while the Beaverhead has suffered from human impacts. Both rivers, however, provide habitat for osprey, great blue herons, bald eagles, raptors, waterfowl, and river otters. In addition, the steep bordering upland habitat supports golden eagles. An historic peregrine eyrie is located along the Big Hole.

The tributary basins of the Pioneer Mountains south of the Big Hole also received outstanding species quality ratings. These largely untouched valleys are rich with deer, elk, moose, bear, and pronghorn. A herd of bighorn sheep winter along the lower Big Hole River slopes. The rugged and forested Pioneers support abundant beaver, bobcat, lynx, and marten.

Ranking only slightly lower in game species value than the Pioneer tributaries, upper Horse Prairie Creek basin also earned an outstanding species rating. This single basin supports outstanding densities of deer, elk, moose, black bear, beaver, bobcat, lynx, and marten.

Recreation

The study inventoried the recreational attributes and values of 138 river segments in the Beaverhead/Big Hole drainage--nearly 1,800 miles of river, about 14 percent of the 12,528 miles studied statewide. Managers and river users rated 21 percent of the drainage's river miles as Class I (Outstanding), 23 percent as Class II (Substantial), 45 percent as Class III (Moderate) and six percent as Class IV (Limited) (Table 34).

The drainages contained 29 percent of the Class I and 16 percent of the Class II river miles in the state--and only four percent of the Class IV river mileage. Thirteen percent of the state's Unknown value class rivers were in this drainage, showing that more inventory work is needed to better define recreational values. Scenic quality of the mountains and surrounding areas was the most common reason for assigning a value class, comprising 21 percent of the reasons listed, followed by good hunting, fishing, and access to wilderness (eight percent each). Reasons for a limited value included the presence of logging and clear cuts and private lands and restricting access.

Use was heavy on 24 percent of the river miles in the Big Hole and Beaverhead drainages and low on 28 percent. The drainages contained 19 percent of the state's heaviest used rivers and 11 percent of the low-use-level segments. Scenic quality was rated as Substantial to Outstanding on 55 percent of this region's river

Table 34. Number of reaches, miles and percentages of recreational assessment reaches by value class in the Big Hole and Beaverhead River drainages.

Value Class	Reaches	Miles
Outstanding	21 (15.2%)	383 (21.5%)
Substantial	34 (24.6%)	404 (22.6%)
Moderate	65 (47.1%)	809 (45.3%)
Limited	8 (5.8%)	103 (5.8%)
Unknown	10 (7.2%)	85 (4.8%)
Totals	138	1,784

miles. The drainage contained eight percent of the state's outstanding river miles for scenic quality.

Just under half (43 percent) of the region's river miles provided opportunities for semi-primitive or primitive recreation experiences. The rivers inventoried contained six percent of the state's miles rated as primitive or semi-primitive. Access was rated as abundant or moderate for about 43 percent of the river miles, while about 50 percent of the rivers statewide had these levels of access. Twelve percent of the mileage contained abundant access, compared to 16 percent statewide.

Fishing from shore was the most popular recreational activity, taking place as a primary activity on nearly 76 percent of the segments. Tent camping was a primary activity on 31 percent, car camping on 30 percent, non-motorized trail use on 25 percent, and motorized trail use on 15 percent. Boating was a primary activity on only 15 percent of the segments and a secondary activity on about 20 percent. This is not surprising, because raters believed that 86 percent of the rivers in the Beaverhead/Big Hole drainage were not boatable. No rivers were believed to contain moderate or larger rapids, although riffles and minor rapids were present on eight percent, including the main stem of the Beaverhead as it drops through the canyon to Dillon.

Botanical Features

The Big Hole and Beaverhead drainages contained 10 percent of the states' botanical features that received a final value rating of Class I and 58 percent of the 31 sites statewide that received a final value rating of either Class I or Class II. Of the total sites inventoried within these drainages, 11 are either proposed or already designated research natural areas (RNAs) or national natural landmarks (NNLs). Two botanical natural feature sites in this drainage are located within U.S. Forest Service wilderness areas.

Red Rock Lakes National Wildlife Refuge is a prime example of a designated ecological natural landmark. Situated at an elevation of 6,600 feet, it encompasses 38,144 acres of lakes, saline and freshwater marshes, wet meadows, bogs, grasslands, deciduous and coniferous forests. This area contains a representative series of relatively undisturbed presettlement wetland, upland meadow and forest types. The Refuge was originally established to protect the declining resident population of trumpeter swans. However, in 1969, after the swan's population increased, the species was removed from the federal endangered species list. About 70 percent of the refuge is included in the Red Rock Lakes Wilderness Area.

The North Fork of the Big Hole River flows through the 656-acre Big Hole National Monument, administered by the National Park

Service and currently under consideration for inclusion as a national natural landmark (NNL). Recognized as the battlefield where Chief Joseph and his Nez Perce tribe fought the U.S. Calvary in 1877, it also possesses the only officially protected wetland and steppe vegetation in the Big Hole Valley.

Due in part to its geographic isolation, southwestern Montana is botanically unique. This region is considered one of the richest areas in the state for rare plants, and many natural feature sites within this drainage contain regionally endemic plant species. One example is the Bitterroot milkvetch (Astragalus scaphoides), a species threatened by grazing and recommended by the Montana Rare Plants Project. Small populations of this plant are found within the sagebrush grasslands that surround the headwaters of Grasshopper and Horse Prairie creeks. Another regionally endemic species is Lemhi beardtongue (Penstemon lemhiensis), found throughout Lemhi County, Idaho and in small populations, in Montana, along the headwaters of Rattlesnake and Horse Prairie creeks.

Geologic Features

Eight percent of the geologic feature sites identified in the Montana Rivers Study, excluding type locations, were found in the Beaverhead and Big Hole drainages.

The Block Mountain area about 16 miles north of Dillon on the Big Hole River graphically illustrates the folding and faulting processes involved in the development of the Rocky Mountains. The area contains an unusually good exposure of Paleozoic and Mesozoic formations, which have been folded and are cut by thrust faults.

The Humbug Spires Primitive Area a few miles east of the town of Divide provides an excellent exposure of the Boulder batholith. Here the granite has been eroded into spectacular tall, reddish spires and pinnacles. Such landforms are commonly developed on the Boulder batholith, but in this case, the landforms are exemplary. The area is frequented by rock climbers.

Not far from Ruby Reservoir south of Alder is an area that produces well-preserved fossil insects. The thin bedded Tertiary shales can be peeled apart to reveal the fossils. The area was mentioned during interviews for the Montana Rivers Study, by several experts from Montana universities and the Museum of the Rockies.

MISSOURI HEADWATER DRAINAGES

MISSOURI HEADWATERS

Rivers: Jefferson, Madison, Gallatin
Boundaries: Headwaters to Three Forks
Drainage size: 13,513 square miles
Main stem lengths: Madison 133 miles; Gallatin 115 miles; Jefferson 84 miles
Cities/Towns: Cameron, Ennis, Gallatin Gateway, Bozeman, Manhattan, Silver Star, Cardwell, Three Forks
Access: U.S. Highway 191, 10 and 287, Montana 41, 55, 286 and 85

The three headwater streams of the Missouri River emerge from their origins in Yellowstone National Park and four mountain ranges in southwestern Montana, flow through semi-arid valleys of sagebrush and grass, and converge at Three Forks. The Jefferson, Madison, and Gallatin rivers drain a portion of the Continental Divide, and the Madison, Spanish Peaks, Gallatin, Tobacco Root, and Gravelly mountain ranges (Figure 7). Many of the peaks reach above 10,000 feet with valleys in these drainages occurring at an average elevation of about 4,500 feet.

Missouri River Headwaters State Park, a national historic landmark, celebrates Lewis and Clark's voyage through the area, and not far upstream, in Jefferson River Canyon, is Montana's first state park -- Lewis and Clark Caverns. As separate rivers, the Madison, Gallatin, and Jefferson are geologically and historically unique, a fact that adds greatly to their value.

Of the three Missouri headwaters rivers, the most familiar nationally is the Madison. Ninety miles of the Madison's 140-mile northerly journey is through the sagebrush country of southwest Montana. It originates in Yellowstone National Park in the midst of geysers and hot pools, and meanders through 50 miles of the park before reaching Montana. Its fluvial journey is quickly interrupted after leaving the park, first by Hebgen Dam built for water storage in 1915, and then by Quake Lake, created by an earthquake in 1959. Next is Ennis Dam, located just below the town of Ennis, dammed in 1900 for power generation.

The free-flowing Gallatin River, although not as well known as its sister river the Madison, joins in from the east to form the Missouri. The West Gallatin, also originating in the park, flows north for about 100 miles to the town of Manhattan. The upper 40 of its 70 miles are confined in a scenic canyon, after which the river spreads out across the valley's private land before being joined by the East Gallatin. The East Gallatin River, nearly 40 miles in length, originates and flows through the Gallatin Valley bottom for its entire course. Once the East and West Gallatins come together, the river flows for only 10 miles before becoming part of the Missouri.

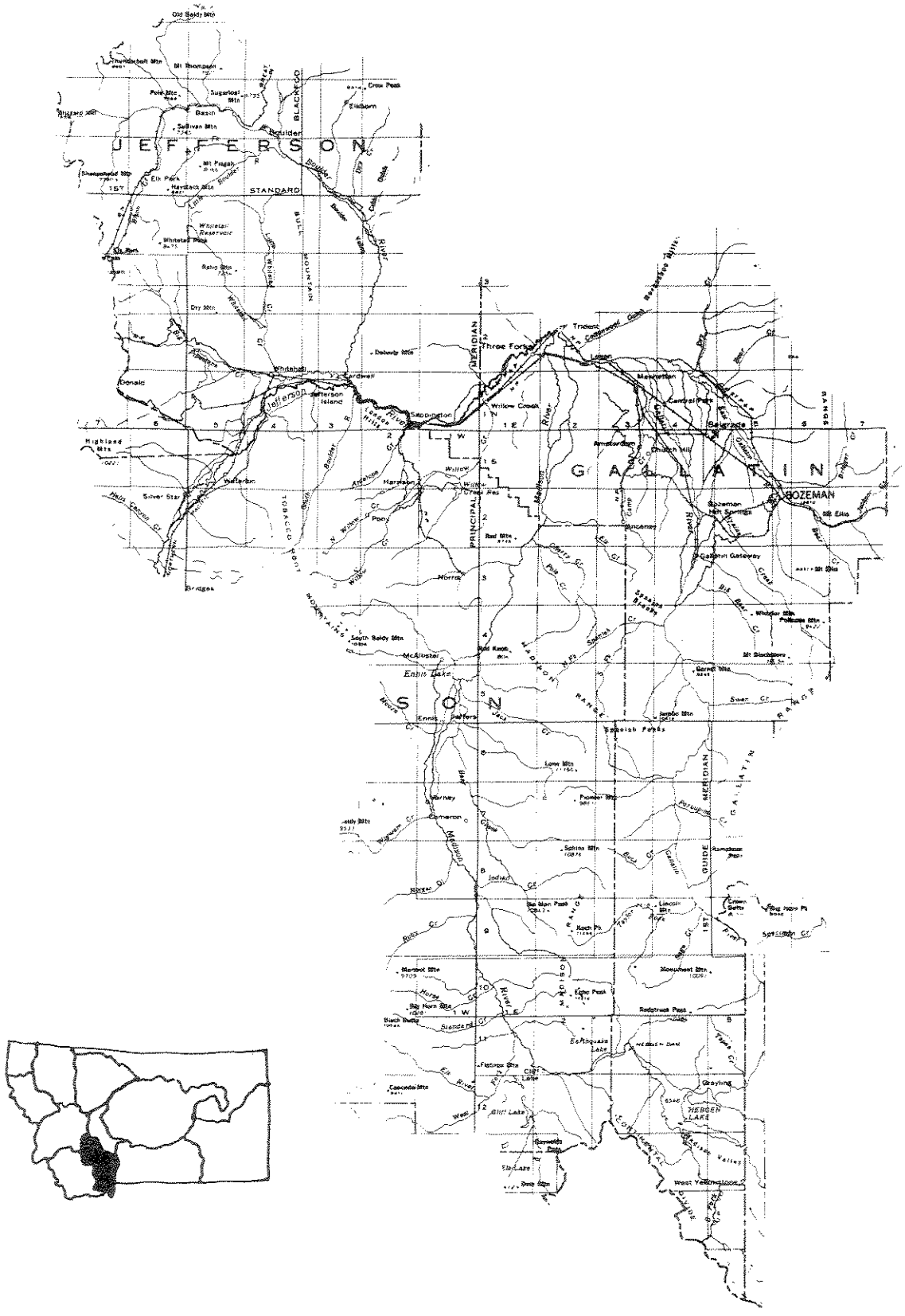

Figure 7. Map of Missouri River headwater drainages, the Madison, Gallatin and Jefferson rivers.

Originating at the confluence of the Big Hole and Beaverhead rivers, the Jefferson flows 77 miles in a northeasterly direction, with its only major tributary, the Boulder River, entering from the north near Cardwell.

Fisheries

The Madison River was one of two rivers in Montana that received a Class I designation in the sport fishery value for its entire length. Six reaches of the Madison were rated and each accumulated points separately to receive a Class I sport fishery value. Being a Class I sport fishery is nothing new to the Madison; from the first state river classification in 1959, the entire Madison has been "blue ribbon". A total of 281,586 angler days were estimated in 1985 on the Madison, which accounted for 15 percent of the total estimated fishing pressure statewide. Of the 102 tributaries of the Madison below the park boundary, 89 reaches in 405 miles were identified in the fishery data base (Tables 35 and 36.) Due to lack of sufficient fisheries information, only 47 (53 percent) of the reaches in 350 miles could be assessed.

As with the Madison, high sport fishery values dominated the fishery assessment in the Gallatin River drainage as well. Eighty-five miles of the Gallatin and its two forks received a Class I or II sport fishery value. The 30-mile stretch of the West Gallatin from the west fork to Gallatin Gateway received a Class I in this category. Only the lower seven miles of the West Gallatin and 22 miles of the East Gallatin were rated a Class III in the sport fishery value. The lower reaches of the West Gallatin suffer from severe dewatering. Of the 117 reaches in the Gallatin drainage in the fishery data base, only 49 reaches could be assessed. However, the unassessed reaches accounted for only 85 of the 396 miles in the drainage.

Portions of the Jefferson River's fishery have been depressed by severe dewatering during the summer irrigation season. Despite this dewatering, the Jefferson has been able to maintain a Class II sport fishery value throughout its length. Abundant populations of brown trout and whitefish, with lesser numbers of rainbow trout, maintain the high-valued fishery. The Boulder, impacted by historic mining pollution, severe dewatering and habitat loss due to channel alteration, did not fare so well in the Montana Rivers Study. All but 14 of its 67 miles received a Class IV in the sport fisheries value.

Of the 20 reaches in the Missouri headwaters receiving a Class I or II in the habitat and species value, only four contained species of special concern. Where arctic grayling and westslope cutthroat trout reigned 100 years ago, grayling have been documented in only three streams today. Although only one genetically pure population was identified in the data base, recent analysis of westslope cutthroat from streams in the

Table 35. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the Missouri headwater drainages. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	6 (4)	14 (9)	17 (11)	116 (74)	5 (3)	135	293 (158)
Sport Fisheries	8 (5)	9 (6)	33 (21)	94 (60)	12 (8)	137	293 (156)
Final Resource	14 (9)	22 (14)	32 (20)	85 (54)	5 (3)	135	293 (158)

Table 36. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the Missouri headwater drainages. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	24 (2)	64 (6)	125 (12)	831 (79)	13 (1)	197	1254 (1057)
Sport Fisheries	121 (11)	136 (13)	196 (19)	571 (54)	28 (3)	201	1253 (1052)
Final Resource	146 (14)	184 (17)	206 (19)	508 (48)	13 (1)	197	1254 (1057)

Missouri headwater drainages suggests considerably more genetically pure populations exist than previously believed.

The Missouri headwater rivers hold the largest number of spring creeks assessed in the state. Odell and Blaine flow into the Madison, while Willow Spring, Cold Springs and Parson Slough drain into the Jefferson. The East Gallatin drainage ties with the upper Yellowstone for the largest number of spring creeks in a single drainage in the state. Ben Hart, Reese, Gibson, Thompson, Story, Trout and several smaller springs originate from surfacing groundwater created from melting snowpack in the Bridger and Gallatin ranges. Of the six spring creeks assessed in the East Gallatin complex, none received a habitat and species value greater than Class II. Many of these spring creeks have been used as parts of irrigation systems with their flows augmented by other streams. Habitat has been altered through grazing, and accumulated sediment has limited available spawning habitat.

Wildlife

Twenty-five wildlife units were assessed in Missouri headwater drainages; 14 in the Jefferson, six in the Madison, and five in the Gallatin drainage (Table 37). Two units along the Jefferson main stem and two in the upper Madison earned Class I or Outstanding final resource values. However, another eight units comprising much of the Madison and Gallatin drainages received Class II final resource value designations.

From its headwaters in the scenic Madison range near Yellowstone Park to its confluence with the Jefferson, the entire Madison drainage received outstanding species values. Three units consisting of tributaries from Ennis Lake to Quake Lake received the highest game species values in this upper Missouri basin. High densities of white-tailed and mule deer, elk, moose, black bear, bighorn sheep, mountain goat, mountain lion, bobcat, lynx, beaver, and upland game birds, contributed to these high game values. Nesting bald eagles and an historic peregrine eyrie gave the Madison main stem above Ennis Class I species status. The headwaters region received Class I species value for nesting bald eagles and grizzly bear habitat critical for recovery of the Yellowstone population. The lower Madison achieved its high species value because of waterfowl, colonial nesting birds, golden eagles, and high raptor densities. Because of the Madison basin's steep terrain and relatively high stream gradients, riparian vegetation along most of the river system is minimally developed. Accordingly, Class III habitat quality occurred in all but one assessment unit.

Similar to the Madison in its origin in the spectacular mountain ranges that rim Yellowstone Park, the five units of the East Gallatin and Gallatin River basins yielded two reaches with a final resource value of II and three reaches with a final resource

Table 37. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the Missouri headwater drainages.

Value	Class				
	I	II	III	IV	Total
Habitat	3 (12)	3 (12)	10 (40)	9 (36)	25 (100)
Species	9 (36)	4 (16)	8 (32)	4 (16)	25 (100)
Final Resource	4 (16)	8 (32)	9 (36)	4 (16)	25 (100)

value of III. High species quality was awarded to both Gallatin main stem sections primarily because of species of special concern including river otters and golden eagles, heron rookeries, and warm springs used by wintering waterfowl. In addition, portions of the main stem support abundant moose, a wintering bighorn sheep herd, as well as black bear, elk, deer, and furbearing animals. Abundant white-tailed deer, elk, mule deer, bighorn sheep, moose, mountain lion, bobcat, and beaver resulted in high game species value for the Gallatin's west side tributaries. Due to steep canyons, agricultural development, and other land uses, riparian habitat quality along most of the Gallatin was considered only moderate. In the case of the heavily farmed and grazed East Gallatin, riparian habitat quality was considered low.

Because of the Madison's and Gallatin's important big game values, the MDFWP saw fit to acquire important wintering habitat along both the Gallatin and Madison Rivers. The Bear Creek and Wall Creek game ranges in the Madison drainage, and the Gallatin Game Range in the Gallatin, were purchased by the Department beginning in 1945 to protect elk winter range. In addition to game ranges, a considerable number of conservation easements have been acquired by various non-profit organizations. Although the original intent was to protect fisheries values, valuable riparian areas along these main stem rivers have been protected from future alteration.

Lewis and Clark journeyed the entire length of the Jefferson River during the summer of 1805 on their westward journey, observing whitetail deer, antelope, bighorn sheep, mountain lion, sandhill cranes, numerous river otter and an occasional grizzly bear. They probably saw a very different Jefferson River basin than we see today. Of the 14 assessed wildlife units in the Jefferson and Boulder River, only the Jefferson main stem from its mouth to the Big Hole received a Class I final resource value. Moderate to high quality habitat coupled with outstanding species quality combined to make this reach outstanding. The Jefferson's myriad of river channels, backwater sloughs, and diverse riparian vegetation with mature cottonwood forests are home to an abundance of unique wildlife resources, including great blue herons rookeries, nesting ospreys and other raptors, river otter, and migrating waterfowl. In addition, golden eagles nest on the upland cliffs above the main stem. Important game species include white-tailed deer, beaver, bobcat, Canada geese and upland game birds.

In contrast to the lush and productive Jefferson main stem, the Boulder River received both species and habitat ratings of III or IV for all five units assessed in the drainage. Moderate to low riparian habitat quality, coupled with low game species diversity, contributed to the low assessment values. No threatened or endangered species or species of special concern were assessed in the entire drainage. Significant elk, mule deer, and white-tailed deer populations do exist within some Boulder River wildlife units, however.

The popular Missouri River Headwaters State Park at the confluence of the Madison, Gallatin, and Jefferson rivers protects a classic example of dense and diverse riparian habitat. Originally acquired for recreational opportunities, this 505-acre tract provides prime river bottom habitat for wintering eagles, beaver, river otter, waterfowl, Canada goose, white-tailed deer, and occasional moose. This intensely braided confluence area earned the maximum number of habitat points possible in the assessment process.

Recreation

The three Missouri headwaters rivers offer some of the best recreation in the state, and Montana's best is often the nation's best. The rivers in this region have a rich and varied history that adds greatly to their recreational value.

The Montana Rivers Study inventoried the recreational attributes and values of 91 river segments in this drainage -- nearly 1,100 miles of river or about nine percent of the 12,528 miles studied statewide. Managers and river users rated 20 percent of the drainage's river miles as Class I (Outstanding), 30 percent as Class II (Substantial), 32 percent as Class III (Moderate) and only two percent as Class IV (Limited) (Table 38).

The drainage had 17 percent of the Outstanding and 13 percent of the Substantial river miles in the state--and only one percent of the Limited value river mileage. Twenty-five percent of the state's Unknown value class rivers were in these drainages, reflecting the need for more inventory work to better define recreational values.

High recreational use was the most common reason for assigning a resource value, comprising 20 percent of the reasons listed, followed by scenic quality and fishing (10 percent each). Access to wilderness, good trail systems, and hunting opportunities were each listed several times as contributing to recreational value. Reasons for limited values included the presence of logging and clear cuts, poor access or low recreational use.

Recreation managers rated use levels as heavy on 40 percent of the river miles and as low on just one percent. These drainages contained 18 percent of the state's heavily used rivers and just five percent of the low use level segments.

Scenic quality was Substantial to Outstanding on 70 percent of these drainages river miles, pointing to another key component of recreational value. The drainage contained 36 percent of the state's river miles with high scenic quality.

Fifty-two percent of the region's river miles provide opportunities for semi-primitive or primitive recreation

Table 38. Number of reaches, miles and percentages of recreational assessment reaches by value class in the Missouri headwater drainages.

Value Class	Reaches	Miles
Outstanding	12 (13.2%)	219 (20.0%)
Substantial	22 (24.1%)	330 (30.2%)
Moderate	31 (34.1%)	356 (32.5%)
Limited	3 (3.3%)	24 (2.2%)
Unknown	23 (25.3%)	165 (15.0%)
Totals	91	1,094

experiences. The segments inventoried contained 14 percent of the state's miles rated as primitive or semi-primitive, showing the importance of undeveloped river segments in these drainages. Coupled with this low level of development is relatively high levels of public access to the segments. Access was rated as moderate or abundant for 62 percent of the river miles, while only 50 percent of the rivers statewide had these levels of access.

The most popular recreational activity in the headwaters was fishing from shore, a primary activity on nearly 70 percent of the drainage's inventoried river segments. Tent camping was a primary activity on 38 percent, non-motorized trail use on 37 percent, motorized trail use on 34 percent, and car camping on 30 percent.

A look at this region's water characteristics quickly shows that here flows some of the state's rare whitewater. Whitewater boating was a primary activity on about 10 percent of the segments and a secondary activity on about nine percent. The entire Gallatin main stem and Bear Trap Canyon on the Madison are well-known among kayakers, rafters, and expert canoeists. But boaters also are starting to float many smaller creeks that provide opportunities for technical whitewater runs. Statewide, only 74 miles of river were rated as containing major, boated rapids; 38 percent of these miles were in the Missouri headwaters. Of the 623 miles statewide of minor-moderate rapids, the region contained 22 percent.

Then there is the Boulder River, a tributary of the Jefferson that begins near the Continental Divide outside the small community of Basin. Before flowing out into the broader Boulder valley, the river plunges down a narrow canyon. So does the newly-widened Interstate 15, which bridges the river more than 40 times. The river between Basin and Boulder once provided outstanding opportunities for whitewater boating during spring runoff. Now the value is lower, but the river still offers the unique recreational opportunity to kayak on the median of an Interstate highway.

Botanical Features

The Missouri headwaters drainages contain 33 botanical natural feature sites, two of which received a Class I final resource value. Sixteen received a Class II. Two botanical natural feature sites in this drainage are located within U.S. Forest Service wilderness areas.

Cliff Lake Research Natural Area (RNA) 25 miles west of Yellowstone National Park and just north of the Continental Divide covers 2,291 acres of high rolling benchland (6,000 to 7,000 feet) on ancient volcanoes that rise above Cliff Lake, which was impounded by a glacial moraine. Half of Cliff Lake RNA is timbered with lodgepole pine and Douglas fir 100 to 200 years old. The other half is covered with sagebrush steppe and foothill prairie

grasslands. Because of its beauty, and because large parcels of high elevation rangeland in good condition are scarce, this RNA is under consideration as a National Natural Landmark (NNL).

Not far from Cliff Lake RNA is Cave Mountain, a proposed RNA and NNL in the Gravelly Mountains. The Cave Mountain area ranges in elevation from 7,740 to 9,880 feet, and covers 1,800 acres of high subalpine forest and alpine grassland dominated by Idaho fescue (Festuca idahoensis). On Cave Mountain, and throughout the Gravelly range, sinkholes or caves were formed by the erosive action of glaciers on the soluble Madison limestone.

The La Hood Canyon Flat and La Hood Canyon Slope areas on the Jefferson River southeast of Whitehall represent near-pristine rangeland, dominated by bluebunch wheatgrass and needlegrasses. These small parcels of near-pristine vegetation are unique examples of original grassland communities, and can be used to monitor the effects of grazing and farming on rangeland ecosystems.

Along with its outstanding geologic features, the 2,730-acre Lewis and Clark Caverns State Park contains some of the best examples of dry forest and rangeland in western Montana. The park's forest community is composed of extensive stands of limber pine and Douglas fir. This site also represents one of the few examples of chaparral vegetation in Montana, and includes xeric species such as curlleaf mountain mahogany, big sagebrush and skunkbrush sumac. This natural feature site is considered to be a high priority candidate for NNL designation, due to its unique ecological and geological attributes.

None of the botanical natural feature sites within these drainages contain any threatened or endangered plants listed by the Montana Rare Plants Project or as candidates for listing by the U.S. Fish and Wildlife Service. If a more extensive survey were conducted, additional rare plants or unique plant communities might be discovered.

Geologic Features

The recognition of the Missouri headwaters geologic diversity may be due in part to its proximity to Montana's universities and its use by universities around the country for field courses. Nonetheless, about 12 percent of the Class I and Class II geological sites found in the study area, not including type locations, were found in these drainages. Some of the most interesting sites showing the area's geological diversity, including glacial, structural, erosional, and depositional features, are described below.

Underneath the ski runs of Big Sky at Lone Mountain, one finds an outstanding example of a rock glacier, consisting of

irregularly shaped boulders cemented together by ice, which is not evident on the surface but facilitates slow movement of the entire rock mass. The rocks are broken off the surrounding valley walls through freezing and thawing. When one of Big Sky's chairlifts was designed, special consideration was given to placing the supporting towers on stable ground rather than the moving ice and rocks.

In the headwaters of Hyalite Creek south of Bozeman one finds the greatest density of named waterfalls in the state outside Montana's national parks and wilderness areas. Ten waterfalls can be found within about 12 square miles, and a system of Forest Service hiking trails provides access to most of them. The area remains undisturbed for the most part. Palisade Falls, the most accessible of these falls, tumbles over a basalt cliff noted for its columnar jointing and straight drop. This basalt cliff originated as a flow of molten rock, which cooled and contracted. Vertical cracks were formed in the rock. The resulting rock columns, visible in the steep cliff, are hexagonal or pentagonal in cross sections.

Farther to the south is Quake Lake. The August 1959 earthquake in the Madison River Valley west of Hebgen Lake caused a large rock avalanche to dam the river and impound the lake. Though modified somewhat from its original state by the Army Corps of Engineers and Montana Department of Highways, the Quake Lake slide remains an excellent example of a massive avalanche and landslide associated with the earthquake. The Forest Service visitor center just off U.S. Highway 287 provides an excellent viewpoint to observe these features.

The Cedar Creek alluvial fan in the Madison Valley southeast of Ennis is a textbook example of an alluvial fan. It is 18 square miles in area and can easily be seen on the Ennis 15-minute United States Geological Survey topographic map. This feature was formed when Cedar Creek, a high gradient tributary stream, enters the relatively flat intermountain valley containing the Madison River. Because of the abrupt change in gradient, Cedar Creek is no longer able to transport its heavy load of sediment and the sediment is deposited at the edge of the valley in a fan shape.

In the headwaters of Pipestone Creek between Whitehall and Butte, several outstanding features are found. Spherical weathering of the granite along the north side of Interstate 90 has resulted in an array of tall, smooth boulders standing on the open hillsides. Fossil beds are found in the lower elevations of this area on private lands. Badlands near Pipestone have yielded vertebrate fossils from sedimentary deposits of Oligocene and Miocene age.

The Ringing Rocks, an assemblage of dark, irregularly shaped boulders that have weathered from a stock, are found on Bureau of Land Management land north of Pipestone. When struck with a

hammer, the rocks produce various ringing sounds. Vehicular access to the area is marginal and walking is recommended.

The Jefferson River Canyon has been cut through vertical limestone walls and the area contains many caves. Best known are Lewis and Clark Caverns located at the state park by that name. Many geology students have done their first mapping of complex geologic structures in the canyon.

Numerous warm springs also are found along these drainages. While a few of the hot springs remain undisturbed, many have been developed into resorts -- including Boulder, Bozeman, Norris, and ilver Star hot springs.

UPPER MISSOURI RIVER DRAINAGE

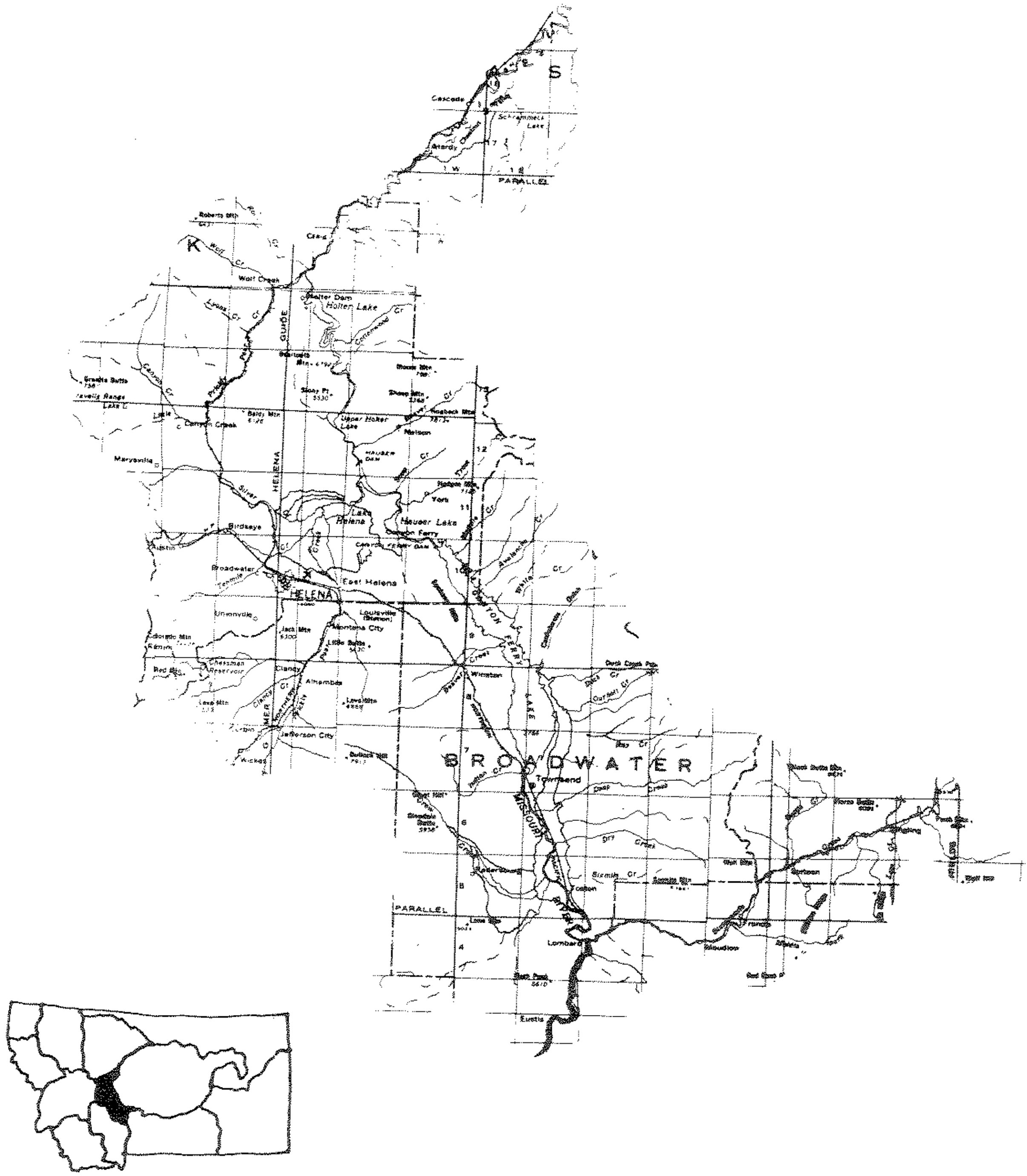

Figure 8. Map of upper Missouri River drainage.

Table 39. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the upper Missouri River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	2 (2)	9 (9)	21 (21)	67 (67)	1 (1)	90	190 (100)
Sport Fisheries	6 (6)	3 (3)	13 (13)	74 (74)	4 (4)	90	190 (100)
Final Resource	8 (8)	11 (11)	25 (25)	55 (55)	1 (1)	90	190 (100)

Table 40. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the upper Missouri River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	4 (4)	13 (3)	210 (42)	277 (55)	1 (<1)	117	622 (505)
Sport Fisheries	54 (11)	51 (10)	137 (27)	247 (49)	10 (2)	122	621 (499)
Final Resource	58 (11)	64 (13)	202 (40)	179 (35)	1 (<1)	117	621 (504)

More than 50 miles of the Missouri River from its headwaters to the Smith River received a Class I in the sport fishery value including the 15 miles from Toston Dam to Canyon Ferry Reservoir, the one mile below Canyon Ferry Dam, the 2.5 miles below Hauser Dam and the 36 miles from Holter Dam to Cascade. The 26-mile stretch from Cascade to the Smith River, meandering through flat prairie and ranch country, was rated as a Class II sport fishery. Only the the upper 25 miles from Three Forks to Toston was rated less than a Class II sport fishery. Although fish populations and size are equal to many of the lower reaches, the remote nature of this stretch with limited public access and a lower aesthetics rating resulted in a Class III rating.

The fishery that attracts one out of every seven angler days in the state, and had an estimated fishing pressure in 1985 second only to the Madison River, is the 61-mile reach of the Missouri from Holter Dam to the Smith River. Twenty species of fish in eight families are found in this reach but the fishery of importance to the angler is the cold-water salmonid population below Holter Dam. Catchable rainbow and brown trout populations average 2,000 to 4,000 fish per mile with 40 to 60 trophy-size trout (18 inches or longer) included in that estimate. At 3,500 pounds of trout per mile, the Missouri River below Holter is ranked second in the state in trout production.

What the main stem contributed to the sport fishery value in the upper Missouri, the Prickly Pear Creek drainage has contributed in the habitat and species value. Of the 10 reaches receiving a Class I or II habitat and species value, nine received this rating as a result of their pure or potentially pure populations of westslope cutthroat trout, and all were located within the Prickly Pear Creek drainage. The upper drainage is located entirely on U.S. Forest Service land within the Elkhorn Mountains Special Management Area. A reach of Prickly Pear itself as well as reaches of Dutchman, McClellan and Warm Springs creeks all sustain westslope cutthroat populations.

Although mitigation for fisheries losses was not required at the time of construction of any of the upper Missouri dams, operating guidelines developed by the Montana Department of Fish, Wildlife & Parks and the dam operators have been developed to ensure the protection of fishing opportunities as well as reproductive success of main stem and tributary spawners. Extensive data have been collected on essential spawning streams to the reservoirs.

Wildlife

The remaining free-flowing portions of the Missouri main stem from its headwaters to the Smith River earned Class I values in habitat and species categories in spite of agricultural and home development along portions of these reaches. Outstanding habitat

values stemmed from excellent habitat diversity due to abundant wetlands and islands, and moderate quantities of mature cottonwood forests. Outstanding species values resulted from occurrences of heron rookeries, waterfowl staging areas, dense osprey populations, and golden eagle nesting habitat. In addition, the upper Missouri main stem supports a high density of wintering bald eagles, while the lower reach supports breeding bald eagles and an historic peregrine eyrie.

Although many of the upper Missouri tributary basins support high densities of mule deer and elk, as well as moderate populations of whitetails, furbearers and upland game, most tributary units earned Class III species values. The drier climate and lower elevations of these isolated mountain ranges do not lend themselves to high quality black bear, moose, bighorn sheep, and terrestrial furbearer habitat.

Of the upper Missouri's 16 units, 13 percent obtained an Outstanding value class, with only another 27 percent in Class II (Table 41). The two outstanding units included the undammed portions of the Missouri River floodplain, indicating the high resource values of this once free-flowing river.

Recreation

The Missouri main stem from Three Forks to Townsend, the short but free-flowing stretch between Hauser Dam and upper Holter Lake, and the stretch from Holter Dam to the confluence with the Smith near Ulm were assessed for their recreational resource value. Because this drainage includes tributaries only down to Holter Dam, the recreational inventory contained just 24 river segments or about 278 miles total. Eight percent of the river segments received a Class I (Outstanding) value, 21 percent of the river miles were rated as Class II (Substantial), 40 percent were rated Class III (Moderate), and 30 percent as Class IV (Limited). Good fishing (mentioned for 59 percent of the river miles), and access (poor on 41 percent of the mileage and good on 28 percent) were the two major reasons for assigned a resource value (Table 42).

From its headwaters near Three Forks to the marshes at Canyon Ferry, the free-flowing stretches of the Missouri provide a classic Montana floating experience. The river flows through rural country, mostly ranch land. Where the river slips into a canyon such as the one above Toston Dam, grassy, rocky hillsides glow in the evening sun. The stretch between Toston and Townsend is a good day float, often combined with fishing. Deep Dale Fishing Access Site is an intermediate put-in or take-out, just upstream from a great blue heron rookery. Mount Edith and Baldy, snowcapped much of the year, rise from forests to the east.

Recreational use was heavy on 25 percent of the river mileage, moderate on 26 percent, and low on 43 percent. Access was rated as

Table 41. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the upper Missouri River drainage.

Value	Class				
	I	II	III	IV	Total
Habitat	4 (25)	0 (0)	5 (31)	7 (44)	16 (100)
Species	2 (12)	8 (50)	3 (19)	3 (19)	16 (100)
Final Resource	2 (12)	4 (25)	7 (44)	3 (19)	16 (100)

Table 42. Number of reaches, miles and percentages of recreational assessment reaches by value class in the upper Missouri River drainage.

Value Class	Reaches	Miles
Outstanding	1 (4.2%)	8 (2.9%)
Substantial	3 (12.5%)	58 (20.9%)
Moderate	11 (45.8%)	112 (40.3%)
Limited	6 (25.0%)	84 (30.2%)
Unknown	3 (12.5%)	16 (5.8%)
Totals	24	278

abundant on 36 percent of the inventoried river miles, compared to limited access on 19 percent and restricted access on 20 percent. Scenic quality was rated as Substantial or higher for 23 percent of the mileage studied, and as Moderate for 59 percent. The drainage contained just 15 miles that provided primitive recreation settings, while 26 percent were rated as semi-primitive, 14 percent as transitional, and 52 percent as more rural.

Fishing from shore was the most common water-based recreation activity, a primary use on 80 percent of the river miles, followed by canoeing and innertubing (a primary or secondary use on 35 percent), fishing from boats, swimming and kayaking (28 percent), and rafting (25 percent). Over half of the river miles (55 percent) were rated as not boated. The floated rivers included 38 miles of flat water and 55 miles containing stretches of riffles and minor rapids. Hunting was the most common land-based activity on about 30 percent of the river miles. Other popular recreational activities included picnicking, camping, viewing scenery, and driving for pleasure.

Botanical Features

The upper Missouri River drainage contained 13 (six percent) of the state's 228 botanical natural feature sites that received a final value rating of Class I or II. Of the 20 sites inventoried in this drainage, 10 received a final value rating of Class I, making it the drainage with the highest proportions of Class I ratings in any of the 12 drainages.

The Middle Fork Canyon area, on Sixteenmile Creek at the northern edge of the Bridger Mountains, is a designated National Natural Landmark, based on its unique geological natural features and is currently under evaluation as a ecological landmark. This 960-acre site is forested with Douglas fir, lodgepole pine and scattered groves of aspen along the northern face. The canyon's southern face supports a dry shrubland community that includes limber pine, common juniper, curlleaf mountain mahogany, and skunkbush sumac. The area has received some grazing pressure within the canyon bottom and there is evidence of selective logging on a small section that is owned by the U.S. Forest Service. Therefore, it is unlikely that this site will be designated as an ecological natural landmark.

An interesting example of a rare plant found within the upper Missouri River drainage is Lesquerella klausii, a recently described member of the Mustard family. This endemic species is only known from Lewis and Clark and Meagher counties. It is found on open slopes at low to high elevations, including a site at Rogers Pass (5,609 feet), along Highway 200. A botanist once returned to a known Lesquerella site after a fire and was unable to locate adult plants. He did notice an abundance of juveniles

in the area, however, suggesting that this plant responds well to fire.

The lesser rushy milkvetch (Astragalus convallarius) is an unusual prairie plant in this drainage, because this population is more than 300 miles from the center of the species distribution in the Great Basin area of southern Idaho and western Utah. This species is found in scattered locations in the Helena Valley, including residential areas and the Mount Helena City Park. The Montana Rare Plants Project (MRPP) has recommended this plant be listed as threatened.

Another threatened plant found within this drainage is trailing fleabane (Erigeron flagellaris), commonly found in other areas but known in Montana only from along the eastern front of the Rocky Mountains. It grows in open meadows and prairies at lower elevations including Falls Creek in Lewis and Clark County, and the MRPP believes this population may be threatened by seismic and other activities occurring at a nearby mining site.

Geologic Features

Seven percent of the Class I or II geologic feature sites identified in the study, excluding type locations, were found in the Missouri Basin from Three Forks to the mouth of the Smith River.

Along the Missouri River near Helena are several sapphire mines where one can pay a fee and sort through gravel for sapphires. Though not as brilliantly colored as the Yogo sapphires found near Lewistown, they still are admirable gem stones. Colors vary from pale blue to yellow and pink. These sapphire mines receive considerable use during the summer months.

Several of the small tributaries cut through deep limestone canyons as they flow to the west out of the Belt Mountains toward the Missouri River. Among these are Sixteen Mile Creek east of Toston, Confederate Gulch on the east side of Canyon Ferry Reservoir, and Beaver and Trout creeks between Holter and Hauser reservoirs. A relatively undisturbed limestone canyon, Refrigerator Canyon, which gets its name from the cool temperatures within, can be reached with a short walk beginning at the road up Beaver Creek.

Near Hardy, the Missouri River flows through an area bounded by reddish brown cliffs formed from volcanic conglomerate cut in many places by igneous intrusions called dikes. The dikes extend out into the plains west of Cascade and in several cases connect the surrounding buttes, including Square Butte and Shaw Butte.

ROCKY MOUNTAIN FRONT DRAINAGES

Rivers: Marias, Teton, Sun, Dearborn
Boundaries: Headwaters to Missouri River
Drainage Size: Marias - not available; Teton - not available; Sun - 1,854 square miles; Dearborn - not available
Main stem length: Marias 171 miles; Teton 196 miles; Sun 106 miles; Dearborn 67 miles
Cities/Towns: Cutbank, Loma, Choteau, Augusta, Simms
Access: Montana Highway 287

The Rocky Mountain Front rises abruptly to 9,500 feet above the prairie grasslands like a mirage shimmering in the desert. Jumbled peaks, crags and cliffs of the Scapegoat, Bob Marshall, and Great Bear wilderness corridor stretch north from Lincoln to Glacier Park and on into Canada. The four tributary streams squeeze through tight limestone canyons before spilling out onto the prairie, where they begin lazy meanderings to meet the Missouri River. The Marias, Teton, Sun and Dearborn rivers drain the Rocky Mountain Front from the Canadian border to Rogers Pass (Figure 9). Like other Montana rivers, the upper drainages of these four rivers lie protected within the boundaries of wilderness areas or Glacier National Park.

The Marias River forms at the confluence of Two Medicine River and Cutbank Creek, along the Blackfeet Indian Reservation border and flows 115 miles before entering the Missouri near Loma. Its tributaries originate along the eastern slopes of Glacier National Park, before flowing through the reservation and onto the rolling plains of north central Montana.

The Teton River joins the Marias less than a mile before its confluence with the Missouri. After being formed by its north and south forks, the Teton meanders across the agricultural valley of the Missouri for 95 miles.

The Sun River has originated at the spillway of Gibson Reservoir since the dam was constructed for irrigation storage. Dammed again only several miles below its origin, its waters are then diverted into two off-stream irrigation storage reservoirs, Willow Creek and Pishkun.

Fisheries

While important to the local communities of Augusta, Choteau and Cutbank, the fisheries of the Marias, Teton, Sun and Dearborn rivers do not hold the national attention that the area's grizzly bears, Pine Butte Swamp, outstanding big game populations, or wilderness values do. Once these rivers leave the forested Front from which they originate they change character quickly into valley rivers, diverted, impounded and rechanneled for the heavily

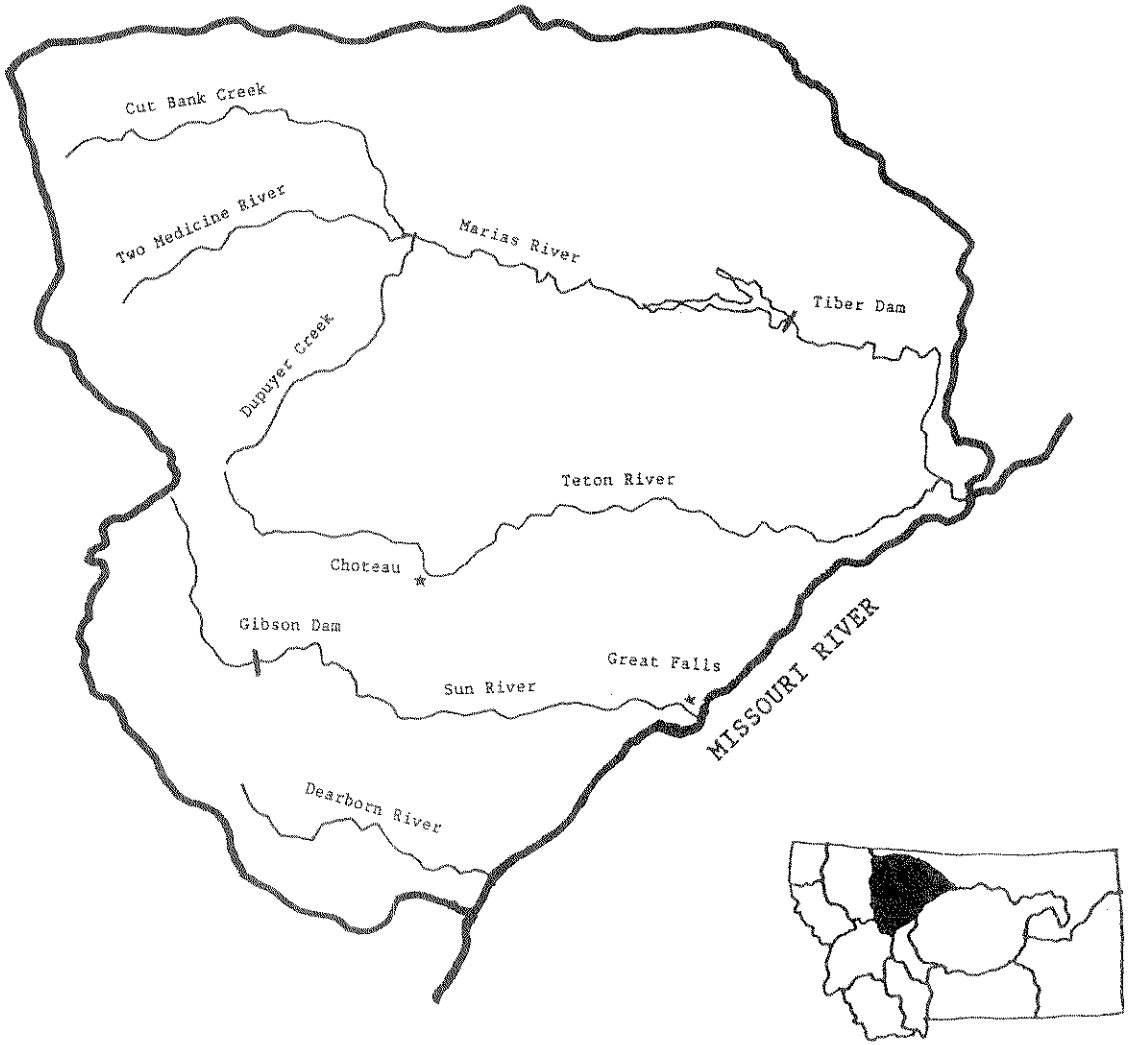

Figure 9. Map of Rocky Mountain Front drainages.

ROCKY MOUNTAIN FRONT DRAINAGES

irrigated lands of the Missouri valley. Although much of the water eventually returns to the river channel, the waters have been muddied and the water quality degraded. Irrigation reservoirs impound numerous reaches of the main stems and their tributaries. Several irrigation canals are so well established that they have fisheries of their own, which were assessed in the Montana Rivers Study.

The Rocky Mountain Front drainages had the lowest number of reaches with a final resource value of Class I or II when compared to the other 11 drainage basins assessed in the state. No reaches received a Class I or II in the sport fishery value and only 10 were rated a Class II or above in the habitat and species value (Tables 43 and 44). Of these ten reaches, seven were located in the Marias River drainage where pure or potentially pure populations of westslope cutthroat trout reside in upper headwater tributaries. Ninety percent of the 128 assessed reaches in 1,271 miles received a final resource value of Class III or less. Only 86 miles of the 466 main stem miles on the Marias, Teton, Dearborn, and Sun received a Class II final resource value. Because wilderness areas, national parks, and Indian reservations were not assessed, much of the more pristine portions of the Rocky Mountain Front river drainages were excluded from the study.

The coldwater fisheries of the headwater streams of the Marias River include native and exotic trout species and mottled sculpin. Immediately below Tiber Reservoir, 76 miles above the mouth, a tailwater fishery of rainbow and brown trout exists. Other game species within this section include channel catfish, sauger, shovelnose sturgeon, burbot and mountain whitefish. Although this fishery attracts local attention, its Class II final resource value was due to the presence of an occasional migrating paddlefish. In years when spring runoff is of a sufficient duration and magnitude, paddlefish migrate upstream from Fort Peck Reservoir into the Marias, presumably to spawn. Missouri sauger and shovelnose sturgeon also use the Marias for spawning.

The natural fish habitat of the Teton has been significantly altered by nine major floods since the late 1800s and an extensive system of irrigation diversions. Irrigation withdrawals dewater the river during the summer months. Of the three main stem reaches totaling nearly 200 miles, only a 10-mile reach above Choteau received a Class II habitat and species value for its high species diversity. The remainder of the river received a Class III in habitat and species, and a Class IV in the sport fisheries value.

In the Sun River drainage, an irrigation canal from Pishkun Reservoir received a Class III final resource value, which was as high (and higher than the lower 18 miles of the main stem) as the Sun River itself. The 38-mile Sunny Slope Canal provides a local fishery of self-sustaining arctic grayling, which survive through the winter in isolated pools after the water has been shut off.

Table 43. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the Rocky Mountain Front drainages. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	2 (2)	8 (6)	22 (17)	94 (73)	2 (2)	2	130 (128)
Sport Fisheries	0 (0)	0 (0)	22 (17)	101 (79)	5 (4)	2	130 (128)
Final Resource	2 (2)	8 (6)	39 (30)	77 (60)	2 (2)	2	130 (128)

Table 44. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the Rocky Mountain Front drainages. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	8 (<1)	111 (9)	375 (30)	768 (60)	9 (<1)	6	1277 (1271)
Sport Fisheries	0 (0)	0 (0)	355 (28)	868 (68)	48 (4)	6	1277 (1271)
Final Resource	8 (<1)	111 (9)	608 (48)	535 (42)	9 (<1)	6	1277 (1271)

Surprisingly, the Dearborn River, which brought the issue of stream access to the forefront of Montana in the early 1980s, received only a Class III in the sport fishery value. Known for its mountain canyon for its lower 15 miles, the river's deep pools and boulder-strewn rapids provide homes for rainbow and brown trout.

Wildlife

The Rocky Mountain Front is a maze of canyons and limestone cliffs towering over remnant buttes, peat bogs, swamps and wetlands that comprises a broad diversity of unique wildlife habitats. As spring snowmelt emerges from the Front's deep canyons, it often passes into underground rivers emerging in the foothills to make swamps and wetlands. Within a few hundred feet of each other, one may encounter vegetative diversity ranging from rough fescue and blue-bunch wheat grass to dense willow, aspen stands and coniferous forests. And, with this wealth of diverse habitats, an equally wealthy wildlife species community is found, consisting of elk, mule deer, bighorn sheep, mountain lion, black bear, grizzly bear, golden eagles, prairie falcons, and long-billed curlews, and more.

Through the foresight of state, federal, and private entities, many of these unique lands and habitats are protected. Two national wildlife refuges, four state game ranges or waterfowl production areas, a Forest Service Outstanding Research or Natural Area, and the largest Nature Conservancy Preserve in Montana lie within the boundaries of Rocky Mountain Front. In addition, a nationally known sportsman organization, the Boone and Crockett Club, recently purchased 6,000 acres of prime big game winter range along the Front for wildlife protection and research purposes. Pine Butte Swamp, a vegetative potpourri, provides habitat for an equally diverse wildlife community, including grizzly and black bears that frequent the marsh in the spring.

Of the 15 wildlife units along the Rocky Mountain Front, five received a final value of Class I, with three earning Class I ratings in both habitat and species values (Table 45). With statistics rivaling southwest Montana, 40 percent of the Rocky Mountain Front units received a species rating of Class I and a habitat rating of Class II or better. The Front's incredible habitat diversity is the reason for these high species values. Top-scoring river reaches included the upper portions of the Teton and Marias rivers, as well as Dupuyer Creek. The Teton and Dupuyer drainages, along with the upper Sun River, were three of only ten units statewide that support large populations of white-tailed deer, mule deer, elk, bighorn sheep, and black bear. Additionally, these drainages and the Dearborn River are home to grizzly bears, golden eagles, prairie falcons and a host of other raptors. These often braided and meandering river channels and springs also provide resting and wintering areas for migrating waterfowl.

Table 45. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the Rocky Mountain Front drainages.

Value	Class				
	I	II	III	IV	Total
Habitat	4 (27)	4 (27)	4 (27)	3 (20)	15 (101)
Species	6 (40)	5 (33)	3 (20)	1 (7)	15 (100)
Final Resource	5 (33)	5 (33)	4 (27)	1 (7)	15 (100)

Recreation

The recreational assessment inventoried the attributes and values of 47 river segments in the Rocky Mountain Front drainage area, totaling 823 miles of river, or about seven percent of the 12,528 miles studied statewide. No stream miles received a Class I (Outstanding) rating from managers and recreation users (Table 46). Eighteen percent received a Class II (Substantial) recreational resource value and 67 percent were rated Class III (Moderate), reflecting the high standards of the raters. Many Montanans, and people from states not blessed with so many free-flowing rivers, would undoubtedly classify more rivers as Outstanding.

The most common positive reasons for assigning a value class were high use levels (14 percent of the river miles), good scenery (11 percent), and good fishing (10 percent). Consistent with that finding, recreational use was heavy on 14 percent of the river mileage, moderate on 26 percent, and low on 60 percent. Similarly, access was rated as abundant on only five percent of the inventoried streams, compared to limited access on 34 percent and restricted access on 36 percent.

Scenic quality was rated as Substantial or higher for 27 percent of the mileage studied, and as Moderate for 66 percent. The drainage contained two river segments (26 miles) that provided primitive recreation settings, while 34 percent were rated as semi-primitive and 60 percent as transitional from semi-primitive to rural.

Fishing from shore was again the most common recreation activity, a primary or secondary use on 98 percent of the segments (all but two). Canoeing was a primary activity on 140 river miles and a secondary use on 554 miles, with rafting occurring on about half of the river miles and kayaking on one quarter. Just 24 percent of the river miles inventoried were rated as not boated, showing the importance of floating in this drainage. The most common land-based recreational activity in the Rocky Mountain Front drainages was hunting, a primary activity along half of the river miles.

Botanical Features

The Rocky Mountain Front contains 19 botanical natural feature sites -- 18 (eight percent) of which received a final value rating of Class I or II. This is close to the average nine percent for the 12 drainages in the state. This drainage also contains the second largest number (10) of botanical natural feature sites that received a final value of Class I. Eleven of the 19 sites in this drainage are within either Glacier National Park, or U.S. Forest Service wilderness areas, and ten of those 11 sites received a final value rating of Class I.

Table 46. Number of reaches, miles and percentages of recreational assessment reaches by value class in the Rocky Mountain Front drainages.

Value Class	Reaches	Miles
Outstanding	0	0
Substantial	7 (14.9%)	149 (18.1%)
Moderate	27 (57.4%)	552 (67.1%)
Limited	12 (25.5%)	107 (13.0%)
Unknown	1 (2.1%)	15 (1.8%)
Totals	47	823

The Nature Conservancy's Crown Butte Preserve about 35 miles west of Great Falls near the headwaters of Little Muddy Creek is considered a high priority site for National Natural Landmark (NNL) designation. Crown Butte is a laccolith, an igneous intrusion formed when a pocket of magma was thrust between layers of sedimentary rock. Due to an absence of grazing as a result of its inaccessibility, the 657-acre site supports native grassland vegetation in pristine condition. This grassland cover type, dominated by bluebunch wheatgrass (Agropyron spicatum) and rough fescue (Festuca scabrella), is commonly found throughout the east front of the Rocky Mountains and parts of eastern Montana.

The Green Timber Basin-Beaver Creek area, a proposed Research Natural Area (RNA) and a high-priority candidate for National Natural Landmark designation, is within the Beaver Creek drainage along the eastern front of the Rocky Mountains. This creek basin contains numerous limestone cliffs and rock outcroppings in the midst of a forest of spruce and Douglas fir. Although the area has been roaded, logged, and grazed by cattle, it possesses some of the rarest orchids found in Montana. The round-leaved orchid (Orchis rotundifolia) and northern lady's-slipper (Cypripedium passerinum) are found in only three or four places in the western Continental U.S. In fact, the northern lady's-slipper is only found only in four locations in Montana and nowhere else. Six other orchids found in the areas around cold limestone springs and seeps are fairy-slipper (Calypso bulbosa), Wister coral-root (Corallorhiza wisteriana), Gray bog-orchid (Habenaria viridis), Alaska rein-orchid (H. unalascensis), small northern bog-orchid (H. obtusata) and northern twayblade (Listera borealis).

Another candidate for NNL designation is the Sun River Game Range west of Choteau along the Sun River. This 19,728-acre area is owned by the state and is administered by the MDFWP. The game range extends from the prairie foothills at about 4,300 feet to alpine meadows at 8,100 feet. Despite the fact that part of this area has been heavily grazed and logged in the past, a large portion of the area is native vegetation in excellent condition. This is the only game range in the state currently under consideration as a NNL.

Pine Butte Swamp Preserve, a Nature Conservancy sanctuary of about 20,000 acres, contains a unique peatland bog or fen, underlain by glacial till derived from the calcareous outwash of the Rocky Mountain Range. Water from the Teton River seeps through this permeable material to form the swamp. The swamp contains open fen community type vegetation composed of mosses, forbs, and grasses. One example of a sedge present in calcareous bogs of this type is pale sedge (Carex livida), a species currently listed by the Montana Rare Plants Project as rare for Montana. The shrub vegetation along the uplands and on high ground within the swamp is dominated by willow, bog birch (Betula glandulosa), and red-osier dogwood (Cornus stolonifera). Peatlands or fens like Pine Butte generally occur in boreal

regions with a cool, moist climate. This area's arid climate and associated upland plant communities combine to make Pine Butte Swamp botanically unique.

A regionally endemic plant found on Marias Pass is peculiar moonwort (Botrychium paradoxum). This tiny fern is known from only four locations and is a candidate for U.S. Fish and Wildlife Service and Montana Rare Plants Project listing for endangered species status.

Craw's sedge (Carex crawei) is another sparsely distributed plant species in this drainage, known to grow only on the gravelly limestone soils along the Teton River. One reason the Montana Rare Plants Project lists Craw's sedge as a threatened species is that oil and gas exploration is currently occurring within this area.

Geologic Features

Even though the east slopes of Glacier National Park, the Bob Marshall-Great Bear wilderness complex, and an Indian reservation along the Rocky Mountain Front were not assessed, these drainages still contained seven percent of the Class I or Class II geologic sites, excluding type locations, identified in the study. Further study is likely to reveal additional outstanding sites.

The spectacular features associated with formation of mountains in the Overthrust Belt stand in sharp contrast to the subtle glacial features at the lower elevations. The area adjacent to the Sun River Canyon northwest of Augusta exemplifies the processes that occurred during the formation of the Lewis and Clark Range. The Sun River has cut a canyon, exposing large slabs of rock which have been shoved on top of each other in a process known as thrust faulting. In a road-cut in the canyon, slabs of older, light gray colored Madison limestone have been pushed over a younger, dark gray shale. This illustrates the faulting process that in this area repeatedly thrust layers of rock over the top of others, much like shingles on a roof, building the steep mountain ridges of the Overthrust Belt.

A striking modified trellis drainage pattern has developed to the north of the Sun River. The drainage pattern follows straight parallel faults and/or jointing patterns on either side of Castle Reef, a prominent ridge.

A vast inland sea lapped up against the mountains during the late Cretaceous period and in the sediments deposited along this sea, paleontologists, have recently unearthed a nesting area of the dinosaur Maiasaura peeblesorum. Most amazing is that the area contains a rare dinosaur nesting area with fossilized eggs, embryos, and young. These fossils are on display at the Museum of

the Rockies. The fossil site west of Choteau was recently purchased by the Nature Conservancy.

Two canyons on the Dearborn River contain rapids in addition to those found in the Sun River Canyon. The upper canyon extends from the national forest boundary to Highway 200, roughly 30 miles, and the lower canyon extends 18 miles from Highway 287 to the Missouri River. In the upper reach, the stream meanders through dolomite of the Helena formation. Stromatolites (fossilized algal masses) are exposed in the cliffs.

Pre-glacial and glacial landscape features more subtle than features associated with mountain building include the Flaxville gravels, an unglaciated gravel remnant exposed at Gilman Hill, and the terminal moraine of the Sun River glacier about three miles north of Gilman Hill.

CENTRAL MISSOURI RIVER DRAINAGE

CENTRAL MISSOURI RIVER DRAINAGE

Boundaries: Smith River to Fork Peck Reservoir
Drainage size: 40,987 square miles
Tributaries: Smith, Judith, Musselshell
Main stem length: 251 miles
Cities/Towns: Great Falls, Fort Benton
Access: U.S. Highways 87 and 191

The Missouri remains wide and lazy for 32 miles after it is joined by the Smith River, but is then transformed into a seething mass of whitewater as it plunges over a series of five bedrock cascades that earned the name Great Falls. Described by Lewis in 1805 as "the greatest sight I ever beheld .. . a sublimely grand spectacle," these rapids forced the expedition to portage tons of gear for nine miles. Today, hydroelectric dams at the lip of each waterfall have significantly altered their character. The only major whitewater on the Missouri is just below Maroney Dam. Other "rapids" downstream are, by comparison, mere riffles.

The Missouri River from the Smith to its confluence with the Musselshell River is noted for the waterfalls at Great Falls, the white cliffs, and, farther downstream, the Missouri Breaks -- an area of weathered shale, along with isolated sandstone cliffs and associated grassland, ponderosa pine, and juniper communities. The forested mountain islands that rise up from the prairie and empty into the Missouri drainage include the Big Snowy, Little Snowy, and Highwood Mountains. Like many mountains in eastern Montana, the Judith, Moccasin, Crazy, and Castle ranges were formed when intrusions of igneous rock cut through the sedimentary floor of the Northern Great Plains.

One of the most significant waterways in the settlement of American west, the Missouri gradually carves its way through the infamous Missouri "breaks" for nearly 170 miles until it meets Fort Peck Reservoir (Figure 10). Following a decade of bitter conflict, the wild character of the last major free-flowing stretch of this historic river finally was assured in 1976 when Congress designated this section part of the National Wild and Scenic River System.

Paralleling the Missouri to the south, the Musselshell River flows eastward for 364 miles from central Montana mountain ranges, one of the longest river journeys in the state, before entering the Missouri above Fort Peck Reservoir. The over-appropriation of the Musselshell's water through an extensive series of ditches, canals, reservoirs, and main stem diversion dams has resulted in a recording of zero flow at Mosby in over half the fifty years the U.S. Geological Society has been recording flows.

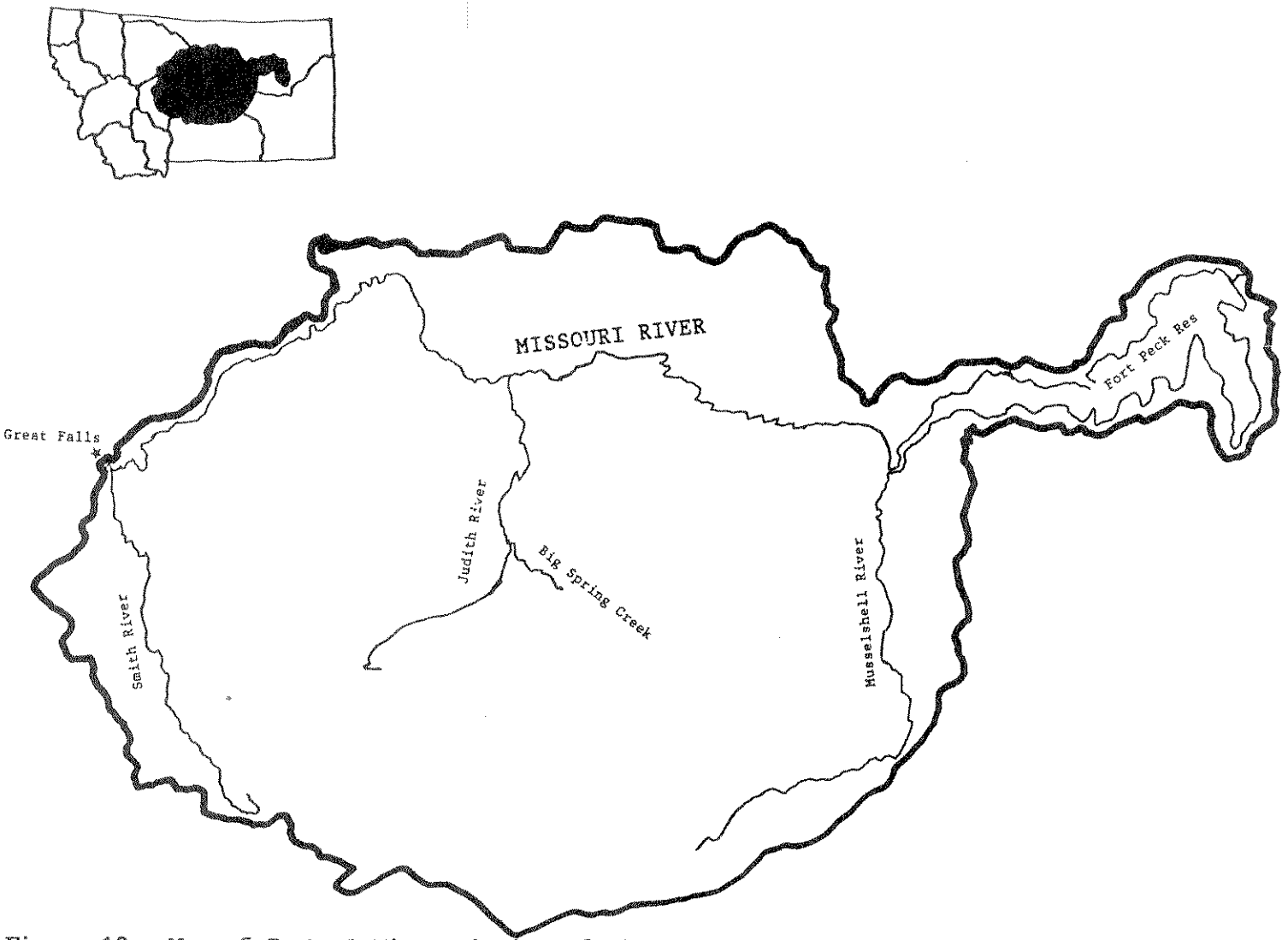

Figure 10. Map of Central Missouri River drainage.

Fisheries

The diverse fishery resource of the Missouri River drainage from the Smith River to Fort Peck Reservoir allows the angler to search small headwater streams for pure "natives," fly fish for brown and rainbow trout, or snag paddlefish from the muddy waters of the main stem. The Great Falls historically established the upper and lower boundaries of the river's fisheries: above the falls are its headwaters with trout populations and a riffle/pool character. Below the falls, channel catfish, sauger, paddlefish and sturgeon dominate the fisheries of the warmer, slow moving waters. The 207 miles of river from Maroney Dam to Fork Peck Reservoir, is the longest free-flowing section remaining on the Missouri today. Within this reach, from Fort Benton to Fred Robinson Bridge, lies the 149-mile section of the Missouri designated a part of the national Wild and Scenic River System. Although the original designation stemmed in large part from the river's historical and recreational features, subsequent fisheries investigations support, as well as depend upon, the river's wild and scenic values.

A total of 2,217 miles of stream in 314 reaches were assessed in the central Missouri River drainage (Tables 47 and 48). The majority of reaches receiving a Class I and II final resource value did so due to the presence of species (paddlefish and pallid sturgeon) and habitats (spring creeks) of special concern. Ten of the 14 reaches receiving a Class II final resource value contained potentially pure westslope cutthroat trout. Although the majority of the reaches (76 percent) received a final resource value of Class III or lower, area biologists believe this was partially due to a need for an update of the fisheries data base.

The presence of the Great Falls was the major factor in determining the final resource value of the Missouri's main stem fisheries from the Smith River to Fort Peck Reservoir. The 207 miles of river below the Great Falls received a Class I final resource value due to seasonal presence of spawning paddlefish and pallid sturgeon, both species of special concern. And the lower 75 miles of this section also received a Class I in the sport fishery value, making it one of only seven reaches in the state receiving a Class I in both categories. The 40 miles of river between the Smith and Maroney Dam appear to be a transitional zone from a cold-water to a warm-water fishery and have also been impacted from urban development. The three main stem reaches in this section each received Class III final resource values.

Of the 38 reaches assessed in the Musselshell, not one received above a Class III in the sport fishery value. And only four stream reaches received a Class II or above in the final resource value -- two small reaches in the Snowy Mountains where pure or potentially pure westslope cutthroat trout were present, and two reaches of the Musselshell where importance to the local community boosted their accumulated points to a Class II habitat

Table 47. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the central Missouri River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	8 (4)	13 (7)	27 (14)	145 (74)	5 (3)	116	314 (198)
Sport Fisheries	1 (<1)	4 (2)	44 (22)	126 (64)	23 (12)	116	313 (197)
Final Resource	8 (4)	14 (7)	57 (29)	114 (58)	5 (3)	116	314 (198)

Table 48. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the central Missouri River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	239 (11)	257 (12)	321 (15)	1322 (62)	78 (4)	168	2385 (2217)
Sport Fisheries	75 (3)	84 (4)	674 (30)	1070 (48)	312 (14)	168	2383 (2215)
Final Resource	239 (11)	272 (13)	691 (32)	938 (44)	77 (4)	168	2385 (2217)

and species rating. Those familiar with the Musselshell categorize the river into three fisheries: the 75 miles from its headwaters to Barber contains a cold-water fishery including westslope cutthroat trout, whitefish and introduced brook, rainbow and brown trout. While riparian cover and undercut banks provide good habitat, 11 major diversions substantially reduce stream flows during the summer months. Recent data indicate that brown trout populations and biomass were severely affected by the drought of 1985, particularly younger trout. The 125-mile mid section from Barber to Musselshell is considered a transitional zone from a cold-water to a warm-water fishery. Through numerous plants of smallmouth bass, a self-sustaining population has been established although population numbers are low and fluctuate widely from year to year. The lower warm water zone, stretching 90 miles to the mouth, provides a sport fishery as well as spawning habitat for sauger and channel catfish migrating from Fort Peck Reservoir.

Nearly 13 percent of the 239 Class I miles in the central Missouri are located in the heart of Montana -- Big Spring Creek, a gemstone in the Judith River Basin. Of the 34 spring creeks assessed in the Montana Rivers Study, Big Spring Creek is the longest, the most heavily fished, and was one of the three considered a Class I spring creek in the state. Based on recent fish population estimates, Big Spring Creek continues to provide a premier trout stream to a region where cold-water fisheries are rare.

Wildlife

With the exception of the Audubon's bighorn sheep, the American bison, the plains grizzly bear and the wolf, much of what Lewis and Clark saw in 1805 can still be seen along the central Missouri River today. Majestic cliffs and desolate badlands, thriving herds of deer, elk and antelope, abundant birds of prey tall stands of cottonwoods interspersed with dense willows, and lush green meadows are a few of the natural resources that still thrive today.

The central Missouri assessment area, including the Smith and the Judith rivers, consists of 27 river units; 11 of these (41 percent) achieved Class I or II final resource values (Table 49). Due to their pristine character, high diversity, and abundant wetlands and cottonwood gallery forests, all four sections of the Missouri main stem from the Smith River confluence to Fort Peck Reservoir earned Class I habitat ratings. In addition, all but one of these main stem reaches achieved Class I species value because they contain historic peregrine eyries, and provide important habitats for wintering bald eagles, migrating waterfowl, nesting herons, and raptors such as ospreys and golden eagles. In addition to these spectacular main stem sections, the diverse, forested, and meandering lower portion of Belt Creek also achieved

Table 49. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the Central Missouri River drainage.

Value	Class				
	I	II	III	IV	Total
Habitat	8 (15)	7 (14)	12 (23)	25 (48)	52 (100)
Species	5 (10)	18 (34)	16 (31)	13 (25)	52 (100)
Final Resource	4 (8)	18 (34)	17 (33)	13 (25)	52 (100)

Class I habitat and species values. Key species include many of the same species and habitats of special concern found along the Missouri main stem.

The Judith River basin encompasses a remote but significant area of central Montana. The river's lower 114 miles earned a respectable habitat rating of III, with a species rating of I for its support of species of special concern such as golden eagles and other raptors that nest along the river's cliffs. The meandering river containing warms springs and wetlands, provides habitat for migrating waterfowl and nesting herons as well as for wintering bald eagles. The Judith's cliffs also contain an historic peregrine falcon eyrie.

Important game populations inhabit much of the upper Judith River Basin, particularly within the Little Belt Mountains. Established in 1938, the Judith River Wildlife Management Area now comprises nearly 5,000 acres and winters nearly 1,000 head of elk. Because the Little Belts are within easy driving distances of Great Falls, Billings, and Lewistown, and are open to general hunting, this region receives more than 40,000 hunter days of pressure during the hunting season.

From rocky mountain top to the scoria-capped ridges of the Bull Mountains near Billings, the 25 units within the Musselshell basin contain a wide diversity of wildlife habitat. Although none of the assessment units achieved a Class I final resource value, 11 (44 percent) earned species and final resource values of Class II. Four of the Musselshell's five main stem units contained sufficiently high riparian values to warrant Class I or II habitat ratings. The Musselshell from Fish Creek near Ryegate down to Melstone received Class I habitat values due to an exemplary riparian community with cottonwood gallery forests, abundant wetlands, and high vegetative diversity. It also provides important resting areas for migrating waterfowl.

Willow Creek, a tributary to the Musselshell near Roundup, also achieved Class I habitat quality due to its numerous and abundant wetlands, pristine habitat quality, and outstanding habitat diversity. Upper Willow Creek also provides critical breeding and resting habitat for waterfowl, supports colonial nesting herons, and contains springs open in winter. Much of upper Willow Creek is protected by the Lake Mason National Wildlife Refuge.

River units earning Class II species values include Flatwillow Creek, Boxelder Creek, McDonald Creek and the lower 73 miles of the Musselshell main stem. Besides comprising important waterfowl resting areas, many of these reaches contain warm springs and support colonial nesting birds, osprey, and golden eagles.

The headwater tributaries from the south side of the Little Belts and Big Snowy Mountains and from the north side of the

Castle Mountains, contain outstanding populations of mule deer, antelope, and sage grouse. Additionally, these units support moderate populations of white-tailed deer, mountain lion, bobcat, lynx, beaver, turkey, pheasants, and sharp-tailed grouse. Also achieving Class II species value, the tributaries from the Castles and the north side of the Crazy Mountains are home to moderate to high populations of white-tailed deer, mule deer, and elk.

Recreation

The central Missouri River drainage contained 84 river segments in 1,361 river miles, which were assessed for their recreational value. Eighty miles (six percent) were rated as Class I (Outstanding), 5 percent as Class II (Substantial), 56 percent as Class III (Moderate), and 30 percent as Class IV (Limited) (Table 50). The most common reason for assigning a resource value was high use levels (mentioned for 22 percent of the river miles). Limited access was a factor on 19 percent of the river miles and good access was mentioned on 12 percent. Recreational use was heavy on 20 percent of the river miles, moderate on 43 percent, and low on just 27 percent. Access was rated as abundant on only nine percent of the inventoried stream mileage, moderate on 36 percent, limited on 21 percent and restricted on 16 percent.

Scenic quality was rated as Substantial or higher for 23 percent of the mileage studied, and as Moderate for 55 percent. The drainage contained 53 miles (six percent of the drainage's miles) providing primitive settings for recreation, while 17 percent were rated as semi-primitive, 60 percent as transitional, and 26 percent as rural.

Fishing from shore was the most common recreation activity by far, a primary or secondary use on 95 percent (all but two) of the segments. Canoeing was a primary activity on 349 river miles and a secondary use on 136 miles. Swimming took place on 55 percent; rafting 44 percent of the river miles, and kayaking on 43 percent. Thirty-eight percent of the river miles inventoried were rated as not boated. The floated rivers contained stretches of flat water (22 percent), minor rapids (23 percent), and moderate rapids (13 percent). Tent camping occurred on about 80 percent of the river miles, and other recreational uses included picnicking and viewing the scenery, car camping, hunting, and hiking.

Botanical Features

The central Missouri River drainage contained 21 botanical natural feature sites, 17 (seven percent of the statewide total) of which received a final value rating of Class I or Class II. This proportion is just under the average of nine percent for the 12 drainages in state. Seven of the sites within this drainage are

Table 50. Number of reaches, miles and percentages of recreational assessment reaches by value class in the central Missouri River drainage.

Value Class	Reaches	Miles
Outstanding	2 (2.4%)	80 (5.9%)
Substantial	7 (8.3%)	69 (5.1%)
Moderate	40 (47.6%)	767 (56.3%)
Limited	33 (39.3%)	413 (9.1%)
Unknown	1 (5.6%)	18 (2.3%)
Totals	84	1,361

either proposed or already designated Research Natural Areas (RNAs) or National Natural Landmarks (NNLs).

Three U.S. Fish and Wildlife Service RNAs, Grand, Two Calf, and Dillon, are riparian forest islands that contain cottonwood, willows, and wheatgrass/needlegrass communities. Two Calf Island also contains old-growth Douglas fir, a unique species for a prairie ecosystem. These areas have been protected from grazing by the Missouri River.

This drainage also contains a U.S. Forest Service proposed RNA and NNL candidate called Paine Gulch, located at the north end of the Little Belt Mountains. This 2,500-acre site sits within a steep-sided gulch that rises from 4,680 feet to 7,213 feet and features limestone benches forested with Douglas fir, limber pine and lodgepole pine. Along with montane and subalpine meadows, the gulch contains numerous seeps, springs, and sinkholes, which commonly occur elsewhere within limestone formations. Paine Gulch has regional significance as an area that contains forest and grassland types characteristic of central Montana.

A plant species of interest within the central Missouri River drainage is long-styled thistle (Cirsium longistylum), endemic to Montana and listed as rare by the Montana Rare Plants Project. Found on fewer than a dozen sites within the Little and Big Belt Mountains, this species grows in moist meadows at 5,000 feet to 7,500 feet.

Geologic Features

Nineteen percent of the Class I and II geologic feature sites identified in the Montana Rivers Study, excluding type locations, were found in the central Missouri River drainage. Further study is likely to identify additional outstanding sites.

At the city of Great Falls, the Missouri River plunges over Black Eagle, Rainbow, Crooked, and Big (Great) Falls, spectacular falls most easily seen from the road along the bluffs on the south side of the river. Below the falls, the river flows over bedrock shelves, and in the summer, drops of one to three feet extend across much of the river. Although maps indicate rapids farther downstream in the white cliffs area, they are more like large riffles.

About 50 miles to the northwest of Great Falls, in the reach between Coal Banks Landing and the mouth of the Judith River, the Missouri River threads its way between spectacular cliffs of white colored Virgille sandstone. Atop the white sandstone is a dark colored layer of sandstone more resistant to weathering than the underlying white sandstone. This resistant cap has caused the sandstone to weather into odd shapes known as "hoodoos," best seen in the vicinity of Eagle Creek. Just below Eagle Creek, a series

of dikes (molten rock injected into vertical cracks) stand out from the surrounding sandstone cliffs. The dikes themselves are much more resistant to weathering than the surrounding sandstone.

As the Missouri River nears the confluence of the Judith River, it cuts deeper through the layers of rock, and the sandstone gives way to weathered shales. This steep, rolling terrain, referred to as the Missouri River Breaks, is adjacent to the flat valley floor and extends downstream to Fort Peck Dam.

The Judith River originates in the Little Belt Mountains in central Montana. One of the better known features in this area is Yogo Gulch, home of the Yogo sapphire, noted for its brilliant blue color. The sapphires have eroded from an igneous dike, and the diggings have disturbed some of the area.

East of Lewistown, paleontologists have discovered fossils of soft-bodied fish. In most fossils, the shape of shells or bones have been preserved. The site outside Lewistown is noteworthy because it contains fossils of primitive shark-like fish that had cartilage instead of bones. Other soft-bodied animals have been preserved in this area as well. Some of the small sharks are only two or three inches long and are preserved nearly perfectly.

Another interesting feature southeast of Great Falls is the old channel of the Missouri River. As the continental ice sheet moved south during the last ice age, it diverted the Missouri through what is now a portion of Shonkin Creek. There was even an impressive waterfall on the old river. The rim of the now dry falls can be seen at Lost Lake, which formed in the plunge pool of the falls. About four miles south of Geraldine is the Shonkin Sag laccolith, a classic example of an exposed igneous intrusion with contrasting rock types resulting from separation of non-mixable molten rocks. The laccolith covers over 1,000 acres, but is best exposed in the vertical cliffs on its south face.

The lower portion of the Musselshell River was also pushed south by the glaciers. The present channel of Beaver Creek was probably occupied by the Musselshell River in pre-glacial times. It is not too difficult to trace the former Musselshell course northward from U. L. Bend and Fort Peck Reservoir.

The Smith River

The Smith River, known for its quality trout fishing and spectacular limestone canyon, comprises a unique river system for central Montana. Originating within a high intermountain valley between the Castles, Big Belts and Little Belt Mountains, the Smith gradually cuts its way down to the Missouri. The river flows north for approximately 126 miles through a valley sparsely populated with small agricultural communities. The Smith River Canyon, the river's most well-known feature, begins about 90 miles

above the confluence with the Missouri, running 76 miles from top to bottom.

Because of limited public access, float fishing and boating are the most common recreational uses of the river. The floating season is concentrated to May, June, and the first half of July due to dewatering in mid- to late summer. The 60-mile upper segment from Camp Baker to Eden Bridge is the most popular float with steep canyon walls dotted with caves, some of which contain Indian pictographs, a tumbling stream bed, and the sense of rural-flavored remoteness. The river corridor also is home to several subdivisions, fence lines, and cattle grazing. From a recreational standpoint, the Smith is a good example of how limited access can add to recreational value. All 80 miles of the Smith rated for their recreational value received a Class I value. As a result of the limited floating season, fishing pressure does not compare to other Montana trout streams. Because access and fishing pressure are two of the four factors involved in determining the sport fishery value of a reach, the highest sport fishery value on the Smith was a Class II, found on the 24-mile section from Fort Logan Bridge to Rock Creek, above the Canyon. The remaining 100 miles of river and the north and south forks received Class III or IV fishery final resource values. In an effort to increase both abundance and size of trout within the Smith Canyon, a special "slot" limit, which allows anglers to keep trout under 13 inches and over 22 inches in length, was established in 1985 by the MDFWP.

For wildlife values, the entire Smith earned a Class II final resource value. The upper Smith River basin, excluding the South Fork, achieved Class II species value because it supports abundant-to-moderate populations of white-tailed deer, mule deer, elk, antelope, mountain lion, bobcat, beaver, and upland game birds. This section of the Smith also achieved Class II for its gallery forests, outstanding habitat diversity, and generally good riparian habitat condition. The lower 43 miles of the Smith and the South Fork of the Smith achieved only Class III habitat quality due to impacts of grazing and agriculture, and generally low to moderate habitat diversity. However, these units still support important species or habitats of special concern such as the osprey, waterfowl staging areas, warm springs, heron rookeries, and high density raptors (South Fork).

LOWER MISSOURI RIVER DRAINAGE

LOWER MISSOURI RIVER DRAINAGE

Boundaries: Fort Peck Dam to North Dakota border
Drainage size: 91,557 square miles
Main stem length: 168 miles
Tributaries: Milk, Poplar, Redwater, Big Muddy Creek
Cities/Towns: Fort Peck, Poplar, Havre, Glasgow, Wolf Point
Access: U.S. Highway 2, Montana 24

The lower Missouri River drainage is a land of badlands and fossils, of breaks and coulees, of rolling farmland and windswept plains dotted with glacial potholes that capture snowmelt and serve as oases for cattle and wildlife. Here at the western limit of the northern Great Plains, the Sweetgrass Hills, Bearpaws, and Little Rockies rise like islands from a sea of grass. The final 167 miles of the Missouri's journey through Montana begins at the base of Fort Peck Dam, which created the fourth largest fresh water reservoir in the world (Figure 11). A total of 134 miles of the river's journey were lost in 1937 when the Army Corps of Engineers closed the 185-foot high earth-filled dam to form Fort Peck Reservoir.

From its entry into Montana northwest of Havre to its confluence with the Missouri below the dam, the sluggish, turbid Milk River, life blood of the prairie, meanders for 704 miles (including its short trip through Alberta), providing irrigation for the crops and hayfields of communities like Chinook, Dodson, Malta and Tampico, located along its shady banks. Above the lush Milk River floodplain, is Montana's Hi-Line -- windswept plains dotted with glacial potholes and debris cut by occasional canyons and coulees. It is a treeless country of dry land farming and grazing with the everpresent earthen dams built along the brushy coulees and water courses to trap and hold the winter snow melt and occasional rains. These reservoirs and the prairie potholes along the Canada Border serve as oases both for cattle and wildlife.

Fisheries

Although the Hi-Line of northeastern Montana is some of the most arid country in the state, 2,236 miles of stream were assessed for their fisheries value, the highest total mileage of any drainage assessed (Table 51). The miles were within 110 reaches, also the lowest number of reaches assessed in the state (Table 52). The average reach length was considerably longer than those found in western Montana partially due to a lack of intense fisheries investigation breaking streams into smaller reaches. Eleven reaches on the Missouri and Milk rivers main stems contributed 25 percent of the mileage, with much of the remainder in long Missouri tributaries, including Porcupine and Big Muddy

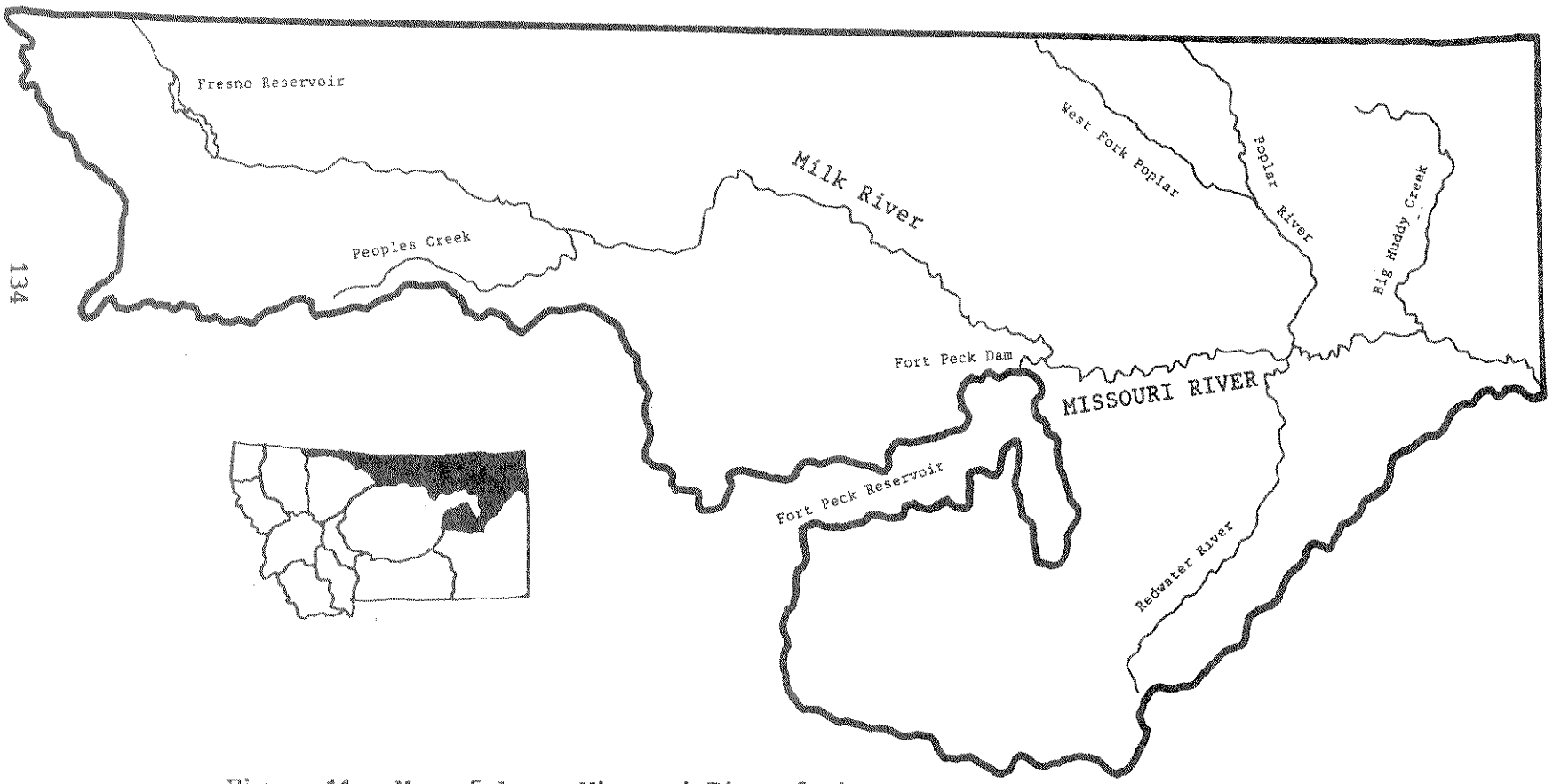

Figure 11. Map of lower Missouri River drainage.

Table 51. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the lower Missouri River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	5 (6)	10 (12)	16 (19)	46 (55)	5 (6)	28	110 (82)
Sport Fisheries	0 (0)	2 (2)	7 (8)	34 (41)	39 (47)	28	110 (82)
Final Resource	5 (6)	10 (12)	17 (21)	45 (54)	5 (6)	28	110 (82)

Table 52. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the lower Missouri River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class I	II	III	IV	V	VI	Total
Habitat & Species	266 (12)	477 (21)	577 (25)	893 (39)	23 (1)	46	2282 (2236)
Sport Fisheries	0 (0)	158 (7)	313 (14)	1141 (50)	623 (27)	46	2281 (2235)
Final Resource	266 (12)	477 (21)	592 (26)	878 (38)	23 (1)	46	2282 (2236)

creeks and the Poplar River originating in Canada, and Redwater Creek (River) from the south.

The lower Missouri drainage contained the second highest number of Class I stream miles and the fourth highest number of Class II stream miles when compared to the other drainages in the state. The Missouri main stem contributed 168 of the Class I miles and the lower reaches of the Milk contributed the remaining 99 miles. The presence of paddlefish, pallid sturgeon and shortnose gar resulted in these Class I values. No reaches received a Class I or II final resource value due to their sport fishery value.

The 477 miles receiving a Class II final resource value included reaches of the Redwater, Poplar and Milk rivers, resulted from local community importance coupled with high species diversity or Missouri main stem essential spawning habitat. Although only one percent of the mileage received a Class V final resource value, 27 percent of the stream miles received a Class V in the sport fishery value. Even though a high species diversity in many of the reaches resulted in higher habitat and species values, their fisheries are not used extensively for recreation.

Among the 53 fish species inventoried in the Missouri River below Fort Peck Dam are three Class A species of special concern -- paddlefish, pallid sturgeon, and shortnose gar -- once common throughout the Missouri-Mississippi river system. Today, due to widespread impoundment and channelization, these large river species are restricted to isolated populations between dams where the impoundments provide necessary feeding habitat.

Two of the six remaining paddlefish populations reside in Montana -- one above Fort Peck Dam, and the other inhabiting the Missouri and Yellowstone rivers between Fort Peck Dam and Garrison Dam in North Dakota. Dredge cuts formed during the construction of Fort Peck Dam also provide a unique fishery for paddlefish, with the primary harvest method being bow and arrow. The dredge cuts provide year-round habitat for these prehistoric relicts with a population estimated in 1979 near 3,000. Another inhabitant of the Fort Peck dredge cuts, although rare, is the shortnose gar, with Montana being at the upper limit of its range. Although the population status of the pallid sturgeon is unknown in Montana, its populations have dwindled throughout its downstream range. In 1979, the Endangered Species Committee of the American Fisheries Society designated this species as threatened.

In addition to the unique fishery offered by the Missouri's prehistoric inhabitants, the river below Fort Peck Dam also offers a lake trout fishery and an unusual strain of rainbow trout adapted to the conditions found below the dam. Recent studies indicate that the "Fort Peck" rainbow, although not particularly abundant, are characterized by excellent longevity and growth rates, are self-sustaining with spawning occurring in the spring,

and have growth rates that exceed mary of the state's other river populations. Fluctuating river levels during reproductive stages are apparently limiting the rainbow's population numbers. The MDFWP is working with the Army Corps of Engineers to determine the impact of the current dam operations on the downstream fishery, and possible mitigation alternatives. In addition, the Corps is studying the possibility of increasing power production at Fort Peck with plans that include a re-regulatory dam that would flood the dredge cuts and destroy the unique fisheries.

Wildlife

Slicing through unglaciated rough breaklands of northeastern Montana is the lower Missouri River. At the time of Lewis and Clark, plains grizzly bears, wolves, the now extinct Audubon's bighorn sheep, bison, plains elk, and black-footed ferrets roamed the lower Missouri basin. However, with the encroachment of civilization and the consequential loss of habitat and overharvest, many of these animals were extirpated from the region. Taking ten years to fill, Fort Peck Reservoir eventually inundated nearly a quarter million acres of Missouri River floodplain and breakland habitat. Simultaneously with the huge dam project, President Franklin Roosevelt withdrew more than a million acres of surrounding abandoned "dust bowl" lands to create the Fort Peck Game Range in 1936, now renamed the Charles M. Russell Refuge.

From the head of Fort Peck Reservoir (but excluding the reservoir itself) to the North Dakota border, the lower Missouri basin is comprised of 17 assessment units (Table 53). Due to Fort Peck Dam's inundation of most of the region's well-developed riparian habitat, 83 percent of the lower Missouri's habitat ratings fell into Class IV. The exceptions included the lower Missouri River reaches from Fort Peck Dam to the Poplar River (Class III) and from the Poplar River to North Dakota (Class II). In the latter reach, cottonwood gallery forests, islands, backwater areas, and a variety of vegetation types are abundant. Big Muddy Creek, which meets the Missouri from the north along the eastern end of the Fort Peck Indian Reservation, also received Class III habitat quality rating.

Earning the only Class I species value in the lower Missouri basin, the north side tributaries to Fort Peck Reservoir support wintering bald eagles, historic peregrine falcon eyries, golden eagles and other raptors, potential black-footed ferret re-introduction habitat, and mountain and piping plovers. This basin also gleaned more game species points than any other unit in the lower Missouri. A population of re-introduced bighorn sheep still occupy portions of this rough and isolated country. The Big Muddy Creek drainage, which includes Medicine Lake National Wildlife Refuge, has been used as a stopover for the endangered Whooping

Table 53. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the lower Missouri River drainage.

Value	Class				
	I	II	III	IV	Total
Habitat	5 (10)	8 (15)	15 (29)	24 (46)	52 (100)
Species	4 (8)	17 (33)	16 (31)	15 (29)	52 (101)
Final Resource	2 (4)	17 (33)	21 (40)	12 (23)	52 (100)

Crane on its annual migration from the Texas coast to Wood Buffalo National Park in northwest Canada.

The expansive Milk River drainage was divided into 34 wildlife assessment units. Given the relatively low habitat diversity of most of the Milk River drainage, 65 percent of the Milk River units fell into Class III or IV final resource value classes. Of the remaining 35 percent, only the Milk River main stem unit between People's and Whitewater Creeks achieved a Class I final resource value for its relatively high quality riparian habitat and species of special concern. In addition to providing habitat for colonial nesting herons, migrating waterfowl, and nesting raptors, this main stem section also contains an historic peregrine eyrie.

Several additional units of the Milk River system earned relatively high habitat or species values including the upper Milk River from Fresno Reservoir to People's Creek near Dodson, both lower sections of the Milk and Chain of Lakes coulee above Fresno Reservoir and Battle Creek flowing south into the Milk River near Chinook. Outstanding habitat quality was found in these units in abundant wetlands and islands, frequent gallery forests, and relatively good habitat condition and diversity.

In Willow Creek south of Glasgow and Little Cottonwood Creek high species values were earned for species of special concern such as mountain and piping plovers, waterfowl staging areas, raptor nesting and the western hognose snake. Confirmed from only a few places in eastern Montana, this medium-sized, robust prairie snake has an unusual shovel-shaped and keeled snout used for burrowing in loose gravels. When disturbed, the hognose may display an unusual "possum" like behavior by turning belly up, writhing vigorously, and then lying still with its mouth open and tongue lolling.

High populations of four key game species of the region, mule deer, antelope, sharp-tailed and sage grouse, were found in Willow, Big Cottonwood and Little Cottonwood Creeks. In addition, significant white-tailed deer and pheasant populations occur in both Big and Little Cottonwood creeks.

Recreation

Between Fred Robinson Bridge and Fort Peck Reservoir, the Missouri winds for 20 miles through the Charles M. Russell National Wildlife Refuge, a lesser explored section rated as an Outstanding value resource. The remote 125-mile stretch of the Missouri River from Fort Peck Dam to the North Dakota border, was rated as having Limited to Moderate recreational value.

The Milk is the other dominant river in this drainage, and in the Montana Outdoors Floater's Guide, author Hank Fischer

describes the Milk: "Although not a classical beauty, the Milk River contains some of the least explored water in Montana. At first glance, the sluggish and turbid Milk might not seem as appealing as better known rivers . . . But those who enjoy solitude, wide open spaces, and the opportunity to see wildlife won't be disappointed."

Statewide, such lower-value rivers not only have their own distinct recreational value, but they help to keep recreational use pressure off the higher-value streams, functioning as part of a river system managed to maintain a diversity of river values.

The lower Missouri drainage contained only 25 river segments, but they averaged 34 miles, more than double the state average, for a total length of 933 river miles. No miles were rated as Class I or Class II recreational rivers (Table 54). Forty-three percent of the mileage was rated Class III (Moderate) and 52 percent as Class IV (Limited). Limited or poor access was the most common reason for assigning a low value, followed by small creek/low or intermittent flows. Good recreation opportunities/potential and good fishing were the most commonly-cited positives.

Recreational use was heavy on 15 percent of the river mileage, moderate to low on 45 percent, and low on 47 percent. Access was rated as abundant on just two percent of the inventoried stream mileage, moderate on 50 percent, limited on 23 percent and restricted on 11 percent. Scenic quality was rated as Substantial or higher for eight percent of the mileage studied, Moderate for 42 percent, and Limited for 47 percent.

Fishing from shore was the most common recreation activity, a primary or secondary use on 80 percent of the segment miles. Canoeing was a primary or secondary activity on 32 percent of the river miles, boat fishing a primary activity on 27 percent, and motorboating a secondary activity on 18 percent. Thirty-five percent of the river miles inventoried were rated as not boated. The floated rivers contained flat water on nearly 75 percent of the boatable miles. The most common land-based activity was hunting, a primary or secondary activity along 35 percent of the river miles.

Botanical Features

The lower Missouri River drainage contained 14 botanical natural feature sites, four of which received a final value of Class I or Class II, the smallest proportion (two percent) of all 12 drainages statewide. It also had the smallest number of botanical natural feature sites rated Class I or Class II. It is difficult to know if these low ratings reflect a true absence of rare or endemic plants within this region, or whether they reflect the paucity of botanical information available for the

Table 54. Number of reaches, miles and percentages of recreational assessment reaches by value class in the lower Missouri River drainage.

Value Class	Reaches	Miles
Outstanding	0	0
Substantial	0	0
Moderate	9 (36.0%)	400 (42.9%)
Limited	14 (56.0%)	485 (52.0%)
Unknown	2 (8.0%)	48 (5.1%)
Totals	25	933

northeastern corner of the state. Nonetheless, this arid region of short-grass prairie contains some outstanding natural features. One prime example is U.L. Bend, a part of the 1-million-acre Charles M. Russell National Wildlife Refuge that encircles the Fort Peck Reservoir. This site was grazed by domestic livestock until 1969, but has retained its near-pristine grassland qualities. The area is dominated by bluebunch wheatgrass and associated species, including prairie junegrass, prairie sandreed and milkvetch.

Prairie Dog Island in the southeastern corner of Fort Peck Reservoir is a designated U.S. Fish and Wildlife Service Research Natural Area (RNA) and part of the Charles M. Russell National Wildlife Refuge. This 15-acre island contains undisturbed shrub-steppe and wheatgrass/needlegrass prairie vegetation.

South of the small town of Bainville and less than five miles from the North Dakota border is the site of a population of nannyberry (Viburnum lentago) -- a shrub listed as rare by the Montana Rare Plants Project. In Montana, this shrub only grows in a few locations along the eastern edge of the state. Also located within this general area are two botanical natural feature sites that contain large stands of mature Plain's cottonwood.

Geologic Features

Seven percent of the Class I or II geologic feature sites identified in the study, excluding type locations, were found in the lower Missouri region. Further study is likely to reveal additional outstanding sites.

Along the Milk River, features relating to continental glaciation are especially prominent. The Milk River Valley was once occupied by the Missouri River, but as the glacial ice sheets pushed south from Canada, the river was moved to the south. By the time the ice sheets retreated, the Missouri had cut a new channel for itself in its present location. Consequently, the Milk River occupies a valley that is much wider than one would expect for a river its size.

Flaxville gravels found between Scobey and Flaxville reveals clues as to the nature of the continental ice sheet. Here, an area of about 1,000 square miles extending from Opheim to Peerless and south into the Fort Peck Indian Reservation contains no glacial till or evidence of being glaciated. This remnant must have stood as an island in a sea of ice.

The dry, shaley badlands surrounding Fort Peck Reservoir are thought to hold an abundance of fossils. "Mort," the fossilized skull of a triceretops found from this area, is on display at the Museum of the Rockies in Bozeman. The museum at Fort Peck also contains an impressive display of fossils, many of which were

found by those who worked on the dam in the 1930s. The Hell Creek National Natural Landmark, located on the south side of Fort Peck Reservoir, is noted for a variety of fossils, including Tyrannossaurus rex, Triceratops prorsus, and the oldest true alligator, Brachychampsa fontana.

Kennedy Coulee, a tributary to the Milk River near the Canadian border, contains fossilized mammals from the Cretaceous era. Experts at the Museum of the Rockies believe this is one of the most prolific fossil areas in the world.

UPPER YELLOWSTONE RIVER DRAINAGE

UPPER YELLOWSTONE RIVER DRAINAGE

Boundaries: Headwaters to Bighorn River
Drainage size: 12,840 square miles
Main stem length: 262 miles (in Montana)
Tributaries: Boulder, Shields, Clark's Fork, Stillwater, Bighorn
Cities/Towns: Gardiner, Livingston, Big Timber, Columbus, Billings
Access: Montana Highway 89, Interstate 90

From sparkling mountain stream high in Yellowstone National Park to major prairie waterway, the sinuous Yellowstone River is one of the last major free-flowing rivers in the contiguous 48 states. The Yellowstone of the 1800's served as an artery of commerce transporting explorers, trappers, soldiers, goldrushers, and eventually railroad workers into the heart of Montana. Water is prized on the dry plains, so it's no surprise that in the 1970s, the Yellowstone River and its tributaries were under siege as debates were staged over conflicting river uses such as hydropower, coal development, and recreation. The Montana Legislature clamped a moratorium on all Yellowstone water projects until water rights issues could be resolved. In a landmark case, the Montana Board of Natural Resources in 1978 approved instream reservations for fish and wildlife resources on the Yellowstone main stem. Plans for greatly expanded development at the Fort Union Coal formation were shelved. The precedent for considering fish and wildlife concerns had been set.

In order to deliver four trillion gallons of water to the Missouri each year, the Yellowstone gathers power in its upper section from tributaries that rise in the Bridger, Crazy, Pryor, Absarokee and Beartooth mountains. Often called the "roof" of Montana, the Beartooth Plateau boasts 29 summits higher than 12,000 feet. Thousands of feet below them, the undulating prairie stretches north and east as far as the eye can see.

The Yellowstone originates in northwestern Wyoming and flows into Yellowstone Lake in Yellowstone National Park before entering Montana at Gardiner (Figure 12). From the park boundary to Livingston, the river flows north through Paradise Valley, bordered on the east by the Absarokee Mountains and on the west by the Gallatin Range. At Livingston, the Yellowstone turns eastward, picking up flows from the Shields River from the north and the Boulder, Stillwater and Clark's Fork of the Yellowstone rivers from the south before the upper section ends at the mouth of the Bighorn River.

Fisheries

A total of 2,601 stream miles in 563 reaches were assessed in the upper Yellowstone River drainage, and another 315 reaches

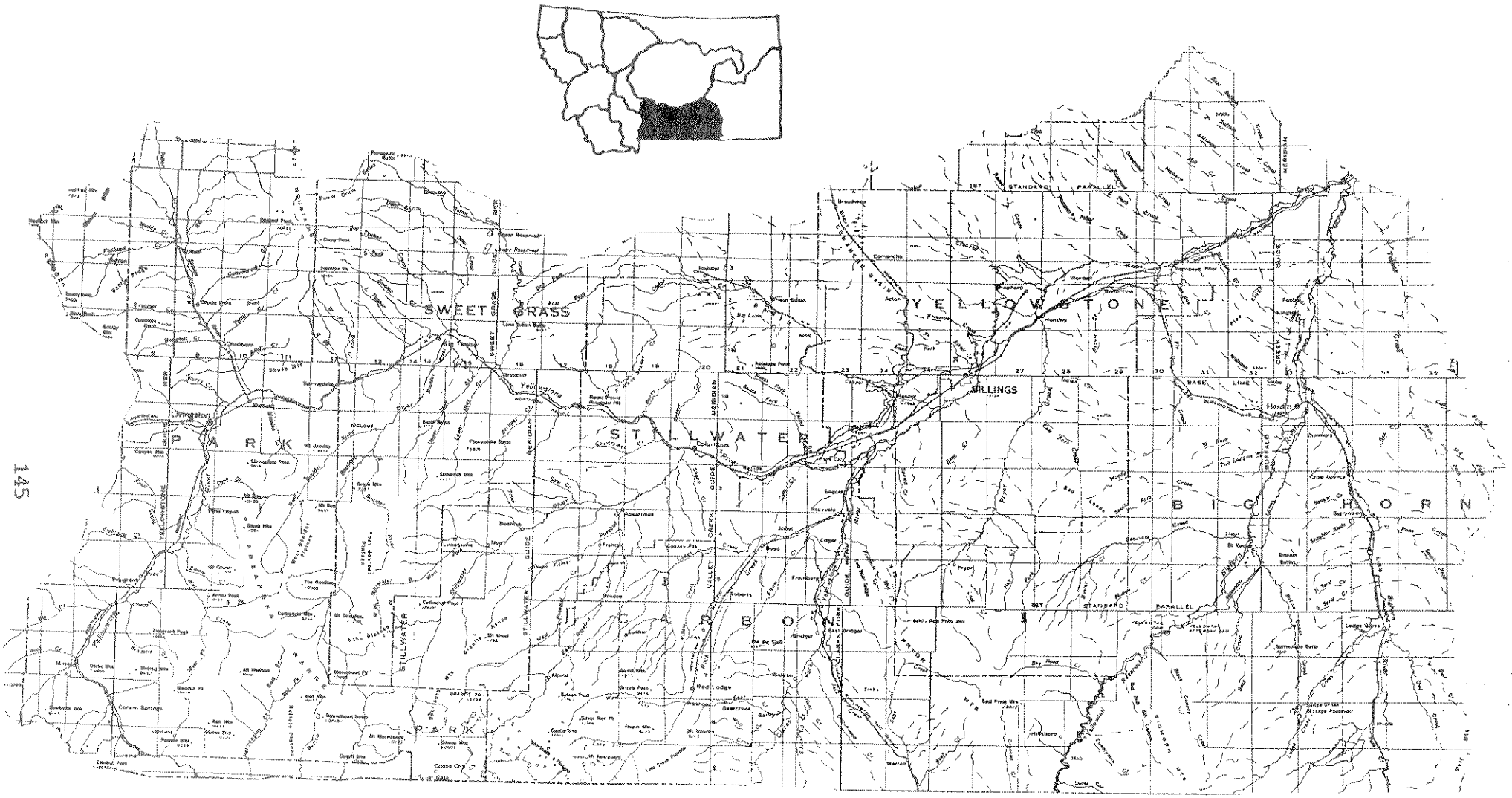

Figure 12. Map of upper Yellowstone River drainage.

in 400 miles could not be rated due to insufficient fisheries information (Tables 55 and 56). In the habitat and species category, 12 reaches in 40 miles received a Class I, including two nationally renowned spring creeks, Armstrong and Nelson, and main stem essential spawning habitat. Of the 19 reaches rated Class II in the habitat and species values, nine contained Yellowstone cutthroat populations, but their genetic purity was unknown. Two others were high-valued spring creeks, four reaches were important to local communities in addition to having high species diversity, and three were essential spawning streams to Class II reaches of the Yellowstone.

Surprisingly, only Crooked Creek in the Pryor Mountains received a Class I species and habitat value due to the presence of pure native Yellowstone cutthroat trout. The species reached Montana nearly 75,000 years ago from the upper Snake River via Two Ocean Pass in the southeastern corner of what is now Yellowstone National Park. Once reaching the pass, the cutthroat spread downstream, extending their range in all tributary streams east to the Tongue River, where Lewis and Clark reported catching 800 in a matter of a few days. By the late 1800s, however, fishing pressure and increased water and land use had decreased the populations throughout their range. By the 1950s, their range had been reduced to upper river tributaries mostly in headwater areas.

Recent genetic analysis of populations from the upper river and the Shields drainage found more pure populations of cutthroat trout than was previously thought. Of the 27 streams analyzed in 1986 and 1987, 17 contained pure populations, but none were isolated from contaminating species such as rainbow trout.

The upper Yellowstone drainage also contained 128 miles of Class I sport fisheries. The upper river was tied with the lower Yellowstone for the largest number of Class I sport fishery stream miles in the state. Included were the 99 miles of the upper Yellowstone River from the Yellowstone National Park boundary to the Boulder River, the longest stretch of "blue ribbon" trout stream in the state. Populations of Yellowstone cutthroat, brown and rainbow trout, with numerous trophy-sized fish, the pristine beauty of the Paradise Valley and a river accessible to the public contributed, to the Class I sport fishery value. Recent fisheries data indicate trophy-sized cutthroat are declining in the main stem and recruitment is controlling the population. For the Yellowstone cutthroat, a tributary spawner, dewatering of spawning habitat appears to be the major problem reducing recruitment. Largest main stem cutthroat populations are found in the vicinity of tributaries unaffected by irrigation withdrawals.

The sport fishery value decreases as the river journeys out of the mountainous Paradise Valley, even though the trout populations remain abundant with numerous large fish down to the Stillwater River confluence. The 74 miles of the Yellowstone from the Boulder River to its convergence with the Clark's Fork received a

Table 55. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the upper Yellowstone River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	12 (4)	20 (6)	39 (12)	205 (65)	39 (12)	248	561 (315)
Sport Fisheries	7 (2)	11 (3)	56 (18)	164 (52)	77 (24)	248	565 (315)
Final Resource	19 (6)	21 (7)	78 (25)	159 (50)	38 (12)	248	563 (315)

Table 56. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the upper Yellowstone River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	40 (2)	331 (15)	381 (17)	1298 (60)	153 (7)	398	2601 (2203)
Sport Fisheries	128 (6)	166 (7)	477 (22)	1021 (46)	409 (19)	398	2599 (2201)
Final Resource	168 (8)	340 (15)	644 (29)	902 (41)	148 (7)	398	2600 (2202)

Class II sport fishery value. This was due to decreased aesthetics resulting from Interstate 90 bordering the river, and lower use levels. As the river continues downstream through Billings to the Bighorn River confluence, the waters slow, turbidity increases, and temperature rises, causing trout populations to disappear. The river received a Class III sport fishery value in this 81-mile reach, with sauger, channel catfish and burbot up to 10 pounds contributing to the sport fishery.

Major tributaries to the Yellowstone receiving a Class II sport fishery included reaches of Rock Creek and the Boulder River, and the entire Stillwater River, the latter two of which are threatened by the largest platinum mining operation in the country. The Shields River, the only northern tributary, received a Class III throughout its length due to a lack of large trout, low fishing pressure and an average aesthetics rating.

The Bighorn River of southeastern Montana received a Class I resource value in its first 31 miles below Yellowtail Dam. Until 1965, the Bighorn was a silty prairie stream with a sauger, catfish and burbot fishery. After the construction of Yellowtail Dam 84 miles above the mouth, waters emerging from the dam were cold, clear and productive. Trout production exploded and a trout stream of national importance was created. Although the brown trout population of the upper Bighorn has been found to fluctuate with environmental factors, including flows, water temperature and gas supersaturation, the river below the dam holds 5,000 to 10,000 trout per mile. The latest estimate indicated 5,000 of those were between 15 and 18 inches and 500 were larger than 18 inches, the greatest biomass of any trout river in the state. As a result of these outstanding fisheries and precipitated somewhat by an 85 percent increase in angler use between 1985 and 1986, a river management plan for the Bighorn was drafted by the MDFWP in 1987, with extensive public involvement.

Wildlife

The upper Yellowstone River drainage supports a valuable wildlife resource. Nineteen (40 percent) of its 48 river units received Class II final resource values, and two others along the Big Horn and East and West Rosebud Creeks received Class I final resource values (Table 57). In all, 38 percent of the river basins received Class I or Class II habitat ratings. About 33 percent achieved Class I or II species ratings.

Substantial wildlife values resulted from extensive riparian zones found along five Yellowstone main stem units and several important tributaries such as the Sweetgrass and Boulder Rivers. Although extensive development has occurred along most of the Yellowstone, its lower 142 miles from Bridger Creek to the Bighorn, earned an outstanding value because of extensive gallery forests, abundant backwater sloughs and wetlands, and islands.

Table 57. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the upper Yellowstone River drainage.

Value	Class				
	I	II	III	IV	Total
Habitat	9 (19)	9 (19)	14 (29)	16 (33)	48 (100)
Species	3 (6)	13 (27)	16 (33)	16 (33)	48 (99)
Final Resource	2 (4)	19 (40)	12 (25)	15 (31)	48 (100)

Nearly 48 percent of the Yellowstone's main stem and tributaries units are used by nesting and wintering bald eagles. These major waterways also provide important resting areas for migrating waterfowl and nesting habitat for great blue herons and Canada geese. In addition, the Yellowstone, Stillwater, Boulder, and Shields rivers contain nine historic peregrine eyrie sites, while the lower Yellowstone is home to the snapping turtle and spiny softshell, reptiles of special concern in Montana.

River units gleaning the highest game values include East and West Rosebud creeks in the upper Stillwater River and westside tributaries of the Shields River. The East and West Rosebud unit is one of four units statewide harboring high densities of white-tailed and mule deer, elk, bighorn sheep, moose, and black bear. In contrast to the Rosebud unit, the Shields River tributaries support an even broader diversity of game and furbearer populations (at least 16 species) although not in as high densities as elsewhere in the state. Significant game and furbearer values were also associated with Yellowstone tributaries from the Gallatin Range and from Red Lodge Creek and upper headwater units within the Clark's Fork of the Yellowstone drainage.

With more than half of its units achieving Class II or above in either habitat or species values, the upper Yellowstone ranks near the top for eastern Montana's river systems. High quality riparian vegetative communities coupled with a wide diversity of wildlife habitats, ranging from river bottom to 9,000-foot plateaus, are major reasons for this region's high wildlife values.

Recreation

The fact that the Yellowstone River is undammed throughout its entire length is a testimony to its recreational values. It makes quite an entrance into Montana, crossing the border near Gardiner, the northern gateway to Yellowstone National Park. The National Park Service disappointed many kayakers with its recent decision not to open the river for boating, but one can start a good day trip right in downtown Gardiner. The rapids, good, clean fun that lasts for several miles, are rafted commercially. About eight miles of flat water separate this whitewater stretch from Yankee Jim Canyon, another popular boating spot, but potentially dangerous and not to be taken lightly.

The Montana Rivers Study inventoried the recreational attributes and values of 90 river segments in the upper Yellowstone drainage, about 1,760 miles of river, or 14 percent of the 12,528 miles studied. Managers and recreational river users rated 13 percent of the miles as Class I (Outstanding), 28 percent as Class II (Substantial), 33 percent as Class III (Moderate) and 19 percent as Class IV (Limited) (Table 58). The drainage

Table 58. Number of reaches, miles and percentages of recreational assessment reaches by value class in the upper Yellowstone River drainage.

Value Class	Reaches	Miles
Outstanding	9 (10.0%)	227 (12.9%)
Substantial	23 (25.6%)	501 (28.5%)
Moderate	35 (38.9%)	585 (33.3%)
Limited	12 (13.3%)	331 (18.8%)
Unknown	11 (12.2%)	115 (6.5%)
Totals	90	1,759

contained more than its share of highly-valued stream mileage -- 17 percent of the state's Outstanding miles and 20 percent of those rated Substantial.

Scenic quality the most frequently given reason for assigning a high value class, with good fishing not far behind. Restricted access was a reason for lowered value on some segments, but nearly as many others were valued for their good access. Recreational use was described as heavy on 21 percent of the river miles, moderate on 30 percent, and low on 37 percent. Access was rated similarly, with about half of the river miles rated as having moderate or better access and half as limited or restricted.

Scenic quality was rated as Substantial to Outstanding on about 40 percent of this region's river miles, but as moderate on about 45 percent. The drainage contained many miles rated as providing recreational opportunities in a rural setting. Another 400 or so miles provided opportunities for semi-primitive or primitive recreation.

Fishing from shore was once again the most common recreation activity, a primary use on 75 percent of the segments. Boating was done on at least 25 percent of the segments, although many more reaches are boatable. Of the state's 100 inventoried miles of rapids rated between moderate and major, 20 percent were in the upper Yellowstone River drainage. A wide spectrum of boating opportunities was found, ranging from flat water on 13 percent of the river mileage, minor rapids on 28 percent, and moderate rapids on five percent. Boating did not occur on 68 percent of the segments, although these were the shorter reaches that comprised only 47 percent of the drainage's river miles. Common land-based activities included viewing the scenery, car and tent camping, picnicking, driving, and non-motorized trail use.

Botanical Features

The upper Yellowstone River drainage contains 18 botanical natural feature sites, 11 of which received a final value rating of either Class I or Class II. They comprised five percent of the statewide, compared with the average of nine percent for all 12 drainages.

Arid climate, unusual geology, and topographic relief that characterizes the Bighorn and Pryor Mountains of south-central Montana makes this region botanically unique. Two unusual plants found in this area are Sullivantia hapemanii and Shoshonea pulvinata. Both endemic plant species are distributed within the Central Rocky Mountains and only occur on wet limestone rock. The Montana Rare Plants Project has recommended Sullivantia for threatened species status. Shosonea, a recently described member of the parsley family (Apiaceae), occurs at the headwaters of Crooked Creek and Grove Creek.

The headwaters of Crooked Creek contain Lost Water Canyon, a proposed U.S. Forest Service Research Natural Area (RNA) and candidate for National Natural Landmark (NNL) designation. This is the only botanical natural feature site in this drainage that received a final value rating of Class I. This rugged limestone canyon is located in the southeastern corner of the Pryor Mountains. The proposed RNA covers the entire Lost Water Canyon, 1,630 acres in size. The vegetation is dominated by Douglas fir and limber pine, and also contains scattered patches of subalpine fir and alpine meadows. This pristine area contains many features of outstanding quality, such as the eastern-most extension of Douglas fir in Montana.

Two other proposed RNAs in this drainage are Passage Creek and Palace Butte within the Gallatin National Forest. Passage Creek is an isolated area of subalpine-fir forest and moist mountain meadows in the Absaroka Mountains. Palace Butte is a near-pristine watershed, located along Hyalite Creek in the Gallatin Mountains, which contains two lakes, a hanging valley and a waterfall. It is covered by subalpine forest and alpine meadows that range from 7,160 feet to 10,333 feet in elevation.

Geologic Features

Twelve percent of the Class I or II geologic feature sites identified in the Montana Rivers Study, excluding type locations, were found in the upper Yellowstone Basin. Further study is likely to reveal additional outstanding sites.

The Beartooth Highway south of Red Lodge crosses a 10,000-foot plateau and the adjacent area is underlain by some of the oldest rock units in the state. These so-called basement complex rocks are thought to underlie most of the younger sedimentary rocks throughout the state. The basement complex consists of metamorphic rocks, extensively altered by heat and pressure from being deeply buried and from mountain-building processes. Hanging valleys, classic U-shaped valleys, cirques, tarns, and horns created by glacial action are all above the tree line and visible from the highway. Hanging valleys are glacial valleys with their mouths at higher elevations than the main or trunk valleys. Both the trunk and side valleys are carved by glaciers, but the much larger glacier in the trunk valley eroded at a faster rate than the glacier in the side valley, leaving a smaller valley hanging above the larger valley. Many glacially carved valleys are noted for their U-shaped cross section. Cirques are steep-walled, half-bowl shaped hollows usually found on a mountain side or at the head of a glacial valley and are carved by glaciers. Cirques often contain small ponds or lakes known as tarns.

The Pryor Mountains west of the Bighorn River contain a large number of caves in a relatively small area, mostly formed in limestone. The walls of several caves are said to be covered with

ice and calcite crystals. The ice caves used to be open to the public, but their present status is unknown. Mystery Cave, which has been locked to prevent vandalism, is reported to contain a variety of stalactites, flowstone, and soda straws.

Bighorn Canyon is a classic example of a superimposed drainage, and while still impressive, must have been spectacular prior to being flooded when Yellowtail Dam was built. The river has lowered itself into a canyon that is roughly 600 feet deep. The canyon is now designated a National Recreation Area.

Northwest of Billings is an interesting area that is drained internally. The broad area is known as the Lake Basin which also encompasses the smaller Commache Basin. Water from these basins does not contribute to the flow of either the Yellowstone or Missouri rivers. Within the basin, one can find many ephemeral lakes, which may have been formed as prevailing winds from the west eroded depressions that might fill with water in wet years.

The sandstone cliffs surrounding Billings are part of the Eagle sandstone, called the Virgelle sandstone farther north. Some researchers believe the sandstone is a barrier complex, while others suggest it is part of an offshore, submerged bar. Whatever the exact origin of deposition, the Billings rimrocks offer an opportunity to study the sedimentology of this sandstone in detail.

The Crazy Mountains are an isolated mountain range north of Big Timber. Driving along the Yellowstone River and looking north, one can see the towering peaks resulting from alpine glaciation. Along the east side of the mountains on the Sweetgrass Creek and extending north into the American Fork of the Musselshell River drainage are good displays of recessional moraines, the hummocky or hilly deposits left at the toe of the ice as the glacier was retreating. Moraines typically contain a variety of rock sizes from clay to cobbles and boulders that are jumbled together with very little sorting of the different particle sizes.

Surrounding the Crazy Mountains are a series of radial dikes that radiate out like spokes of a wheel from the central diorite stocks (igneous intrusions) near the center of the mountains. The dikes cut through the surrounding sedimentary rocks and stand like walls over the surrounding terrain. This is one of the best examples of a radial dike swarm in the country.

LOWER YELLOWSTONE RIVER DRAINAGE

LOWER YELLOWSTONE RIVER DRAINAGE

Boundaries: Bighorn River to North Dakota border
Drainage size: 69,103 square miles
Main stem length: 270 miles
Tributaries: Powder, Tongue
Cities/Towns: Forsyth, Miles City, Glendive, Sidney, Richland
Access: Interstate 90

French explorers called it the Roche Jaune, meaning "yellow rock," and Captain Clark in 1805 wrote, " The clifts on the South Side of the Rochejhone are generally comp. of a yellowish Gritty soft rock." The final stretch of the Yellowstone River, a wide, tree-lined river meandering northeast to meet the Missouri in North Dakota, begins at the Bighorn River, 50 miles northeast of Billings (Figure 13). By this time, its transformation from a mountain stream into a mighty plains river is complete. Its total 678 mile journey, 550 which are in Montana, is the longest free-flowing river in the lower 48 states.

Although the continental ice sheet dammed a portion of the lower Yellowstone, most of the river and its tributaries can be described as unglaciated plains, a country of plateaus, wind-carved sandstone "hoodoos," and eroded gumbo badlands. Landforms are more subdued than in the mountainous areas to the west. Elevations range from about 1,880 feet where the Yellowstone enters North Dakota, to roughly 4,000 feet in the mountain ranges of the Big and Little Sheep Mountains.

The lower Yellowstone is a country of prairie streams and rivers where dry sage and grass uplands contrast with the cool, green woody growth of majestic cottonwoods and shrubby river bottoms. Woody draws dissect the land and combine to form larger and larger streams until they unite into creeks such as the Mizpah, Pumpkin, Rosebud, Porcupine, or Sunday. Entering Montana from higher mountains in Wyoming, the Powder and Tongue rivers meander along wide river valleys contributing substantial quantities of water as well as sediment to the mighty Yellowstone. This change of character naturally affects the river's fisheries, wildlife and recreational use.

Fisheries

The Yellowstone River and its fishery changes character from a mountain trout stream in its upper 100 miles to a warm-water prairie river as it leaves the state. Above Tower Junction in Yellowstone National Park, one fish species is present, the Yellowstone cutthroat trout. Introduction of exotic trout species, in addition to native whitefish and forage fish, brings the species list to 11 in the reach upstream of the Boulder River.

Figure 13. Map of lower Yellowstone River drainage.

Twenty species are found in the mid section to the Bighorn, and in the lower river, a total of 46 species in 12 families are present. The lower-river sport fishery is provided by spawning paddlefish, walleye, burbot, sauger, shovelnose sturgeon, northern pike, smallmouth bass, and channel catfish. The angler has several methods for harvesting this array of species, including set lines, hoop nets and use of live bait. With 15-inch sauger common, burbot up to 10 pounds, channel cats providing 25 percent of the catch, and a snag fishery for paddlefish, the angler can never complain about a lack of variety.

A total of 1,448 stream miles in 114 reaches were assessed for their fishery value in the lower Yellowstone River drainage (Tables 59 and 60). In the habitat and species category, three reaches of the Yellowstone main stem received a Class I. The 214 miles of the Yellowstone main stem from Forsyth to the state line provide substantial habitat for paddlefish and pallid sturgeon, and limited-to-moderate habitat for two minnow species of special concern, the pearl dace and the sturgeon chub.

Local importance and high species diversity played major roles in determining reaches receiving a Class II habitat and species value. Seventeen reaches in 551 miles received a Class II, including the major tributaries to the lower river, the Powder River, O'Fallon Creek and most of the Tongue River. Six of the Class II reaches received this rating as a result of their local importance. The presence of two Class B species of special concern, the sturgeon chub and the pearl dace, as well as paddlefish using the lower Tongue, contributed to the Class II ratings. The Tongue and Powder also provide spawning habitat to Yellowstone sauger, catfish and shovelnose sturgeon, as well as a good resident fishery for smallmouth bass.

Two reaches received a Class I in the sport fishery value, the Yellowstone main stem from the Powder River to the state line, totaling 128 miles in length. The lower river was tied with the upper river for the largest number of Class I sport fishery miles in the state. Two additional reaches of the Yellowstone main stem, from the Bighorn to the Powder, contributed 141 miles of Class II sport fisheries. A lower aesthetics rating and fishing pressure, and a lack of abundant paddlefish contributed to the Class II ratings.

The presence of spawning paddlefish in the Yellowstone contributed to the Class I sport fishery from the Powder River to the state line. A diversion dam at Intake serves as a partial barrier to the fish, concentrating them below the dam. Although these Garrison Reservoir residents have been using the Yellowstone and Missouri River below Fort Peck since the early 1900s, a snag fishery did not develop until the 1960s. Since 1972, a creel census has been conducted at Intake, where annual harvest has been estimated at 2,000 to 5,000 paddlefish. Because considerable "high-grading" (keeping a fish until a bigger one is caught and

Table 59. Number and percentages (%) of fisheries assessment reaches within species and habitat category, sport fisheries category and final resource value for the lower Yellowstone River drainage. Calculated percentages do not include Class VI reaches (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	3 (3)	17 (15)	34 (30)	56 (49)	4 (4)	23	137 (114)
Sport Fisheries	2 (2)	2 (2)	2 (2)	30 (26)	78 (68)	23	137 (114)
Final Resource	3 (3)	17 (15)	34 (30)	56 (50)	4 (4)	23	137 (114)

Table 60. Length in miles and percentages (%) of fisheries assessment miles within the species and habitat category, sport fisheries category and final resource value for the lower Yellowstone River drainage. Percentages do not include Class VI fisheries miles (unable to assess due to insufficient information). Total in parentheses indicate total without Class VI miles.

Value	Class						
	I	II	III	IV	V	VI	Total
Habitat & Species	214 (15)	551 (38)	473 (33)	202 (14)	8 (<1)	43	1491 (1448)
Sport Fisheries	128 (9)	141 (10)	84 (6)	610 (42)	484 (33)	43	1490 (1447)
Final Resource	214 (15)	551 (38)	473 (33)	202 (14)	8 (<1)	43	1491 (1448)

then releasing the smaller fish) has occurred in the fishery, regulation changes in 1981 restricted catch-and-release and imposed a two-fish-per-season limit.

Wildlife

The Yellowstone, Tongue, and Powder rivers greatly enhance wildlife values of the Montana's southeast. Of the 26 river units identified along the lower Yellowstone, 10 earned a final resource value of II and one achieved a Class I final resource value (Table 61). Eighty percent of these Class I and II wildlife units were along these three major waterways.

The green and lush Yellowstone main stem from the Bighorn to the Tongue forms one of the best examples of a naturally flooding, braided river system within the lower 48 states. Scoring the maximum number of habitat quality points, this section of the Yellowstone contains abundant wetlands, backwater sloughs, islands, and gallery forests. The condition of the island riparian habitat is considered excellent. This reach supports nesting and wintering bald eagles, colonial nesting herons, and high density of breeding raptors including golden eagles. The river and associated wetlands comprise an important waterfowl staging area during migrations. Backwater sloughs support the spiny softshell and snapping turtle, species of special concern in Montana. Key game species include white-tailed and mule deer, beaver, pheasant, nesting Canada geese, and sharp-tailed grouse. With the exception of the 34-mile stretch between the Tongue and the Powder River confluence, the rest of the 150 miles of the lower Yellowstone also earned Class I habitat ratings as well as Class II or III species values.

To protect the productive floodplain habitat of the lower Yellowstone, the MDFWP has acquired three wildlife management areas: Issac Homestead, Elk Island, and Seven Sisters. With combined acreage of nearly 2,150 acres, their acquisition is a significant step toward protecting this dynamic river system.

The meandering lower 87 miles of the Tongue River with its cottonwood forest, high vegetative diversity, and excellent riparian condition also achieved outstanding habitat quality ratings. For its support of species of special concern such as the plains hognose and milk snakes, colonial nesting birds, golden eagles and other raptors, the upper Tongue River above Hanging Woman Creek earned outstanding species values. Other rivers receiving Class II habitat and species values include two reaches of the Powder River, Otter Creek, Sunday Creek, and northside tributaries to the Yellowstone between Sunday Creek and the Powder River.

Cutting through the isolated southeast corner of Montana is the Little Missouri River, which eventually flows directly into

Table 61. Number and percentages (%) of wildlife river units within habitat, species, and final resource value classes for the lower Yellowstone River drainage.

Value	Class				
	I	II	III	IV	Total
Habitat	4 (12)	6 (19)	7 (22)	15 (47)	32 (100)
Species	2 (6)	10 (31)	11 (34)	9 (28)	32 (99)
Final Resource	1 (3)	12 (38)	12 (38)	7 (22)	32 (101)

the Missouri River in North Dakota. Of the five assessment units in this drainage, the Little Missouri main stem and its major tributary, Boxelder Creek, both earned Class II species values for their high-quality riparian community and assortment of species of special concern. In addition, high densities of white-tailed deer, mule deer, antelope, sharp-tailed and sage grouse, beaver, bobcat, and turkeys are found along the Little Missouri and many of its tributaries. Because of its dense gallery forests and high habitat diversity, Beaver Creek achieved a Class II habitat rating.

Recreation

The Montana Rivers Study inventoried the recreational attributes and values of only 18 river segments in the lower Yellowstone drainage, but they totaled 794 miles, or six percent of the 12,528 miles studied. Managers and recreational river users rated none of the drainage's river miles as Outstanding, a testimony more to the national value of many other Montana rivers than to the lack of value here. Managers and users were instructed that the Outstanding category should be reserved for the best 10 percent of recreational river segments in the state. This was not a firm rule, but a reminder to reviewers that value class distinctions might not be as meaningful if only the higher-value categories were used.

Regional value is extremely high in eastern Montana, where there aren't as many rivers as in western Montana. Thirty-two percent of the river miles inventoried received a Class II (Substantial) recreational value, while 56 percent were Class III (Moderate) and nine percent rated Class IV (Limited) (Table 62).

Fishing quality, hunting opportunities, scenic quality, presence of paddlefish, and unusual topography added to recreational value, while detractors included poor access, muddy water, low or intermittent flows, limited boating opportunities, low scenic quality, and agricultural lands. Recreational use was moderate to heavy on less than one-third of the river mileage, and low on 43 percent. These relatively low use levels were consistent with generally low levels of access. No segments had abundant access and 71 percent of the mileage was rated as limited or restricted.

No segments in the lower Yellowstone received an Outstanding scenic quality, again likely a result of comparison with mountainous western Montana. Undoubtedly there are many who would argue with this rating, finding great beauty in the rugged plains. Scenic quality was rated as Substantial on only 10 percent of the segments, and as Moderate on 50 percent.

The drainage was not thought to contain any river segments that provided primitive or semi-primitive recreation settings;

Table 62. Number of reaches, miles and percentages of recreational assessment reaches by value class in the lower Yellowstone River drainage.

Value Class	Reaches	Miles
Outstanding	0	0
Substantial	5 (27.8%)	256 (32.2%)
Moderate	9 (50.0%)	448 (56.4%)
Limited	3 (16.7%)	72 (9.1%)
Unknown	1 (5.6%)	18 (2.3%)
Totals	18	794

nearly all river miles were divided between transition and rural settings. Fishing from shore was yet again the most common recreation activity, a primary use on 78 percent of the segments. Canoeing was a primary activity on over 60 percent of the segments, and boat fishing a primary or secondary activity on 78 percent. Only 13 percent of the river miles inventoried were rated as not boated. The most common land-based activity was viewing the scenery, with no other activities except picnicking rated as primary uses more than once or twice. Nearly all of the land-based activities included on the segment rating sheet were thought to be secondary activities.

Botanical Features

The lower Yellowstone River drainage contained 23 botanical natural feature sites, none of which received a final value rating of Class I. This drainage also contains the second lowest proportion (three percent) of sites that received a final value rating of either Class I or Class II. The fact that this region is sparsely populated and isolated from the rest of the state may have influenced the number of sites that were inventoried for the Montana Rivers Study.

Two outstanding natural features within this drainage are Seven Sisters and Elk islands on the Yellowstone River. The free-flowing river periodically floods and scours its banks, an action that scarifies the seeds of their cottonwood trees and stimulates germination. Flooding also deposits nutrient-rich, silty alluvial soil along the floodplain, providing cottonwood seedlings with a high quality site for establishment. Cottonwood regeneration depends on periodic flooding that occurs on free-flowing rivers.

Elm-ash hardwood forests are found in the lower Yellowstone River drainage. Commonly found in the eastern U.S., these hardwood forests are restricted to the extreme eastern edge of Montana. Deciduous woodlands, composed of American elm, green ash and box elder, grow on sandy soils and upland areas along the tributaries of the Yellowstone River. These unique areas are threatened by overgrazing from cattle because they provide succulent forage, drinking water, and shade in an otherwise treeless prairie environment.

Poker Jim Research Natural Area, a proposed National Natural Landmark (NNL) is located on the North Fork of Jim Creek, a tributary of the Tongue River. The 363-acre area, established as a RNA in 1974 by the U.S. Forest Service, is an excellent example of an undisturbed ponderosa pine forest community, typical of this region. The vegetation on this sandstone plateau is dominated by the ponderosa pine and interspersed with a mixed-grass prairie community of bluebunch wheatgrass and western wheatgrass.

Four plant species of concern in this drainage are the wild lily-of-the-valley (Maianthemum canadense), New Jersey tea (Ceanothus herbaceus), few-flowered panic-grass (Panicum oligosanthes), and leadplant (Amorpha canescens). The wild lily-of-the-valley grows in riparian forests at low elevations along the Little Missouri River and is listed as rare by the Montana Rare Plants Project. The other three species grow in prairies and open woodlands, and can be found throughout the adjacent Great Plains states. Each of these species was collected only once and none have been seen in the state in more than 30 years.

Geologic Features

Six percent of the Class I and II geologic feature sites identified in the Montana Rivers Study, excluding type locations, were found in these drainages. This low number of outstanding sites in an area of this size can be partially explained in that much of the area has not been examined as thoroughly by geologists and paleontologists as central and western Montana. Without a doubt, more thorough examination will reveal additional outstanding sites.

Southeastern Montana is not known for its lakes, but during the Ice Age, a lobe of the continental ice sheet dammed the Yellowstone River near Intake and created glacial Lake Glendive. The water was backed up to just beyond present-day Miles City.

Makoshika State Park near Glendive is an outstanding example of "badlands," erosional features developed in fine-grained sedimentary rocks such as shales and often devoid of vegetation. Dendritic drainage patterns resembling a branching tree are often associated with these areas. Another good example of badlands can be found north of Terry.

Sandstone bluffs that have weathered into "hoodoos" can be seen at Medicine Rocks State Park north of Ekalaka. The cap rock is more resistant to weathering than the material below it, causing the hoodoos to stand some 30 to 40 feet above the surrounding eroded landscape. These rock forms provide opportunities for casual rock climbing. Fossils of small mammals have been found at Medicine Rocks State Park, and fossils from the southeastern part of the state are on display at the Carter County Museum at Ekalaka.

An interesting rock type scattered throughout the southeastern part of the state is called clinker or porcelinite, formed when the intense heat from a naturally burning coal seam melts the surrounding rock. The resulting clinker is often resistant to weathering and is often found on ridges. It can be seen in scattered locations on many of the tributaries to Rosebud Creek near Colstrip and because it is the most durable rock in the area, it is sometimes used as gravel to surface dirt roads.

The drainage divide between the Yellowstone and Missouri rivers northwest of Glendive was formed by the former valley of the Yellowstone. Volcanic ash in the sediments has been dated at seven million years, indicating a fantastic rate of downcutting and southeastward migration of the Yellowstone in a relatively short period of time.

MONTANA RIVERS STUDY
RELEVANT LITERATURE

Statewide

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APPENDIX A

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APPENDIX A

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APPENDIX B

Recommended Protected Areas for Resident Fish and Wildlife in Montana

Bitterroot River

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
GRANITE CREEK	MOUTH	HEADWATERS	GOLD CREEK	7.5	cons pure cutthroat trout	
MARTIN CREEK	BUSH CREEK	6194 M ELEVATION	MOOSE CREEK	11.7	cons pure cutthroat	uncon bull trout
SLEEPING CHILD CREEK	MOUTH	HEADWATERS	BITTERROOT RIVER	19.5	cons pure cutthroat	uncon bull trout

Blackfoot River

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
BELMONT CREEK	MOUTH	HEADWATERS	BLACKFOOT RIVER	5.0	ess spawn hab SF1	
BLACKFOOT RIVER SEC 01	MOUTH	CLEARWATER RIVER	CLARK FORK RIVER	92.9	SPORT FISH1	
EAST TWIN CREEK	LOWEST RD XING	180 M ABOVE XING	BLACKFOOT RIVER	0.1	ess spawn hab SF1	
GOLD CREEK	MOUTH	END OF RD	BLACKFOOT RIVER	10.8	ess spawn hab SF1	
JOHNSON GULCH	MOUTH	75 M ABOVE MOUTH	BLACKFOOT RIVER	0.1	ess spawn hab SF1	
WEST TWIN CREEK	50 M BELOW 1ST BRIDGE	50 M ABOVE 1ST BRIDGE	BLACKFOOT RIVER	0.1	ess spawn hab SF1	

Clark Fork River (upper)

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
BEEFSTRAIGHT CREEK	MOUTH	200 M ABOVE AMERICAN GULCH	GERMAN GULCH	2.3	abund pure cutthroat	
DEMPSEY CREEK	N FK DEMPSEY CREEK	HEADWATERS	CLARK FORK RIVER	7.1	cons pure cutthroat	
DOUGLAS CREEK	SETTLING POND	HEADWATERS (N & M FORK)	FLINT CREEK SEC 01	2.4	abund pure cutthroat	
E FK ROCK CREEK	MOUTH	E FK RESERVOIR	ROCK CREEK	8.0	ess spawn hab SF1	cutthroat & bull trout
GERMAN GULCH	MOUTH	HEADWATERS	SILVER BOW CREEK	5.6	abund pure wslope cutthroat	
GILBERT CREEK	MOUTH	RESERVOIR	ROCK CREEK	2.5	ess spawn hab SF1	
HARVEY CREEK	RAILROAD DROP STRUCTURE	HEADWATERS	CLARK FORK RIVER SEC 03	16.5	abund pure cutthroat	
HOGBACK CREEK	MOUTH	HEADWATERS	ROCK CREEK	3.1	ess spawn hab SF1	
LOWER WILLOW CREEK	WILLOW CREEK RESERVOIR	SOURCE	FLINT CREEK	5.0	abund pure cutthroat	
M FK DOUGLAS CREEK	MOUTH	HEADWATERS	DOUGLAS CREEK	1.2	abund pure cutthroat	
M FK ROCK CREEK	MOUTH	COPPER CREEK	ROCK CREEK	14.7	ess spawn hab SF1	cutthroat & bull trout
N FK DOUGLAS CREEK	MOUTH	HEADWATERS	DOUGLAS CREEK	3.9	abund pure cutthroat	
POWELL CREEK	EAST BOUNDARY SECTION 17	WEST BOUNDARY SECTION 17	CLARK FORK RIVER SEC 04	1.0	abund pure cutthroat	
RANCH CREEK	MOUTH	HEADWATERS	ROCK CREEK	8.7	ess spawn hab SF1	
ROCK CREEK SEC 01 & 02	MOUTH	FORKS	CLARK FORK RIVER	49.9	SPORT FISH1	cutthroat and bull trout
ROSS FORK ROCK CREEK	MOUTH	ELK CREEK	M FK ROCK CREEK	8.2	ess spawn hab SF1	cutthroat trout
S FK DOUGLAS CREEK	MOUTH	HEADWATERS	M FK DOUGLAS CREEK	1.4	abund pure cutthroat	
STONY CREEK	MOUTH	LAKE SOURCE	ROCK CREEK	9.0	ess spawn hab SF1	
TELEGRAPH CREEK	BEGIN PRIVATE LAND	END PRIVATE LAND IN FOREST	LITTLE BLACKFOOT RIVER	2.7	cons pure cutthroat trout	
WELCOME CREEK	MOUTH	CARBON CREEK	ROCK CREEK	4.1	cons pure cutthroat	cons bull trout
W FK ROCK CREEK	MOUTH	SOURCE	ROCK CREEK	18.3	ess spawn hab SF1	cons pure cutthroat/ bull trou

Clark Fork River (lower)

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
E FK DRY CREEK	JUNCTION WITH W FK DRY CREEK	SOURCE	DRY CREEK	6.0	cons pure cutthroat	
O'KEEFE CREEK	2 MI N OF I-90/US-93 WYE	HEADWATERS	CLARK FORK RIVER	7.0	cons pure cutthroat	
VERMILION RIVER	VERMILION FALLS	SOURCE	CLARK FORK RIVER	1.7	cons pure cutthroat	

Upper Flathead and Swan

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
ELK CREEK	9 KM ABOVE MOUTH	N & S FK	SWAN RIVER	4.5	ess spawn hab Swan Lake bull t	
FLATHEAD RIVER SEC 02	FLATHEAD LAKE	4 & M FK FLATHEAD RIVER	CLARK FORK RIVER	50.0	SPORT FISHI	coma cutthroat and bull trout
GOAT CREEK	MOUTH	1 KM ABOVE SCOUTH CREEK	SWAN RIVER	6.5	ess spawn hab Swan Lake bull t	
LION CREEK	MOUTH	10 KM ABOVE MOUTH	SWAN RIVER	6.2	ess spawn hab Swan Lake bull t	
SQUEEZER CREEK	MOUTH	BRIDGE AT 6.5 KM	GOAT CREEK	4.0	ess spawn hab Swan Lake bull t	
BAPTISTE CREEK	300 M ABOVE ROAD 38	SOURCE	HUNGRY HORSE RESERVOIR	3.0	coma pure cutthroat trout	
BEAR CREEK	MOUTH	1ST RR XING BELOW SUMMIT	M FK FLATHEAD RIVER	14.7	ess spawn & rear hab for SSCI	
BIG CREEK	MOUTH	1.5 KM ABOVE NICOLA CREEK	N FK FLATHEAD RIVER	11.9	ess spaw hab for SSCI	poten pure cutthroat and bull
BUNKER CREEK	MOUTH	FALLS	S FK FLATHEAD RIVER	11.2	ess spawn hab SSCI	
CHALLENGE CREEK	DOGGIE CREEK	HEADWATERS	M FK FLATHEAD RIVER	2.5	ess spawn hab SSCI	ess spawn hab Flathead Lk bull
COAL CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	19.3	ess spawn hab SSCI	abund pure cutthroat,bulltrout
CYCLONE CREEK	MOUTH	CYCLONE LAKE	COAL CREEK	4.0	ess spawn hab SSCI	pure cutthroat,pure bull trout
DEPUY CREEK	MOUTH	SOURCE	CANYON CREEK	2.5	coma pure cutthroat trout	
EMERY CREEK	MOUTH	CONFLUENCE OF HEADWATERS	HUNGRY HORSE RESERVOIR	6.3	ess spawn hab Hungry Horse Res	
ESSEX CREEK	MOUTH	WILDERNESS BOUNDARY	M FK FLATHEAD RIVER	2.9	ess spawn hab SSCI	
FELIX CREEK	MOUTH	3.8 KM ABOVE MOUTH	HUNGRY HORSE RESERVOIR	2.4	coma pure cutthroat trout	
GRANITE CREEK	7.9 KM ABOVE MOUTH	JCT DOGGIE/CHALLENGE CREEKS	M FK FLATHEAD RIVER	3.4	coma pure cutthroat	uncoma bull trout
HALLOWAT CREEK	MOUTH	4 KM ABOVE LAST BRIDGE	BIG CREEK	7.9	ess spawn hab SSCI	bull trout & cutthroat trout
HAY CREEK	BRIDGE 2 KM BELOW HAY LAKE	HAY LAKE	N FK FLATHEAD RIVER	1.2	uncoma pure cutthroat trout	
HUNGRY HORSE CREEK	MOUTH	SOURCE	HUNGRY HORSE RESERVOIR	6.4	ess spawn hab wsct Hungry Hr R	
KNIEFF CREEK	1.2 KM ABOVE MOUTH	SOURCE	HUNGRY HORSE RESERVOIR	2.5	coma pure cutthroat trout	
LANGFORD CREEK	MOUTH	MUD LAKE	BIG CREEK	2.0	ess spawn hab SSCI	abund cutthroat & bull trout
LID CREEK	HUNGRY HORSE RESERVOIR	SOURCE	HUNGRY HORSE RESERVOIR	2.5	coma pure cutthroat trout	
LOWER TWIN CREEK	MOUTH	WILDERNESS BOUNDARY	S FK FLATHEAD RIVER	1.0	ess spawn hab wsct Hungry Hr R	ess spawn hab bull tr Hung Hr
MATHEAS CREEK	MOUTH	CULVERT 1.5 KM ABOVE MOUTH	S FK COAL CREEK	0.9	coma pure cutthroat	bull trout
MCGINNIS CREEK	FALLS	SOURCE	CANYON CREEK	0.4	coma pure cutthroat trout	
MOOSE CREEK	MOUTH	24086 2 KM ABOVE WHALE BUTTES	N FK FLATHEAD RIVER	6.2	ess spawn hab SSCI	pure cutthroat trout
MORAN CREEK	7.1 KM ABOVE MOUTH	DAY AREA BELOW CASCADE	HAY CREEK	2.0	coma pure cutthroat trout	
MORRISON CREEK	0.1KM BELOW CRESCENT CREEK	HEADWATERS	M FK FLATHEAD RIVER	6.9	coma bull trout	uncoma cutthroat trout
PAOLA CREEK	MOUTH	WILDERNESS BOUNDARY	M FK FLATHEAD RIVER	3.5	ess rear hab bull tr Flthead L	
PUZZLE CREEK	MOUTH	SOURCE	MORRISON CREEK	4.0	ess spawn hab bull tr Flthd Lk	
QUINTONKIN CREEK	MOUTH	SOURCE	SULLIVAN CREEK	9.3	abund pure cutthroat trout	bull trout
RED MEADOW CREEK	MOUTH	LINK LAKE FORK	N FK FLATHEAD RIVER	13.6	ess spawn hab SSCI	pure cutthroat bull trout
RYLE CREEK	MOUTH	SOURCE	TENT CREEK	2.5	coma pure cutthroat trout	
SHORTY CREEK	MOUTH	FALLS 1 KM ABOVE N FK SHORTY C	WHALE CREEK	2.8	coma pure cutthroat trout	bull trout
SKOOKOLEEL CREEK	4.8 KM ABOVE MOUTH	LAKE AT HEADWATERS	BIG CREEK	2.1	uncoma pure cutthroat trout	
SKYLAND CREEK	MOUTH	W FK SKYLAND CREEK	BEAR CREEK	2.1	ess rear hab bull tr Flthd Lk	
S FK COAL CREEK	MOUTH	HEADWATERS	COAL CREEK	6.8	ess spawn hab SSCI	pure cutthroat & bull trout
SPOTTED BEAR RIVER	MOUTH	CLEAN FALLS	S FK FLATHEAD RIVER	19.6	abund pure cutthroat trout	bull trout
SULLIVAN CREEK	MOUTH	SOURCE	HUNGRY HORSE RESERVOIR	12.9	abund pure cutthroat trout	bull trout
TRAIL CREEK	MOUTH	BOTTOM OF DRY AREA	N FK FLATHEAD RIVER	7.1	poten pure cutthroat tbull trt	
TWENTY-FIVE MILE CREEK	1 KM ABOVE MOODE CREEK	EAR CREEK	M FK FLATHEAD RIVER	1.2	ess spawn hab SSCI	
UNNAMED CREEK	MOUTH	SOLPOE	FELIX CREEK	3.1	coma pure cutthroat trout	
WEST FORK	MOUTH	WHALE CREEK FALLS	N FK FLATHEAD RIVER	15.8	ess spawn hab SSCI	
WHELP CREEK	MOUTH	10.0 KM ABOVE MOUTH	HUNGRY HORSE RESERVOIR	6.2	ess spawn hab ctidv HH Reserv	
WOLVES BACK CREEK	MOUTH	2.8 KM ABOVE WILDCAT CR	HUNGRY HORSE RESERVOIR	4.4	ess spawn hab ctidv HH Res	

Kootenai River

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
BIG CREEK	MOUTH	JUNCTION OF N.S.FORKS	LAKE KOOCANUSA	7.9	ess spawn hab Lake ko corridor	
BOUNDARY CREEK	MOUTH	TERGE CREEK	KOOTENAI RIVER	9.1	ess spawn hab BT	
BRIGGS CREEK	MOUTH AT RESERVOIR	JUNCTION OF N.S.FORKS	LAKE KOOCANUSA	6.5	ess spawn hab RB Lake Koocanus	
CALLAHAN CREEK	FALLS	SOURCE	KOOTENAI RIVER	7.9	sound pure native rainbow trut	
CLARENCE CREEK	GRAVES CREEK	1KM PAST END OF CLARENCE ROAD	GRAVE CREEK	3.9	ess spawn hab bull tr Lk Kooca	
DUCK CREEK	MOUTH	WYOMA CREEK	KOOTENAI RIVER	6.3	ess spawn hab RB tr Lk Koocanu	
FISHER RIVER	MOUTH	LOON LAKE	KOOTENAI RIVER	43.3	ess spawn hab BT	
GRAVE CREEK	JUNCTION WITH FORTINE CREEK	MOUTH OF FOUNDATION CREEK	TOBACCO RIVER	27.0	ess spawn hab RB,DT,DV Lk Kooc	
KOOTENAI RIVER	FALLS	LIBBY DAM	COLUMBIA RIVER	26.3	SPORT FISHI	
KOOTENAI RIVER	STATE LINE	FALLS	COLUMBIA RIVER	20.4	white sturgeon	
LIBBY CREEK	MOUTH	HEADWATERS	KOOTENAI RIVER	26.2	ess spawn hab BT	
NORTH CALLAHAN CREEK	MOUTH	STATE LINE	CALLAHAN CREEK	2.0	abund pure native rainbow trt	
N FK BIG CREEK	NORTH AND SOUTH FORK JUNCTION	HEADWATERS	BIG CREEK	5.4	ess spawn hab Lake Koocanusa	
PINKHAM CREEK	MOUTH	FALLS (6 MI)	KOOTENAI RIVER	6.0	ess spawn hab Lake Koocanusa	
PIPE CREEK	MOUTH	NOISY CREEK	KOOTENAI RIVER	15.7	ess spawn hab bull tr,RB BT	
QUARTZ CREEK	MOUTH	HENNESY CREEK	KOOTENAI RIVER	9.1	ess spawn hab BT	
SINCLAIR CREEK	JUNCTION WITH TOBACCO RIVER	BUILDINGS 10.2KM FROM MOUTH	TOBACCO RIVER	6.3	ess spawn hab wsct Lk Koocanus	
SOUTH CALLAHAN CREEK	MOUTH	STATE LINE	CALLAHAN CREEK	2.8	abund pure native rainbow trt	
S FK BIG CREEK	NORTH SOUTH FORK BIG JUNCTION	HEADWATERS	BIG CREEK	15.0	ess spawn hab Lake Koocanusa	
TOBACCO RIVER	LAKE KOOCANUSA AT FULL POOL	JUNCTION FORTINE & GRAVE CREEK	LAKE KOOCANUSA	13.6	ess spawn hab Lk K corridor	ess spawn hab bull,rb,rbtc
YOUNG CREEK	MOUTH AT KOOCANUSA AT FULL POO	JUNCTION S FORK YOUNG CREEK	LAKE KOOCANUSA	7.5	ess spawn hab Lake Koocanusa	

Bitterroot River

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
BITTERROOT RIVER SEC 01	MOUTH	BELL XING	CLARK FORK RIVER	38.5	EAGLE NESTS(2);EAGLE WINT	OTTER-MOD;HERON ROOKERY
CAMERON CREEK	MOUTH	N FK CAMERON CREEK	E FK BITTERROOT RIVER	8.2	BG CRIT RANGE-ELK	
E FK BITTERROOT RIVER	MOUTH	MOOSE CREEK	BITTERROOT RIVER	14.4	BG CRIT RANGE-ELK	
GUIDE CREEK	MOUTH	HEADWATERS	E FK BITTERROOT RIVER	1.9	BG CRIT RANGE-ELK	
MINK CREEK	MOUTH	2.0 KM ABOVE MOUTH	E FK BITTERROOT RIVER	1.2	BG CRIT RANGE-ELK	
PIGLETT CREEK	MOUTH	HEADWATERS	W FK BITTERROOT RIVER	9.5	AMPHIB OF SPECIAL CONCERN	
REIMEL CREEK	MOUTH	3.2 KM ABOVE MOUTH	E FK BITTERROOT RIVER	1.9	BG CRIT RANGE-ELK	
SHEEP CREEK	MOUTH	HEADWATERS	W FK BITTERROOT RIVER	3.8	BG CRIT RANGE-ELK	
TOLAN CREEK	MOUTH	4.0 KM ABOVE MOUTH	E FK BITTERROOT RIVER	2.4	BG CRIT RANGE-ELK	
WARM SPRINGS CREEK	MOUTH	4.0 KM ABOVE MOUTH	E FK BITTERROOT RIVER	2.4	BG CRIT RANGE-ELK	

Blackfoot River

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
ALICE CREEK	MOUTH	HEADWATERS	BLACKFOOT RIVER	13.9	NCDE CRIT GB HAB	
ARRASTRA CREEK	MOUTH	NATIONAL FOREST	BLACKFOOT RIVER	4.3	BG CRIT RANGE-ELK	
BARTLETT CREEK	MOUTH	HEADWATERS	ALICE CREEK	6.7	NCDE CRIT GB HAB	
BEAVER CREEK	MOUTH	HEADWATERS	KEEP COOL CREEK	7.2	NCDE CRIT GB HAB	BG CRIT RANGE-ELK
BLACKFOOT RIVER SEC 01	MOUTH	CLEARWATER RIVER	CLARK FORK RIVER	51.7	EAGLE NEST;EAGLE WINT;OSPREY	PEREG EYRIE;OTTER-MOD
BLACKFOOT RIVER SEC 02	CLEARWATER RIVER	ARRASTRA CREEK	CLARK FORK RIVER	41.5	EAGLE NESTS(3);EAGLE WINT	OTTER-MOD;HERON ROOKERY;OSP
BLACKFOOT RIVER SEC 03	LINCOLN GULCH	HUMBUG CREEK	CLARK FORK RIVER	4.8	EAGLE NEST	
BLANCHARD CREEK	MOUTH	COLD BROOK CREEK	CLEARWATER RIVER	6.7	BG CRIT RANGE-ELK	
CABOTTE CREEK	MOUTH	HEADWATERS	BLACKFOOT RIVER	3.8	NCDE CRIT GB HAB	
CHAMBERLAIN CREEK	MOUTH	EAST FORK	BLACKFOOT RIVER	7.7	BG CRIT RANGE-ELK	
CLEARWATER RIVER	MOUTH	ELBOW LAKE INLET	BLACKFOOT RIVER	6.0	EAGLE NEST;OTTER-MOD;OSPREY	EAGLE WINT;BG CRIT RANGE-WT
COPPER CREEK	MOUTH	HEADWATERS	LANDERS FORK	14.4	NCDE CRIT GB HAB	
COTTONWOOD CREEK	MOUTH	NATIONAL FOREST	BLACKFOOT RIVER	9.1	BG CRIT RANGE-ELK	
DOUGLAS CREEK	MOUTH	COTTONWOOD CREEK	NEVADA CREEK	3.8	BG CRIT RANGE-ELK	
E FK CLEARWATER RIVER	MOUTH	HEADWATERS	CLEARWATER RIVER	5.8	NCDE GB CORRIDOR	
ELK CREEK	MOUTH	CAP WALLACE GULCH	BLACKFOOT RIVER	4.8	BG CRIT RANGE-ELK	
JOHNSON GULCH (CREEK)	MOUTH	2.0 KM ABOVE MOUTH	BLACKFOOT RIVER	1.2	PERES EYRIE	
LANDERS FORK BLACKFOOT R	MOUTH	FALLS CREEK	BLACKFOOT RIVER	10.3	NCDE CRIT GB HAB	
LOST HORSE CREEK	MOUTH	4.0 KM ABOVE MOUTH	CLEARWATER RIVER	2.4	EAGLE NEST FORAGE STREAM	
MCELWAIN CREEK	MOUTH	4.0 KM ABOVE MOUTH	NEVADA CREEK	2.4	BG CRIT RANGE-ELK	
MONTURE CREEK	MOUTH	HEADWATERS	BLACKFOOT RIVER	21.7	NCDE CRIT GB HAB;OTTER-MOD	BG CRIT RANGE-ELK
NEVADA CREEK	MOUTH	6.0 KM ABOVE MOUTH	BLACKFOOT RIVER	3.6	EAGLE NEST FORAGE STREAM	OTTER-MOD;BG CRIT RANGE-WT,E
N FK BLACKFOOT RIVER	MOUTH	WILDERNESS	BLACKFOOT RIVER	23.0	NCDE CRIT GB HAB;OSPREY	OTTER-MOD;BG CRIT RANGE-ELK
PLACID CREEK	PRIVATE LAND	SECOND CREEK	OWL CREEK	9.1	AMPHIB OF SPECIAL CONCERN	
POORMAN CREEK	MOUTH	FIELDS GULCH	BLACKFOOT RIVER	12.1	BG CRIT RANGE-ELK	
STONEWALL CREEK	NATIONAL FOREST	HEADWATERS	KEEP COOL CREEK	4.8	NCDE CRIT GB HAB	
WALIS CREEK	BLM BOUNDARY	HEADWATERS	BLACKFOOT RIVER	4.2	BG CRIT RANGE-ELK	
WARREN CREEK	MOUTH	3.0 KM ABOVE MOUTH	BLACKFOOT RIVER	1.2	EAGLE NEST FORAGE STREAM	
W FK CLEARWATER RIVER	MOUTH	HEADWATERS	CLEARWATER RIVER	12.1	NCDE GB CORRIDOR	

Upper Clark Fork River

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
ANTELOPE CREEK	MOUTH	6.0 KM ABOVE MOUTH	ROCK CREEK	3.6	BG CRIT RANGE-ELK	
BREWSTER CREEK	MOUTH	3.0 KM ABOVE MOUTH	ROCK CREEK	1.8	BG CRIT RANGE-ELK	
CLARK FORK RIVER SEC 03	BERT CREEK	HOOVER CREEK	COLUMBIA RIVER	5.0	EAGLE NEST FORAGE STREAM	
DEMPSEY CREEK	MOUTH	6.0 KM ABOVE MOUTH	CLARK FORK RIVER	3.6	BG CRIT RANGE-ELK	
DRY COTTONWOOD CREEK	MOUTH	6.0 KM ABOVE MOUTH	CLARK FORK RIVER	3.6	BG CRIT RANGE-ELK	
DUNKLEBERG CREEK	MOUTH	5.0 KM ABOVE MOUTH	CLARK FORK RIVER	3.0	EAGLE NEST	
LOST CREEK	MOUTH	6.0 KM ABOVE MOUTH	CLARK FORK RIVER	3.6	BG CRIT RANGE-ELK	
MILL CREEK	MOUTH	4.0 KM ABOVE MOUTH	CLARK FORK RIVER	2.4	BG CRIT RANGE-ELK	
MODESTY CREEK	MOUTH	4.0 KM ABOVE MOUTH	CLARK FORK RIVER	2.4	BG CRIT RANGE-ELK	
PETERSON CREEK	MOUTH	4.0 KM ABOVE MOUTH	CLARK FORK RIVER	2.4	BG CRIT RANGE-ELK	
RANCH CREEK	MOUTH	3.0 KM ABOVE MOUTH	ROCK CREEK	1.8	AMPHIB OF SPECIAL CONCERN	
ROCK CREEK SEC 02	HORSACK CREEK	FORKS	CLARK FORK RIVER	20.0	PERES EYRIE;HERON ROOKERY	OTTER-MOD;BG CRIT RANGE-ELK
ROSS FORK ROCK CREEK	MOUTH	4.0 KM ABOVE MOUTH	W FK ROCK CREEK	2.4	BG CRIT RANGE-ELK	
SPRING CREEK	MOUTH	4.0 KM ABOVE MOUTH	ROCK CREEK	2.4	BG CRIT RANGE-ELK	
UPPER WILLOW CREEK	MOUTH	SHEEP GULCH	ROCK CREEK	4.8	PEREG EYRIE	BG CRIT RANGE-ELK
WARM SPRINGS CREEK	12.8 KM BELOW SILVER LAKE	SILVER LAKE	CLARK FORK RIVER	7.7	BG CRIT RANGE-ELK	

Lower Clark Fork River

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
BEAVER CREEK	MOUTH	BIG BEAVER CREEK	CLARK FORK RIVER	7.0	BG CRIT RANGE-ELK	
BIG BEAVER CREEK	MOUTH	LION CREEK	?	2.9	BG CRIT RANGE-ELK	
BIG EDDY CREEK	MOUTH	HEADWATERS	CLARK FORK RIVER	1.9	BG CRIT RANGE-ELK	
BIG ROCK CREEK	MOUTH	HEADWATERS	THOMPSON RIVER	7.7	AMPHIB OF SPECIAL CONCERN	
CASCADE CREEK	MOUTH	HEADWATERS	CLARK FORK RIVER	4.2	AMPHIB OF SPECIAL CONCERN	
CLARK FORK RIVER SEC 01	SQUAW CREEK	WEEKSVILLE CREEK	PEND OREILLE RIVER	55.1	AMPHIB OF SPECIAL CONCERN	OTTER-MOD;OSPREY;BG RANGE-BHS
CLARK FORK RIVER SEC 02	FISH CREEK	DEEP CREEK	PEND OREILLE RIVER	23.0	EAGLE NESTS(2);PEREG EYRIE	EAGLE WINTER;BG CRIT RANGE-WT,ELK
CLEAR CREEK	MOUTH	6.4 KM ABOVE MOUTH	PROSPECT CREEK	3.8	BG CRIT RANGE-WT,MD,ELK	
DRY CREEK	MOUTH	JUNCTION E & W FORKS DRY CREEK	PROSPECT CREEK	3.4	BG CRIT RANGE-WT,MD,ELK	
E FK BULL RIVER	MOUTH	WILDERNESS	BULL RIVER	4.3	CYE CRIT GB HAB	
E FK ROCK CREEK	MOUTH	HEADWATERS	ROCK CREEK (LOWER CF)	4.8	CYE CRIT GB HAB	
EDDY CREEK	MOUTH	HEADWATERS	CLARK FORK RIVER	1.9	BG CRIT RANGE-ELK	
ELK CREEK	MOUTH	E & W FK ELK CREEK	CLARK FORK RIVER	5.6	BG CRIT RANGE-ELK	
FISH CREEK	MOUTH	WALL CANYON CREEK	CLARK FORK RIVER	6.0	BG CRIT RANGE-ELK	
FISHTRAP CREEK	MOUTH	BEATRICE CREEK	THOMPSON RIVER	5.8	BG CRIT RANGE-WT	
GILT EDGE CREEK	MOUTH	SPRING SOURCE	BIG CREEK	3.4	AMPHIB OF SPECIAL CONCERN	
GRAVES CREEK	MOUTH	WILDERNESS	CLARK FORK RIVER	7.7	CYE CRIT GB HAB	BG CRIT RANGE-BHS
GROUSE CREEK	MOUTH	HEADWATERS	VERMILION RIVER	2.4	CYE CRIT GB HAB	
LITTLE BEAVER CREEK	MOUTH	SWEETER CREEK	BEAVER CREEK	5.2	BG CRIT RANGE-ELK	
MARTEN CREEK	MOUTH	N FK MARTEN CREEK	CLARK FORK RIVER	10.1	BG CRIT RANGE-ELK	
MAYO CREEK	MOUTH	HEADWATERS	ST. REGIS RIVER	2.4	BG CRIT RANGE-ELK	
MCKAY CREEK	FORKS	HEADWATERS	CLARK FORK RIVER	3.8	CYE CRIT GB HAB	
M FK BULL RIVER	MOUTH	WILDERNESS	BULL RIVER	1.9	CYE CRIT GB HAB	
MOSQUITO CREEK	MOUTH	HEADWATERS	CLARK FORK RIVER	5.8	BG CRIT RANGE-BHS	
N FK BULL RIVER	MOUTH	WILDERNESS	BULL RIVER	2.9	CYE CRIT GB HAB	
O'KEEFE CREEK	MOUTH	4.0 KM ABOVE MOUTH	CLARK FORK RIVER	2.4	EAGLE NEST FORAGE STREAM	
PETTY CREEK	MOUTH	2.0 KM ABOVE MOUTH	CLARK FORK RIVER	1.2	PEREG EYRIE	
PILGRIM CREEK	MOUTH	W FK PILGRIM CREEK	CLARK FORK RIVER	5.3	BG CRIT RANGE-ELK	
PROSPECT CREEK	MOUTH	E FK PROSPECT CR	CLARK FORK RIVER	5.6	BG CRIT RANGE-WT,MD,ELK	
ROCK CREEK	MOUTH	4.0 KM ABOVE MOUTH	CLARK FORK RIVER	2.4	EAGLE NEST FORAGE STREAM	
ST REGIS RIVER	SILVER CREEK	DOMINION CREEK	CLARK FORK RIVER	3.8	AMPHIB OF SPECIAL CONCERN	OTTER-MOD;BG CRIT RANGE-WT
SQUAW CREEK	MOUTH	4.0 KM ABOVE MOUTH	CLARK FORK RIVER	2.4	BG CRIT RANGE-ELK	
SWAMP CREEK	NOXON RESERVOIR	HEADWATERS	CLARK FORK RIVER	10.6	CYE CRIT GB HAB	BG CRIT RANGE-ELK
THOMPSON RIVER SEC 01	MOUTH	FISHTRAP CREEK	CLARK FORK RIVER	15.4	AMPHIB OF SPECIAL CONCERN	OTTER-MOD;BG CRIT RANGE-WT,BHS
TROUT CREEK	MOUTH	WILTON CREEK	CLARK FORK RIVER	4.8	BG CRIT RANGE-ELK	
TUSCOR CREEK	MOUTH	FORKS	CLARK FORK RIVER	1.9	BG CRIT RANGE-ELK	
TWELVEMILE CREEK	MOUTH	E FK TWELVEMILE CREEK	ST. REGIS RIVER	1.9	BG CRIT RANGE-ELK	
VERMILION RIVER	MOUTH	HEADWATERS	CLARK FORK RIVER	12.4	CYE CRIT GB HAB	BREEDING HARLEQUIN DUCKS
WFK THOMPSON RIVER	FOUR LAKES CREEK	HEADWATERS	THOMPSON RIVER	3.4	CYE CRIT GB HAB	BG CRIT RANGE-BHS

Upper Flathead and Swan

RIV_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
ALDER CREEK	MOUTH	HEADWATERS	SWAN RIVER	2.4	BG CRIT RANGE-ELK	
ANTICE CREEK	MOUTH	HEADWATERS	SWIFT CREEK (WHITEFISH)	3.8	NCDE CRIT GB HAB	
ASHLEY CREEK	MOUTH	IDAHO CR	FLATHEAD MAINSTEM	16.6	OTTER-HIGH	
BARBER CREEK	SFK BARBER	HEADWATERS	SWAN RIVER	2.7	NCDE GB CORRIDOR	
BEAVER CREEK	MOUTH	HEADWATERS	SWAN RIVER	10.6	NCDE GB CORRIDOR	
BUCK CREEK	NATIONAL FOREST	HEADWATERS	SWAN RIVER	2.9	NCDE CRIT GB HAB	
CAT CREEK	MOUTH	HEADWATERS	DOG CREEK (SWAN)	3.9	NCDE CRIT GB HAB	BG CRIT RANGE-MT
CONDON CREEK	MOUTH	HEADWATERS	SWAN RIVER	7.7	NCDE CRIT GB HAB	BG CRIT RANGE-MT
COONEY CREEK	NATIONAL FOREST	HEADWATERS	SWAN RIVER	2.9	NCDE CRIT GB HAB	
DEG CREEK	MOUTH	HEADWATERS	CONDON CREEK	5.7	NCDE CRIT GB HAB;BG CRIT RANGE AMPHIB OF SPECIAL CONCERN	
DUNSIRE CREEK	MOUTH	6.0 KM ABOVE MOUTH	SHEPPARD (STILLWATER)	3.6	OTTER-HIGH	
E FK SWIFT CREEK	MOUTH	HEADWATERS	SWIFT CREEK (WHITEFISH)	9.6	EAGLE NEST FORAGE STREAM	OTTER-MOD;NCDE CRIT GB HAB
ELK CREEK	NATIONAL FOREST	WILDERNESS	SWAN RIVER	2.9	NCDE CRIT GB HAB	
FLATHEAD RIVER SEC 02	FLATHEAD LAKE INLET	KOKANEE BEND	FLATHEAD LAKE	34.9	EAGLE NESTS(2);EAGLE WINT	OTTER-HIGH;OSPREY;ROOKERY
GLACIER CREEK	NATIONAL FOREST	WILDERNESS	SWAN RIVER	4.9	NCDE GB CORRIDOR	BG CRIT RANGE-MT
GOAT CREEK	NATIONAL FOREST	HEADWATERS	SWAN RIVER	9.1	NCDE CRIT GB HAB	BG CRIT RANGE-MT
GOOD CREEK	MOUTH	MILLER CREEK	LOGAN CREEK (STILLWATER)	10.6	OTTER-HIGH	
GRIFFIN CREEK	MOUTH	6.0 KM ABOVE MOUTH	LOGAN CREEK (STILLWATER)	3.6	OTTER-HIGH	
HELLROARING CREEK	MOUTH	HEADWATERS	STILLWATER RIVER	2.4	NCDE CRIT GB HAB	
HEMLOCK CREEK	MOUTH	WILDERNESS	KRAFT CREEK (SWAN)	1.9	NCDE GB CORRIDOR	
HOLLAND CREEK	HOLLAND LAKE	HEADWATERS	SWAN RIVER	2.9	NCDE GB CORRIDOR	
LAZY CREEK	MOUTH	3.0 KM ABOVE MOUTH	WHITEFISH RIVER	1.8	EAGLE NEST FORAGE STREAM	
LEFEAU CREEK	MOUTH	2.0 KM ABOVE MOUTH	STILLWATER RIVER	1.2	EAGLE NEST FORAGE STREAM	
LION CREEK	MOUTH	HEADWATERS	SWAN RIVER	13.2	NCDE CRIT GB HAB	BG CRIT RANGE-MT
LITTLE BITTERROOT RIVER	HUBBART RESERVOIR	LITTLE BITTERROOT LAKE	FLATHEAD MAINSTEM	2.4	EAGLE NEST FORAGE STREAM	BG CRIT RANGE-MT,ELK
LOGAN CREEK	MOUTH	TALLY LAKE	STILLWATER RIVER	16.9	OTTER-HIGH	
N FK LOST CREEK	6.4 KM ABOVE MOUTH	HEADWATERS	LOST CREEK (SWAN)	4.9	BG CRIT RANGE-MT	NCDE CRIT GB HAB
OWL CREEK	MOUTH	HEADWATERS	HOLLAND CREEK (SWAN)	2.9	NCDE GB CORRIDOR	
PATRICK CREEK	BIRCH CREEK	HEADWATERS	ASHLY CREEK	5.8	BG CRIT RANGE-MT	
PIPER CREEK	MOUTH	WILDERNESS	SWAN RIVER	5.3	NCDE GB CORRIDOR	
RUMBLE CREEK	NATIONAL FOREST	HEADWATERS	SWAN RIVER	2.9	NCDE CRIT GB HAB	
SOUP CREEK	MOUTH	6.0 KM ABOVE MOUTH	SWAN RIVER	3.5	BG CRIT RANGE-MT	
S FK LOST CREEK	MOUTH	6.0 KM ABOVE MOUTH	LOST CREEK (SWAN)	3.6	BG CRIT RANGE-MT	
SQUAW CREEK	MOUTH	6.0 KM ABOVE MOUTH	SWAN RIVER	3.6	BG CRIT RANGE-MT,ELK	
SQUEEZER CREEK	MOUTH	HEADWATERS	GOAT CREEK (SWAN)	7.7	NCDE CRIT GB HAB	BG CRIT RANGE-MT
STILLWATER RIVER	MOUTH	HEADWATERS	FLATHEAD MAINSTEM	52.1	EAGLE NESTS(2);OTTER-HIGH	BG CRIT RANGE-MT,MD
SWAN RIVER SEC 02	SWAN LAKE INLET	5.0 KM ABOVE INLET	FLATHEAD LAKE	3.0	EAGLE NEST;HERON ROOKERY	OSPREY;BG CRIT RANGE-MT,EL
TAMARACK CREEK	MOUTH	2.0 KM ABOVE MOUTH	LITTLE BITTERROOT RIVER	1.2	EAGLE NEST FORAGE STREAM	
W FK SWIFT CREEK	MOUTH	HEADWATERS	SWIFT CREEK (WHITEFISH)	6.3	NCDE CRIT GB HAB	
SWIFT CREEK	MOUTH	W FK SWIFT CREEK	WHITEFISH RIVER	17.4	EAGLE NEST	NCDE CRIT GB HAB
WOLF CREEK	MOUTH	HEADWATERS	SWAN RIVER	8.2	NCDE CRIT GB HAB	BG CRIT RANGE-MT,MD,ELK
WOMAN CREEK	MOUTH	4.0 KM ABOVE MOUTH	SWAN LAKE	2.4	NCDE CRIT GB HAB	BG CRIT RANGE-MT,MD,ELK
YEW CREEK	MOUTH	3.0 KM ABOVE MOUTH	SWAN RIVER	1.8	EAGLE NEST FORAGE STREAM	BG CRIT RANGE-MD
ADDITION CREEK	MOUTH	HEADWATERS	S FK FLATHEAD RIVER	4.8	NCDE CRIT GB HAB	
BRUCE CREEK	MOUTH	HEADWATERS	S FK FLATHEAD RIVER	2.9	NCDE CRIT GB HAB	
BUNKER CREEK	MOUTH	HEADWATERS	S FK FLATHEAD RIVER	54.7	NCDE CRIT GB HAB	BG CRIT RANGE-ELK
CANYON CREEK	MOUTH	KIMMERLY CREEK	N FK FLATHEAD RIVER	9.4	NCDE CRIT GB HAB	BG CRIT RANGE-MT,MD,ELK
CHALLENGE CREEK	MOUTH	HEADWATERS	S FK FLATHEAD RIVER	3.3	NCDE CRIT GB HAB	
COAL CREEK	MOUTH	S FK COAL CREEK	N FK FLATHEAD RIVER	9.6	NCDE CRIT GB HAB;OTTER-MOD	BG CRIT RANGE-MD
CYCLONE CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	7.7	NCDE CRIT GB HAB;EAGLE NEST	BG CRIT RANGE-MD
DEEP CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	2.9	NCDE CRIT GB HAB	
DORIS CREEK	MOUTH	HEADWATERS	S FK FLATHEAD RIVER	3.3	AMPHIB OF SPECIAL CONCERN	
EMERY CREEK	MOUTH	6.0 KM ABOVE MOUTH	S FK FLATHEAD RIVER	3.6	AMPHIB OF SPECIAL CONCERN	
GRAVES CREEK	MOUTH	JEWEL BASIN	S FK FLATHEAD RIVER	3.8	AMPHIB OF SPECIAL CONCERN	
HAY CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	13.0	NCDE CRIT GB HAB	
HUNGRY HORSE CREEK	MOUTH	6.0 KM ABOVE MOUTH	S FK FLATHEAD RIVER	3.6	AMPHIB OF SPECIAL CONCERN	
LANGFORD CREEK	MOUTH	MID LAKE	BIG CREEK (N. FK FLATHEAD)	1.9	AMPHIB OF SPECIAL CONCERN	
LOST JACK CREEK	MOUTH	WILDERNESS	S FK FLATHEAD RIVER	1.5	NCDE CRIT GB HAB	
LOWER TWIN CREEK	MOUTH	WILDERNESS	S FK FLATHEAD RIVER	1.2	NCDE CRIT GB HAB	BG CRIT RANGE-ELK
MOOSE CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	10.1	NCDE CRIT GB HAB	
MORAN CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	7.2	NCDE CRIT GB HAB	
PADLA CREEK	MOUTH	WILDERNESS	N FK FLATHEAD RIVER	3.4	NCDE CRIT GB HAB	
PUZZLE CREEK	MOUTH	HEADWATERS	MORRISON CREEK (N FK FLAT)	4.8	NCDE CRIT GB HAB	
RED MEADOW CREEK	MOUTH	RED MEADOW LAKE	N FK FLATHEAD RIVER	15.1	NCDE CRIT GB HAB	
SHORTY CREEK	MOUTH	HEADWATERS	WHALE CREEK (N. FORK)	5.5	NCDE CRIT GB HAB	
SILVERTIP CREEK	MOUTH	WILDERNESS	SPOTTED BEAR RIVER	1.2	NCDE CRIT GB HAB	
S FK RED MEADOW CREEK	MOUTH	HEADWATERS	RED MEADOW CREEK	4.8	NCDE CRIT GB HAB	
SPOTTED BEAR RIVER	MOUTH	WILDERNESS	S FK FLATHEAD RIVER	18.9	BREEDING HARLEQUIN DUCKS	OTTER-MOD;BG CRIT RANGE-ELK
TEEPEE CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	10.6	NCDE CRIT GB HAB	
TIN CREEK	MOUTH	HEADWATERS	S FK FLATHEAD RIVER	3.8	NCDE CRIT GB HAB	
TUCHUCK CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	3.9	NCDE CRIT GB HAB	
TWIN CREEK	MOUTH	WILDERNESS	S FK FLATHEAD RIVER	1.8	NCDE CRIT GB HAB	BG CRIT RANGE-ELK
WERNER CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	1.9	NCDE CRIT GB HAB	
WHALE CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	17.3	NCDE CRIT GB HAB	
YAKINIKAN CREEK	MOUTH	HEADWATERS	N FK FLATHEAD RIVER	7.7	NCDE CRIT GB HAB	

Kootenai River

ST_NAME	LO_BOUND	UP_BOUND	TRIB_TO	MILES	REASON1	REASON2
ALDER CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
ALEXANDER CREEK	MOUTH	3.0 KM ABOVE MOUTH	KOOTENAI RIVER	1.8	EAGLE NEST FORAGE STREAM	BG CRIT RANGE-WT,MD,ELK
BEAR CREEK	MOUTH	WILDERNESS	LIBBY CREEK	4.8	CYE CRIT GB HAB	BG CRIT RANGE-MD
BIG CHERRY CREEK	LEIGH CREEK	WILDERNESS	LIBBY CREEK	4.3	CYE CRIT GB HAB;BG CRIT RNG-MD	AMPHIB OF SPECIAL CONCERN
BURNT CREEK	MOUTH	HEADWATERS	YAAK RIVER	4.0	CYE CRIT GB HAB	
BURRELL CREEK	MOUTH	HEADWATERS	KOOTENAI RIVER	2.4	CYE GB CORRIDOR	BG CRIT RANGE-BHS
BUTLER CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
CABLE CREEK	MOUTH	HEADWATERS	BEAR CREEK (LIBBY)	2.9	CYE CRIT GB HAB	BG CRIT RANGE-MD
CARNEY CREEK	MOUTH	6.0 KM ABOVE MOUTH	KOOTENAI RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
CHINA CREEK	MOUTH	HEADWATERS	KOOTENAI RIVER	2.9	CYE GB CORRIDOR	BG CRIT RANGE-BHS
COPY CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
COAL CREEK	MOUTH	HEADWATERS	YAAK RIVER	3.8	CYE CRIT GB HAB	
COW CREEK	MOUTH	HEADWATERS	FISHER RIVER	4.3	BG CRIT RANGE-WT,MD,ELK	
DEEP CREEK	5.0 KM BELOW WILDERNESS	WILDERNESS	BIG CHERRY CREEK (LIBBY)	3.0	CYE CRIT GB HAB	
DOAK CREEK	MOUTH	6.0 KM ABOVE MOUTH	PIPE CREEK	3.6	BG CRIT RANGE-WT,MD,ELK	
DOE CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
DRY CREEK	SPRING CREEK	WILDERNESS	LAKE CREEK	2.4	CYE CRIT GB HAB	
DUNN CREEK	MOUTH	3.0 KM ABOVE MOUTH	KOOTENAI RIVER	1.8	EAGLE NEST FORAGE STREAM	
FAWN CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
FLEETWOOD CREEK	MOUTH	6.0 KM ABOVE MOUTH	RAINY CREEK	3.6	BG CRIT RANGE-WT,MD,ELK	
GRANITE CREEK	MOUTH	WILDERNESS	BIG CHERRY CREEK (LIBBY)	6.0	CYE CRIT GB HAB	BG CRIT RANGE-MD
GRAVE CREEK	MOUTH	HEADWATERS	TOBACCO RIVER	16.3	MODE CRIT GB HAB	BG CRIT RANGE-WT,MD,ELK
GUS CREEK	MOUTH	HEADWATERS	YAAK RIVER	1.4	CYE CRIT GB HAB	
HARRIS CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
INDEPENDENCE CREEK	MOUTH	HEADWATERS	YAAK RIVER	3.4	CYE CRIT GB HAB	
KAVALLA CREEK	MOUTH	6.0 KM ABOVE MOUTH	WOLF CREEK	3.6	BG CRIT RANGE-WT,MD,ELK	
KEELER CREEK	MOUTH	N FK KEELER CREEK	LAKE CREEK	1.9	AMPHIB OF SPECIAL CONCERN	
KENNEDY GULCH	MOUTH	4.0 KM ABOVE MOUTH	KOLTENAI RIVER	2.4	BG CRIT RANGE-WT,MD,ELK	
KOOT CREEK	MOUTH	HEADWATERS	KOOTENAI RIVER	1.9	CYE GB CORRIDOR	BG CRIT RANGE-BHS
KOOTENAI RIVER	KOOTENAI FALLS(INCL)	LIBBY DAM	COLUMBIA RIVER	25.9	MARLEQUINS;EAGLE NEST;PEREGRINES	EAGLE WINT;OTTER-MOD;OSPREY
LAKE CREEK	MOUTH	BULL LAKE OUTLET	KOOTENAI RIVER	19.2	EAGLE NEST;OTTER-MOD;OSPREY	
LEIGH CREEK	MOUTH	WILDERNESS	BIG CHERRY CREEK (LIBBY)	3.8	CYE CRIT GB HAB	BG CRIT RANGE-MD
LIBBY CREEK	RAMSEY CREEK	WILDERNESS	KOOTENAI RIVER	4.8	CYE CRIT GB HAB;OTTER-MOD	OSPREY;HERON ROOKERY
LITTLE CHERRY CREEK	MOUTH	4.0 KM ABOVE MOUTH	LIBBY CREEK	2.4	BG CRIT RANGE-MD	
LITTLE CREEK	MOUTH	HEADWATERS	YAAK RIVER	1.9	CYE CRIT GB HAB	BG CRIT RANGE-WT,MD
MCGUIRE CREEK	MOUTH	6.0 KM ABOVE MOUTH	LAKE KOOCANUSA	3.6	BG CRIT RANGE-MD,BHS	
MCPILLOP CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
MEADOW CREEK	MOUTH	2.0 KM ABOVE MOUTH	YAAK RIVER	1.2	PEREG EYRIE	
MITCHELL CREEK	MOUTH	6.0 KM ABOVE MOUTH	KOOTENAI RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
MUD CREEK	MOUTH	HEADWATERS	THERRIAULT CREEK (TOBACCO)	4.8	MODE CRIT GB HAB	BG CRIT RANGE-WT,MD,ELK
N FK SEVENTEENMILE CREEK	MOUTH	HEADWATERS	SEVENTEEN MILE CREEK (YAAK)	3.8	CYE CRIT GB HAB	BG CRIT RANGE-MD,ELK,MD
OTIS CREEK	MOUTH	HEADWATERS	YAAK RIVER	2.4	CYE CRIT GB HAB	
PEOPLES CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
PHEASANT CREEK	MOUTH	HEADWATERS	YAAK RIVER	4.8	CYE CRIT GB HAB	
POORMAN CREEK	MOUTH	WILDERNESS	LIBBY CREEK	4.8	CYE CRIT GB HAB	BG CRIT RANGE-MD
RAINY CREEK	MOUTH	4.0 KM ABOVE MOUTH	KOOTENAI RIVER	2.4	BG CRIT RANGE-WT,MD,ELK	
RAMSEY CREEK	MOUTH	4.0 KM ABOVE MOUTH	LIBBY CREEK	2.4	BG CRIT RANGE-MD	
RED TOP CREEK	MOUTH	2.0 KM ABOVE MOUTH	YAAK RIVER	1.2	PEREG EYRIE	
ROCKY CREEK	MOUTH	4.0 KM ABOVE MOUTH	KOOTENAI RIVER	2.4	BG CRIT RANGE-MD,BHS	
SEVENTEENMILE CREEK	MOUTH	HEADWATERS	YAAK RIVER	11.0	CYE CRIT GB HAB	BG CRIT RANGE-MD,ELK,MD
SHEEP CREEK	MOUTH	HEADWATERS	LAKE KOOCANUSA	1.9	BG CRIT RANGE-MD,BHS	
SKUNK CREEK	MOUTH	HEADWATERS	YAAK RIVER	1.9	CYE CRIT GB HAB	
SMEARL CREEK	MOUTH	HEADWATERS	BIG CHERRY CREEK (LIBBY)	3.8	CYE CRIT GB HAB	
SMOKE CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
SNELL CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
SNOWSHOE CREEK	MOUTH	HEADWATERS	BIG CHERRY CREEK (LIBBY)	3.4	CYE CRIT GB HAB	
S FK YAAK RIVER	MOUTH	HEADWATERS	YAAK RIVER	10.4	CYE CRIT GB HAB	
SQUAW CREEK	MOUTH	6.0 KM ABOVE MOUTH	FISHER RIVER	3.6	BG CRIT RANGE-WT,MD,ELK	
STANLEY CREEK	MOUTH	5.0 KM ABOVE MOUTH	LAKE CREEK	1.9	EAGLE NEST FORAGE STREAM	
TWEEL CREEK	MOUTH	HEADWATERS	LAKE KOOCANUSA	1.9	BG CRIT RANGE-MD,BHS	
UPAL CREEK	MOUTH	HEADWATERS	LAKE KOOCANUSA	1.8	BG CRIT RANGE-MD,BHS	
WEST FISHER RIVER	MOUTH	HEADWATERS	FISHER RIVER	5.8	CYE CRIT GB HAB	
WILLIAMS CREEK	MOUTH	WILDERNESS	KOOTENAI RIVER	1.9	CYE CRIT GB HAB	
YAAK RIVER SEC 01	MOUTH	S FK YAAK RIVER	KOOTENAI RIVER	32.6	PEREG EYRIE;CYE GB CORRIDOR	OTTER-MOD
YOUNG CREEK	MOUTH	3.0 KM ABOVE MOUTH	LAKE KOOCANUSA	2.1	EAGLE NEST FORAGE STREAM	

APPENDIX C

Example of Data Available in Montana Rivers Study Data Management System

MONTANA RIVERS STUDY
SUMMARY OF VALUE CLASS ASSIGNMENTS BY REACH
05/10/88 - 10:49

1)KOOTENAI RIVER

RIVER NAME	WATER CODE	RESOURCE	REACH	UPPER BOUNDARY	LOWER BOUNDARY	VALUE
KOOTENAI RIVER	113500	Cultural	83	T32N- R34W - SEC 16	T32N- R34W - SEC 34	1
			548	T30N- R29W - SEC 18	T31N- R30W - SEC 32	1
			549	T31N- R31W - SEC 36	T31N- R32W - SEC 24	1
			550	T31N- R32W - SEC 17	T31N- R33W - SEC 20	1
			551	T31N- R34W - SEC 12	T32N- R34W - SEC 34	1
		Fisheries	669	LIBBY DAM	FALLS	1
			675	FALLS	STATE LINE	1
		Geological	1	-	-	1
			659	-	-	2
			939	-	-	2
			431	-	-	U
		Natural	362	-	-	4
		Recreation	1	KOOTENAI FALLS	IDAHO BORDER	1
			2	HWY 37 BRIDGE	KOOTENAI FALLS	1
		Wildlife	JHP	LAKE CR	IDAHO BORDER	2

*** REPORT END ***

Montana Rivers Study
Fishery Assessment Details

****

Filter conditions:
Class Database: riv_name='KOOTENAI RIVER'
Stand Database:

****

Stream name: KOOTENAI RIVER Serial: 669
FWP Region: 1 Code: 113500 Reach: 002 Length: 43.1 km
FS Dist: 1405 Hydrologic Unit: 17010101
Lower boundary: FALLS T31NR33W13
Upper boundary: LIBBY DAM T31NR29W33A
County at lower boundary: LINCOLN
Tributary to: COLUMBIA RIVER
Sport Fishery Value: 1 Habitat & Species Value: 4
Resource (FINAL) Value: 1

****

Fish Species Abundance

RAINBOW TROUT	Abundant w/ proportional No. large fish
CUTTHROAT TROUT	Common
LONGNOSE DACE	Common
REDSIDE SHINER	Common
LARGESCALE SUCKR	Abundant
MT WHITEFISH	Abundant
TORRENT SCULPIN	Abundant
BULL TROUT	Rare
BURBOT	Rare
PEAMOUTH	Rare
N SQUAWFISH	Rare
LONGNOSE SUCKER	Rare
SLIMY SCULPIN	Rare

Trout biomass = 0000371kg/300m

Other Characteristics Used in Fishery Assessment

Use: 02518 fisherman-days/yr/10km (FMD overall = 0010853)
Ingress Rating: Permitted
Esthetics Rating: National renown

****

MONTANA RIVERS STUDY
WILDLIFE ASSESSMENT DETAILS
05/10/88 - 10:20

*** WILDLIFE AREA DESCRIPTION ***

Area JHY: KOOTENAI RIVER MAINSTEM DFWP Region: 1
Lower Bdy: LAKE CR (Riv. Mi.187.0, Legal: T31NR33W18)
Upper Bdy: LIBBY DAM (Riv. Mi. 221.7)
Trib to: COLUMBIA RIVER Hydro Unit:17010101 Drainage: 11
Unit Type: MAINSTEM Counties: LINC.

*** HABITAT CRITERIA ***

DESIGNATED HABITAT PROTECTION:

Conservation Easement,

RIPARIAN HABITAT QUALITY:

Condition: MODERATE	Forested: MODERATE	Wetlands: MODERATE
Islands: MODERATE	Diversity: MODERATE	

*** SPECIES CRITERIA ***

T & E SPECIES: (0 = absent,1 = present, 2 = critical habitat)

Grizzly Bear: 2	Bald Eagle: 2	Wolf: 0
Whooping Crane: 0	Peregrine Falcon: 0	Ferret: 0

GAME & FURBEARER SPECIES VALUE:(* 0 = None, 1= Low, 2 = Moderate, 3 = High)

	Value*	Seasonal use		Hab Suit/Dens*
Whitetail Deer:	2	YEARROUND	River Otter:	2
Mule Deer:	1	SPRING	Beaver:	1
Elk:	1	YEARROUND	Bobcat:	1
Antelope:	0	NONE	Lynx:	0
Bighorn Sheep:	2	YEARROUND	Marten:	0
Moose:	1	YEARROUND	Wild Turkey:	1
Black Bear:	2	YEARROUND	Mountain Grouse:	1
Mountain Lion:	1	YEARROUND	Pheasant:	0
Sharptail Grouse:	0	NONE	Canada Goose:	2
Sage Grouse:	0	NONE	Wolverine:	0
Mountain Goat:	0	NONE	Other:	0

SPECIALIZED WILDLIFE USE:
Large nesting osprey population
Golden eagle nesting cliffs present
Wintering raptors

TOTAL POINTS

Habitat: 55 Species: 173

FINAL RATINGS

(1 = Outstanding, 2 = Substantial, 3 = Moderate, 4 = Limited, 5 = Unknown)

Habitat: 3 Species: 1

FINAL VALUE CLASS: 2

MONTANA RIVERS STUDY
RECREATION ASSESSMENT DETAILS
05/10/88 - 10:48

```
SET FILTER TO RIV_NAME = 'KOOTENAI RIVER                    '.AND.
SUBSTR(CODE,1,2) = '11'
```

CODE: 113500 RIVER NAME: KOOTENAI RIVER COUNTY: LINC.
SEGMENT NO.: 1 LENGTH: 20 mi
LOWER BOUNDARY: IDAHO BORDER UPPER BOUNDARY: KOOTENAI FALLS
DFWP REGION: 1 RATING AGENCIES: USFS ONLY
USFS FOREST: 14 USFS DISTRICT: 05 USGS HYDROLGIC UNIT: 17010101
WATER CHARACTER: Moderate/Major rapids MONTHS/YR BOATABLE: 7
ACTIVITY RATINGS: (1 = Primary activity,2 = Secondary activity)
MOTOR BOATING: 1 CANOEING: 1 KAYAKING: 1 RAFTING: 1
TUBING: 2 SWIMMING: 2 BOAT FISHING: 1 SHORE FISH: 1
TENT CAMPING: 1 CAR CAMPING:1 TRAIL USE: 2 MTR TRAILER: 2
DRIVING: 1 VIEWING: 1 PICNICING: 1
USE LEVEL: Unknown USE ESTIMATE: Moderate ACCESS: Limited/Restricted
SCENIC QUALITY:Outstanding ROS CLASS: Transition NO. DEVELOPED SITES:2
VALUE CLASS ASSIGNMENTS (1 = outstanding,2 = substantial,
3 = moderate, 4 = limited, 5 =unclassified, 0 = not rated)
DFWP: 1 BLM: 0 USFS: 1 FINAL VALUE: 1

```
 FILE:   GEO.dbf              RECORD NO:    1      05/10/88     10:37:03
SET FILTER TO RIV_NAME = 'KOOTENAI RIVER                  '.AND.
SUBSTR(CODE,1,2) = '11'

 SITE NUMBER:   G-1         DFWP WATER CODE:   113500  USFS FOREST:  14
 SITE NAME:     Kootenai Falls                          USFS DISTRICT:  05
 TYPE:     falls, gorge, chute
 STATUS:   Proposed NNL, priority 1-AA
 COUNTIES:     LINC; ;
 RIVER NAME:     KOOTENAI RIVER    RIVER MILES     191     - 193.5
 QUADS:     Kootenai Falls  (1963 ,  7.5 )   (19    ,       )
 BLM 1:100000 MAP NUMBER:     50
 LEGAL:  T-     31    N    -T              R-  32    W    - R
 SECTIONS:     N 1/2 S 13, parts of S 14
 LATITUDE:              -              LONGITUDE:             -
 DESCRIPTION:
See Hyndman and Alt (1982), pp. 62-70 (#1); DNRC (1982)

 SOURCES:  :
See description
 ACCURACY:   1
 UNIQUENESS:     2      DESIGNATION:     1     USE:    2   SCIENTIFIC VALUE:     3
 FINAL VALUE CLASS:     1


 FILE:   GEO.dbf              RECORD NO: 588      05/10/88     10:37:09
SET FILTER TO RIV_NAME = 'KOOTENAI RIVER                  '.AND.
SUBSTR(CODE,1,2) = '11'

 SITE NUMBER:   G-659       DFWP WATER CODE:   113500  USFS FOREST:  14
 SITE NAME:     China Rapids                            USFS DISTRICT:  05
 TYPE:     rapids, ,
 STATUS:
 COUNTIES:     LINC; ;
 RIVER NAME:     KOOTENAI RIVER    RIVER MILES     195.3  - 195.8
 QUADS:     Scenery Mountain  (1963 ,  7.5 )   (19    ,       )
 BLM 1:100000 MAP NUMBER:     50
 LEGAL:  T-     31    N    -T              R-  32    W    - R
 SECTIONS:     S17
 LATITUDE:              -              LONGITUDE:             -
 DESCRIPTION:
Rapids.

 SOURCES:  :
Allen, S. (1985) interview
 ACCURACY:   2
 UNIQUENESS:     2      DESIGNATION:     4     USE:    2   SCIENTIFIC VALUE:
 FINAL VALUE CLASS:     2
```

MONTANA RIVERS STUDY
CULTURAL FILE RESOURCE / DUMP
05/10/88 - 10:51

```
SET FILTER TO RIV_NAME = 'KOOTENAI RIVER                    '.AND.
SUBSTR(CODE,1,2) = '11'
```

```
CODE   113500       FINAL_VAL    1
       REACH          83    RESOURCE     C   MAP_NAME     YAAK
       RIV_NAME     KOOTENAI RIVER
       VALUE_A          VALUE_B          VALUE_C          VALUE_D
       UP_TWP       32N  UP_RAN        34W  UP_SEC        16
       LO_TWP       32N  LO_RAN        34W  LO_SEC        34
```